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Lighthouse

JOURNAL OF THE CANADIAN HYDROGRAPHIC ASSOCIATION

REVUE DE L'ASSOCIATION CANADIENNE D'HYDROGRAPHIE

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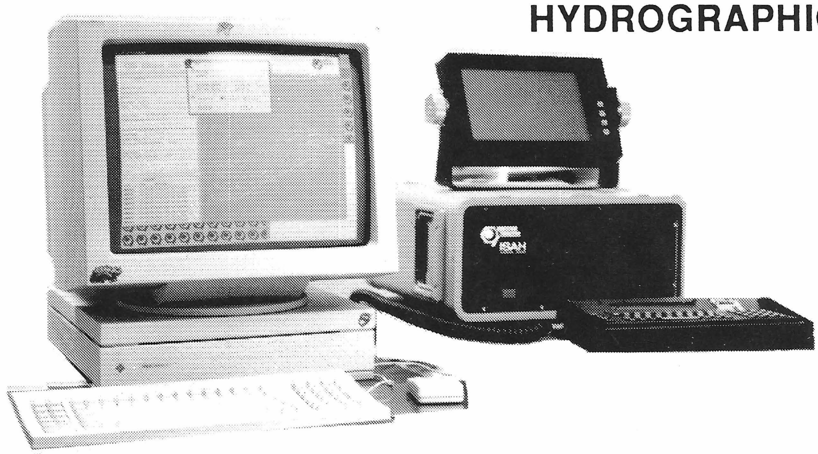

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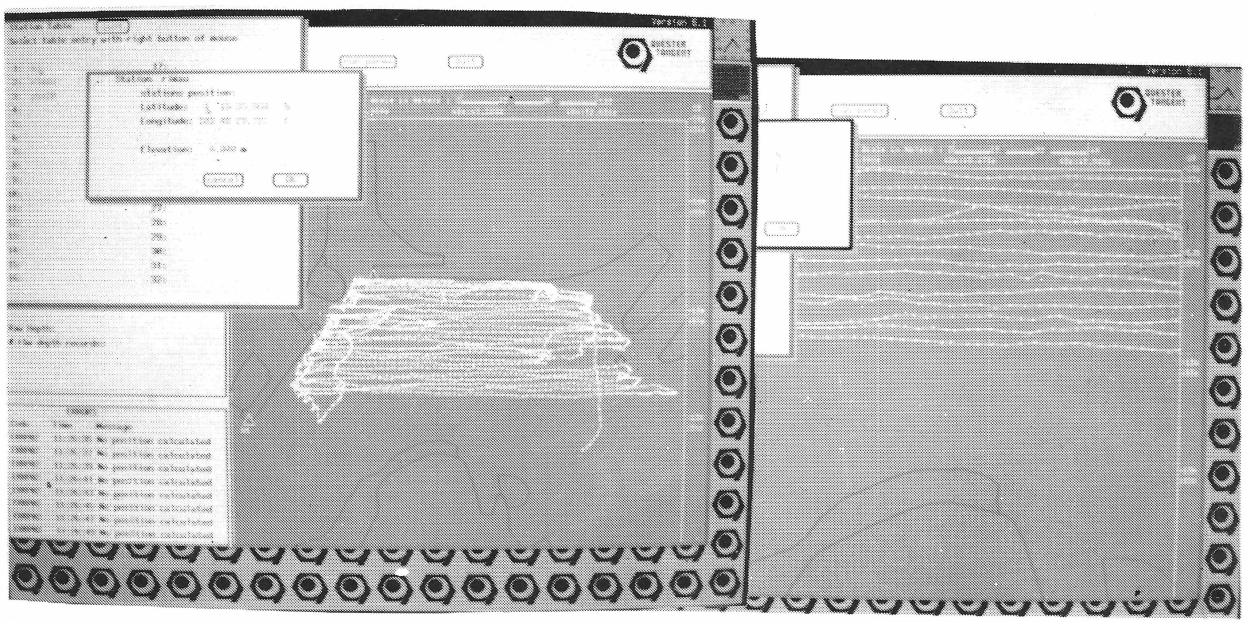

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Edition / Édition 45

LIGHTHOUSE

Spring / Printemps 1992

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

LIGHTHOUSE is published twice yearly by the Canadian Hydrographic Association and is distributed free to its members. A membership application form can be found on **page 2** of this issue. Yearly subscription rates for non-members are $20 for Canadian residents, and $25 for non-residents. Please make cheque or money order payable in Canadian funds to the Canadian Hydrographic Association.

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Pour les tarifs et les spécifications publicitaires, se référer à la **page 59** de cette édition.

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Back issues of Lighthouse, Editions 24 through 44 are available at a price of $10 per copy. Please write to the Editor.

Les éditions 24 à 44 de la revue Lighthouse sont disponibles au coût de 10 $ par copie en écrivant au rédacteur en chef.

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Spring Issue	March 1 / 1er mars	Édition du printemps
Fall Issue	October 1 / 1er octobre	Édition de l'automne

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Application for Membership / Formule d'adhésion

I hereby make application for membership in the Canadian Hydrographic Association and if accepted agree to abide by the constitution and by-laws of the association.

Je désire devenir membre de l'Association canadienne d'hydrographie en tant que et si ma demande est acceptée je m'engage à respecter la constitution et les règlements de cette association.

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Letters to the Editor
Lettres au rédacteur en chef

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Dear Sir:

Lighthouse

Thank you for sending a sample copy of the above journal. We would be very glad if you would supply us with regular complimentary copies so that abstracts may be published in our **Geographical Abstracts: Physical Geography** publication, and on **GEOBASE**, our on-line database.

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Thank you for your cooperation.

Yours faithfully,

Mr. N. T. Davey, Technical Editor
ELSEVIER Science Publishers, Norwich, England

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Message from the National President / Mot du Président national

Following from my last message in the Fall '91 edition of Lighthouse it seems that many people have indeed "caught the wave" and the winter has provided many excellent Branch seminars, social events and the initiating of a very exciting project by Central Branch.

During 1992 Central Branch, will undertake the construction of a replica survey launch (length 23 feet, beam 7.5 feet) used to obtain soundings in the harbour of Toronto, Ontario in 1792. The launch will be constructed using 1800's launch building techniques. When complete it will used for field survey re-enactments, staffed by persons in period attire; a very worthy project which will promote hydrography. We all wish Central Branch the best for this project. (editor's note: For further information on this project see the article by A. Leyzack on page 31 and the sketch on the back cover of this issue.)

The wave doesn't stop there, new Branch Executives have been installed and are now busy aligning themselves with how to best serve the needs of your Branch. To this end the Branch Vice-President's, who are also the Director's of the CHA, will be meeting during the early summer to discuss activities for CHA nationally and internationally. Your suggestions and views are solicited.

I would like to thank Larry Robbins, CHA's "extraordinaire international chargé d'affaires" for organizing and conducting a CHA hospitality function during the recent Australian Hydrographic Symposium (Dec. 9 - 12). I understand that it was well attended and that Larry in typical fashion "kept everyone's toes wet".

There is one wave though that has nearly crested, and it is my own. My term as National President of CHA is complete at the conclusion of '92 and the Nomination Committee chaired by Mr. Jake Kean is soliciting nominees. Please review the Committees nomination guide-lines and make your voice known. (editor's note: see 'Notice of Nominations Invitation' below.)

It is satisfying to note that our Association has grown in the last 26 years from an active group of hydrographers employed by the Canadian Hydrographic Service to a group of people operating in the private, academic and public sectors who operate in the holistic world of hydrography.

This diversity in members and the Association's continual support of a myriad of hydrographic projects will ensure that the CHA maintains a healthy growth perspective for the next 26 years.

Regards,
Dave

Invitation for Nominations / Appel de candidatures

C.H.A. - National President / Président national - A.C.H.

The Nominations Committee for the position of **National President** of the **Canadian Hydrographic Association** for the term **1993-1996** invites nominations.

Eligibility requirements for a candidate's nomination are:

1. a member in good standing with the Canadian Hydrographic Association;
2. nominated in a letter endorsed by two members in good standing of the Canadian Hydrographic Association, addressed to the Nominations Committee; and
3. a letter of acceptance of nomination by the nominee addressed to the Nominations Committee.

Nominations for the position of National President will close on October 1st, 1992 and the candidates will be reported in the next edition of Lighthouse (Fall '92). Balloting will take place on December 1st, 1992.

Correspondence should be addressed to:

Mr. Jake Kean, Chairperson
Nominations Committee
Canadian Hydrographic Association
Box/C.P. 5378, Station F/Succursale F
Ottawa, Ontario, Canada K2C 3J1

Le comité d'élection au poste de **Président national** de **l'Association canadienne d'hydrographie** fait appel à des candidatures pour le prochain terme de **1993 à 1996**.

Les qualifications nécessaires pour être éligible sont:

1. le candidat doit être un membre en bonne et due forme de l'Association canadienne d'hydrographie;
2. doit être proposé dans une lettre de présentation endossée par deux membres en bonne et due forme de l'Association canadienne d'hydrographie et adressée au Comité d'élection; et
3. le candidat doit soumettre une lettre d'acceptation de sa candidatature adressée au Comité d'élection.

La période d'appel des candidatures au poste de Président national se terminera le 1er octobre 1992 et les candidats seront présentés à l'automne 92 dans l'édition 46 de la revue Lighthouse. Le dépouillement du scrutin aura lieu le 1er décembre 1992.

La correspondance doit être adressée à:

M. Jake Kean, Président
Comité d'élection
Association canadienne d'hydrographie
C.P. 5378, Succursale F
Ottawa, Ontario, Canada, K2C 3J1

Lighthouse Abstracts

Cape Sable

by
B. J. Smith

Cape Sable, located in southwestern Nova Scotia, is the site of the lightstation shown on this journal's cover. This article briefly covers the station's history, from its beginning in 1861 to its automation and subsequent de-staffing in 1986.

Page 7

Cape Sable

par
B. J. Smith

Cape Sable, situé dans le sud-ouest de la Nouvelle-Écosse, est le site du phare montré sur la page couverture de cette revue. Cet article présente brièvement l'histoire de cette station depuis ses débuts en 1861 jusqu'au retrait du personnel en 1986 suite à son automatisation.

Page 7

Land Settlements and Aboriginal Self-Government

by
P. Knight

Canada Lands Surveyors have the responsibility for surveying on Indian Reserves in Canada and are becoming increasingly involved in the survey of native land claims. This paper discusses the history of native land claims in Canada, the issue of aboriginal self-government and the requirement for surveyors to understand these native issues.

Page 15

Règlements des terres et gouvernement aborigène autonome

par
P. Knight

Les arpenteurs fédéraux ont la responsabilité d'arpenter sur les réserves indiennes au Canada et deviennent de plus en plus impliqués dans les levés des terres autochtones revendiquées. Cet article relate l'histoire des réclamations territoriales indigènes au Canada, la question d'un gouvernement aborigène autonome et la nécessité pour les arpenteurs de comprendre ces questions autochtones.

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A Field Evaluation of the KAE Fansweep - A Portable, Shallow-Water, Multi-Beam Sonar System

by
P. R. Milner and J. L. Galloway

In July, 1991, the Canadian Hydrographic Service, Pacific Region, acquired the Krupp Atlas Electronik Fansweep for a period of four weeks for evaluation. Various tests were performed to assess the Fansweep as a primary sounding tool for large scale hydrographic surveys and to assess the system's usefulness as a sweep tool for shoal detection and examination.

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Une évaluation terrain du "Fansweep" de KAE - Un système sonar portatif à multifaisceaux pour les eaux peu profondes

par
P. R. Milner et J. L. Galloway

En juillet 1991, le Service hydrographique du Canada, région du Pacifique, a obtenu le "Fansweep" électronique de Krupp Atlas pour une période de quatre semaines afin de l'évaluer. Différents tests furent réalisés pour évaluer l'utilité du système comme outil de balayage pour la détection et l'examen de hauts-fonds.

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Résumés pour Lighthouse

Fansweep Tests - Manufacturer's Comments

by
I. Harre and V. Meyer

In this paper the manufacturer of the Fansweep (Atlas Elektronik) comments on the tests performed by the Canadian Hydrographic Service, Pacific Region as presented in "A Field Evaluation of the KAE Fansweep - A Portable, Shallow-Water, Multi-Beam Sonar System" (see page 21, in this edition of Lighthouse). System modifications and comparisons with the results of subsequent Fansweep tests, obtained in the Netherlands and the United States, are also provided.

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Les tests "Fansweep" - Commentaires du manufacturier

par
I. Harre et V. Meyer

Dans cet article, le manufacturier du "Fansweep" (Atlas Electronik) commente les tests réalisés par le Service hydrographique du Canada, région du Pacifique, tels que présentés dans "Une évaluation terrain du Fansweep de KAE, un système sonar portatif à multifaisceaux pour les eaux peu profondes." (voir page 21, dans cette édition de Lighthouse). Les modifications et les comparaisons du système "Fansweep" avec les résultats de tests subséquents obtenus au Pays-Bas et aux États-Unis sont aussi présentées.

Page 29

The CHA/CB Heritage Launch Project

by
A. Leyzack

The Canadian Hydrographic Association/Central Branch is constructing a full size replica of an 18th-century survey launch at Toronto's Harbourfront recreation facility in 1992 and 1993, using period tools, techniques and costume. A historical sketch of the founding of Toronto including the early hydrographic surveys of Toronto Harbour is also provided.

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Le projet de l'embarcation héritage

par
A. Leyzack

L'Association canadienne d'hydrographie, section centrale, construit en 1992 et 1993, une réplique grandeur nature d'une embarcation de levé sur le site des installations récréatives du port de Toronto en utilisant les outils, les techniques et les costumes de l'époque. Un aperçu historique de la fondation de Toronto incluant les levés hydrographiques du port de Toronto est aussi présenté.

Page 31

LORAN-C Signal Analysis in the Lower St. Lawrence Using a Mobile GPS System

by
B. Townsend, G. Lachapelle and D. Hains

Loran-C signals along the Lower St. Lawrence River were analysed using LORCAL[2], a mobile Loran-C coverage validation and calibration system. The system consists of analog and digital Loran-C equipment and a GPS system. The Loran-C Time Differences were calibrated along some 1800 km of roads using GPS. A preliminary analysis of the following measurements is presented: TD distortions due to the secondary and additional secondary factors, Signal-to-Noise Ratio, Field Strength, and Envelope-to-Cycle Differences. Preliminary conclusions pertaining to Loran-C coverage and performance in the area are presented. Plans for future work are outlined.

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Analyse du signal LORAN-C dans le bas Saint-Laurent en utilisant un système GPS mobile

par
B. Townsend, G. Lachapelle et D. Hains

On analyse les signaux Loran–C dans le Bas Saint–Laurent en utilisant le système mobile LORCAL[2] développé spécialement pour l'étude de la couverture et la calibration du Loran–C. Ce système consiste de récepteurs Loran–C analogue et digital, ainsi que d'un récepteur GPS. Les differences de temps Loran–C ont été calibrées le long de quelques 1800 km de routes à l'aide du GPS. On présente une analyse préliminaire des mesures suivante. Les distortions des différences de temps dues aux factors secondaires et secondaires additionnels, les rapports signaux/bruits, l'intensité de champ, et la différence entre l'enveloppe modulante de les cycles. Quelques conclusions préliminaires concernant la couverture et les performances du Loran–C dans la région sont présentées. Les travaux supplémentaires en cours sont finalement décrit.

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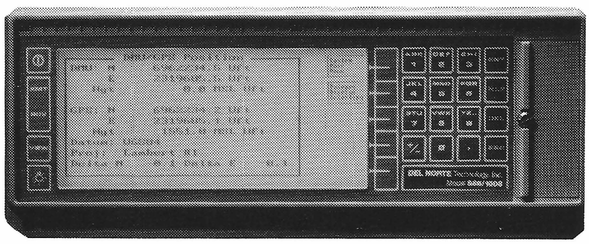
How many pieces of survey equipment should you buy as your needs change?



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Cape Sable

by

Betty June Smith

On a clear day at Chapel Hill, Nova Scotia, looking south you will see, 9 miles away, the slim white lighthouse tower at Cape Sable. *[Editor's note: This is also the same lighthouse which has graced the cover of our journal for the past 8 years (16 editions).]* This beautiful light is one of Canada's tallest, and its most southerly East Coast light and fog alarm station. The islet it stands on is so low you see only its higher dunes; seamen must be close inshore to "raise" it from a low deck viewpoint. The Cape Sable lighthouse is therefore high and its foghorn loud to guide ships away from, or through the nearby shoals and ledges made more dangerous by strong, erratic tides and heavy fogs that last days and weeks.

From seaward, Cape Sable appears part of the mainland; only the Micmacs knew how inside passages separated it. The first Europeans here charted it as the SW tip of what is now Nova Scotia, or even as the entire peninsula; indeed, on some early charts "Cape Sable" meant large parts of the northeastern New World. On the southern hillside below the observation tower on Chapel Hill lay Lomeron, the first trading station in greater Cape Sable. The post brought the Micmacs into happy contact with Europeans, as it lay on their traditional migration route. Going out in tough, seaworthy canoes to gather fish trapped in the shallows, dig clams and hunt seabirds' eggs, the Micmacs rounded the cape close inshore.

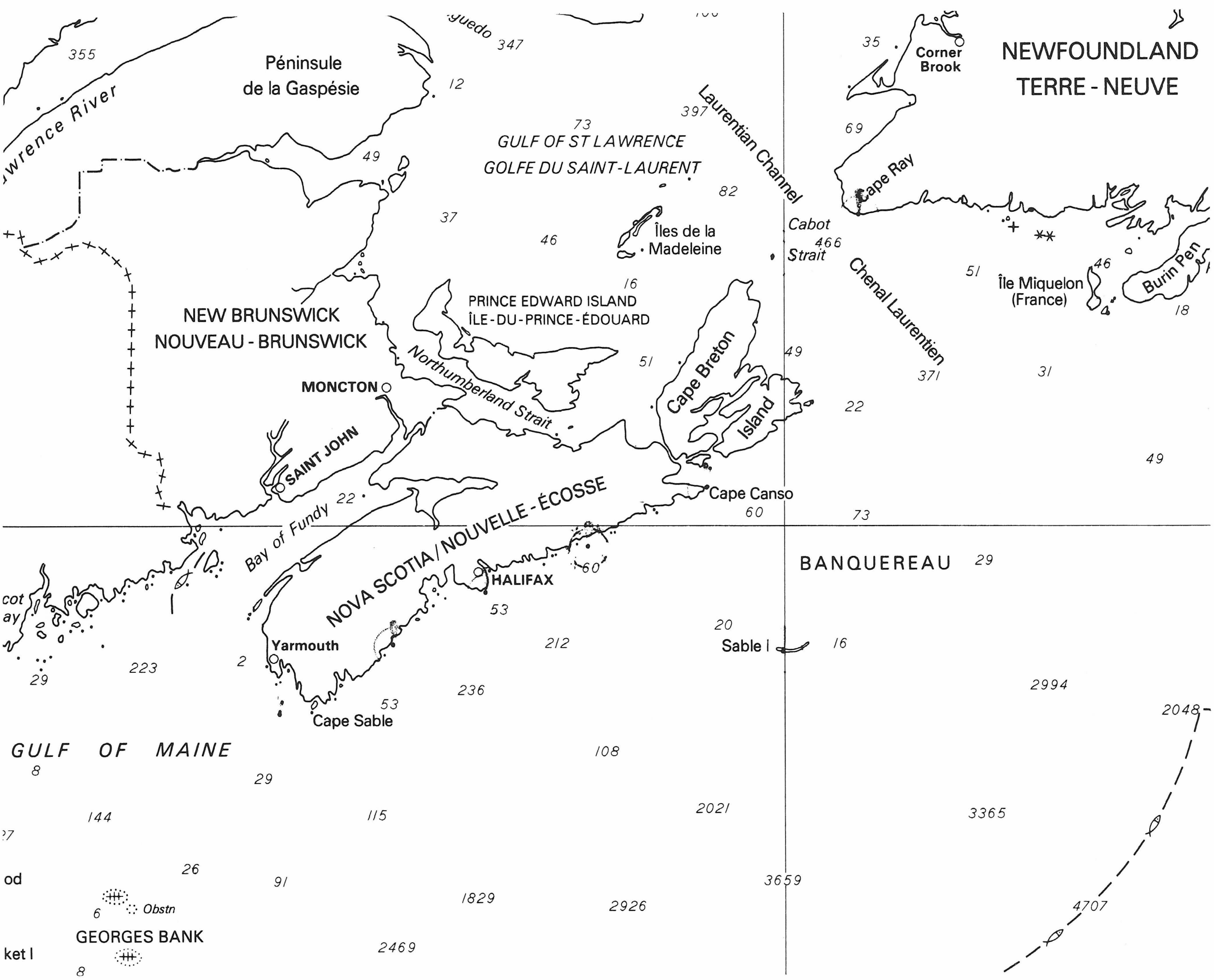


Figure 1: Location of Cape Sable, Nova Scotia. (portion of Canadian Hydrographic Service chart 4000)

However, the first deep-sea sailors passed this hazard well offshore. It soon became notorious. Imagine the square sails and high prows of Viking ships coming into view, scudding fast on a following wind; for in 1000 A.D., Norse adventurers did sail past. One leader inscribed a message on a boulder at Green Island; years of weathering broke down the surface and the runes have not been conclusively translated. Do they tell how a *'knorr'* struck the ledges, with wreckage and passengers driven ashore by wind and waves? Or did the navigator chisel in with pride and thanks to God that he had safely passed the dreaded Cape?

Then picture small fishing boats from Portugal and Spain, that came before Columbus's time to fish here; their hulls and stubby masts bobbing over wave crests, dropping into troughs, with some of them inevitably lost. By our hurricane season they would be deeply laden with good cod, easily swamped or smashed on the lee shores.

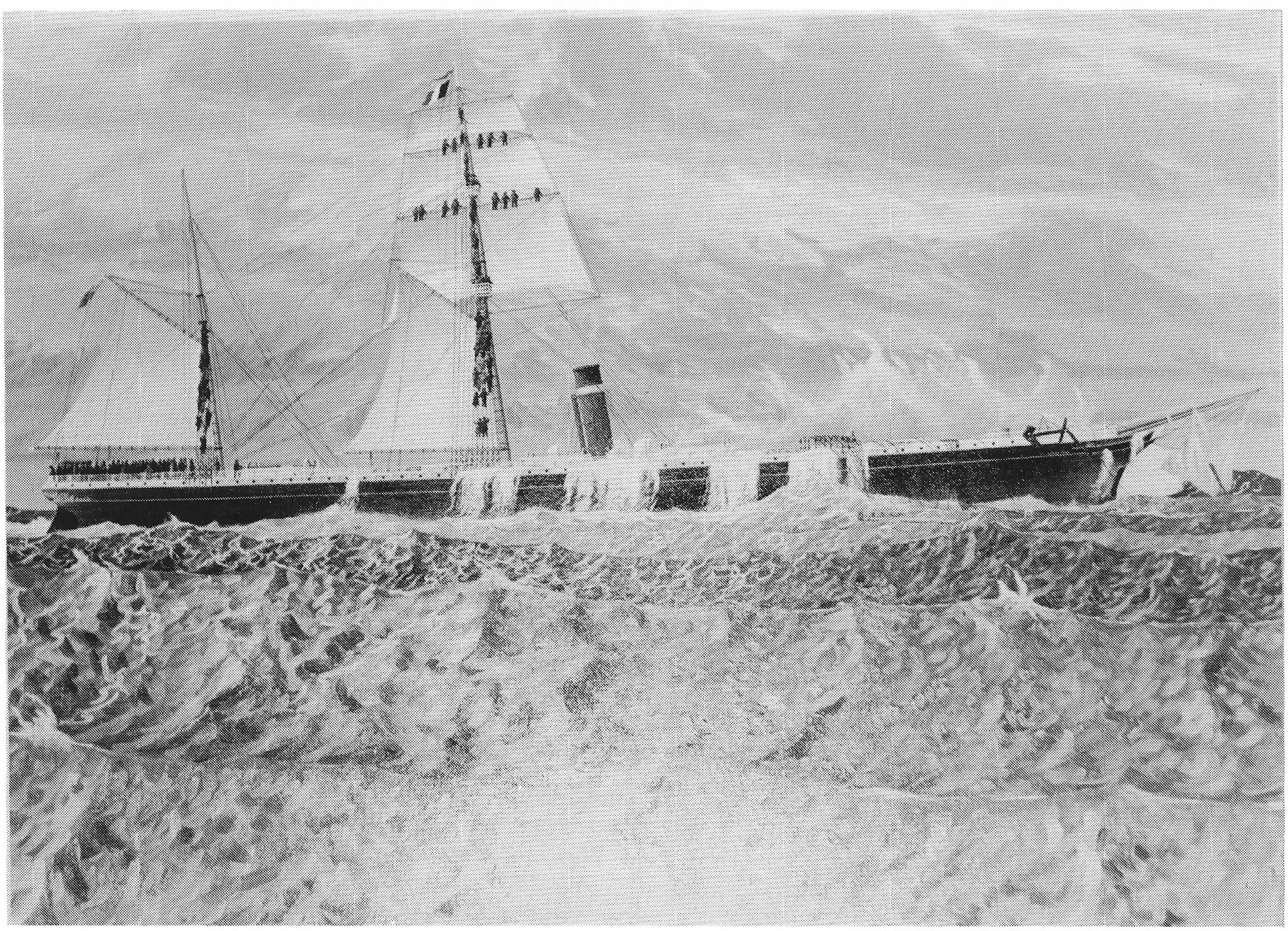
'Little ships' (less than 200 tons), poop-decked and ornate, struggled past in 1604. By then, seasonal European fishing stations had reached southward from Newfoundland. The control of fisheries, lumbering, trading and mining in the New World was desired by powers in the Old. Then came geographer Samuel de Champlain with a French expedition looking for permanent settlement sites and recording many features for the first time. Southwest of Cape Sable, already well known, this old map-maker added, *"ille ans tous marains"* - "this bend is all shoals".

Still exploration and trade grew and for more than 200 years captains tried to pass this cape relying only on compass and sextant readings. Their inaccurate charts were scratched over with notes; information obtained by the trial and error method. The errors meant lost ships and men: financial ruin for owners, hardship and grief for families. By 1800, lighthouses at other headlands helped navigators set courses to clean Cape Sable, but still its horrendous weather and strong tides caught too many vessels.

Petitions were signed begging the Provincial Government for a light at Cape Sable. Legislation of 1850: "Enacted ... (b) Grant of 2000 pounds ($10,000±) for lighthouse at Cape Sable or Baccaro ...". Probably because construction was easier and cheaper on the mainland than on an island, this light went to Baccaro Point; and for years further petitions for a Cape Sable went unanswered.

Wooden hulls gave way to steel; and sails, hard to maneuver with, gave way to steam power, paddle wheels, and propellers. All were improvements, but all were more expensive to build and to run. Owners urged faster trips, and captains cut as close as they dared to shore around the major headlands. Of many wrecks over those years, one in particular is seen as the immediate impetus for a light at Cape Sable:

"On a night in February, 1860, the steamship HUNGARIAN was caught up in the fury of the wind and sea, and was destroyed on the reef that runs out from Cape Sable ... Nova



The Steamship HUNGARIAN

Painting by Gerald Smith, Ottawa, (formerly of Cape Sable). Photo by Kathy Johnson.

Scotians were alarmed at the great loss of life – over 200 – and of cargo valued in the millions ...". [1]

From eyewitness accounts, February 20, 1860: "As soon as anything could be discerned through the heavy frost vapour, we saw a large steamer ... Her foremast was gone but her smokestack, main and mizzen masts were still standing ... we could make out people in the rigging.". Soon after, waves poured in cataracts over the hull, the mainmast fell with its human burden, and bitter cries went up from the watchers on the shore. When that flood tide turned ebb, the great ship was nothing but wreckage.

The next year the government came to a different decision from that of 1850, and on November 12, 1861, a light shone out from the top of the new, wooden, 60-foot lighthouse.

It was a red light! Lamps burning seal oil behind lantern windows of ruby-red glass present a beautiful picture to our minds today, but it was a signal far weaker than was needed to shine far seaward. To this day Cape Sable is undergoing the series of changes to equipment that began (as far as we know) in 1868, when Canada's Department of Marine and Fisheries took over the administration of lightstations, and reported: "The light at this station is of the greatest importance. An improvement has been made in the light by changing the glass in the lantern from red to clear, and substituting red chimneys for clear ones. It can be seen from four to five miles further since the alteration was made.". [1]

In 1874: "Old oil lamps replaced by a compound series of nine large circular burners with 25" reflectors (each costing $90, a newsman reported) ... probably catatropic (reflecting) Argand lamps ...".[1] Now the signal was white, and much brighter, but still fixed.

Strangely, the most significant advance in light signals had been made 50 years before; in 1823 Augustin Fresnel of France built a lens that collected and focused light beams. Observers ran a test proving that 17% of a reflected light reached them at sea, and 83% of lens-directed light. Later Cape Sable did receive a beautiful lens, made in Birmingham, England. It was about 6' high and four-sided; each side was made up of many individual prisms set in thick brass, with a bull's eye lens about 8" in diameter centred in each side. From a distance, viewers saw a flash of light when the bull's eye of the turning lens directly faced them. The lens enclosed the light source: wick lamps changed to kerosene-vapour burners with mantles. Generators powered electric lamps of ever-changing types after 1960, which was a much safer method.

Lens and light source were mounted on a heavy cast iron deck, cut away at one point so the keeper's upper body could be inside as he cared for or lit the lamps (indeed, he entered the lens bodily to clean its interior). Lens and mount weighed several thousand pounds, and had to turn at a precise and unvarying speed night after night. A great basin filled with mercury floated it effortlessly. Clockwork mechanisms maintained the speed prescribed to regulate the flashes. In the yard below, the turning beams were visible overhead all the time, rather like the arms of a giant ceiling fan, and were loveliest when filled with snowflakes. Cape Sable's signal, 1 flash every 5 seconds, was easily distinguished from any other lights near it; that is, if it could be seen at all.

No matter how bright the light, it ccould not reach far enough through the fog or precipitation, so wrecks continued. In 1876, another building went up, for a steam-powered whistle; Nova Scotia's tenth, and likely its most needed. Typically, the new fog alarm "... soon received an extended test when Cape Sable was blanketed with heavy fog for two solid weeks. From this time ... reports on fog horns at this and other stations generally occupy as much space in the annual reports as do those on light towers". [1]

Certainly, the horn was of major importance to navigation and also the more difficult of the two signals to operate, requiring 200 tons of coal, plus some firewood, every year. The fuel was landed from supply ships at the natural landing some distance from the station, stored there in a large shed, and hauled to a sub-depot attached to the whistle-house. It was hauled by ox and cart, so the steam-engineer/lightkeeper had to also be a farmer and maintain the barn, maintain the field and fences, make hay, haul seaweed dressing to fertilize the soil (which is almost all sand and was easily depleted), and keep up that hauling road with the mountains of ash from the steamer!

The whistle's daily care could be also much harder than the light's. At that time, the light was lit at sundown, watched and tended several times during the night, extinguished at sunup, cleaned and refilled. Though this was time consuming, it was made easy by routine. The fog alarm, on the other hand, might have needed to be run 24 hours out of the day, or worse, needed to be started and stopped many times, a laborious process.

In 1906 a diaphone fog horn (operated by compressed air) replaced the whistle; the steam equipment continued in use to run the air compressors. In 1925, an improved, "type F", diaphone was put in, which was more complex, reliable, and louder. It was very loud, but its regular note was deep and pleasant, adding to the overall feeling that this was an important and efficiently functioning station.

The whistle house was demolished in 1990; the blueprints, though interesting, cannot bring to life the striking atmosphere within that building. At first it housed a sunken reservoir and steel coal-fired boilers that converted the water to steam. Keepers from that time later spoke with much nostalgia of this system and the shrill blast produced to pierce the fog with one 10-second blast per minute, to identify it as Cape Sable's signal.

In 1953, when I went to Cape Sable as the lightkeeper's wife, I learned that this building along with several additions was called the engine room. The original boiler room, about 30 feet square and 12 feet high with floor and walls of greying brick, was used for storage and workshop. The steam works had been removed and rusting a few yards away outside. Next, there was a room holding towering tanks for fuel and compressed air, with stairs leading up two storeys to the horn room. There, the diaphone workings were inside for servicing, and the trumpet of the horn, 51 inches long, made of cast iron, reached out through the wall, about 15 feet above the beach.

Storms had moved the naturally–formed cobblestone seawall against the building's seaward side, so this comparatively small device seemed to be throwing its warning right into the

Cape Sable Lightstation c 1909.
Left to right, whistle-house and engine-room; original light; 2 sheds; barn; original dwelling. Telephone poles, extended from Marconi Station elsewhere on the island. The view is from north.

teeth of the offending weather. This was an especially gallant and moving stance when hurricane winds lashed it with salt water torn from the tops of waves, which broke within feet of it, and when seaward nothing could be seen but more crashing breakers. The smother of the breakers and the fog, cut off visibility close inshore, but ocean swells from the deep water would break on ledges about 5 miles out, rebuild briefly over deeps, then break again. Through the fog we could sense the forces and fury of the storms as if we could see it all.

Anyone within hearing of the brave signal, from the south, was doomed; but it could be useful to seamen west or east of the Cape. The keepers would never let the horn stop if they could prevent it. One winter storm in the early '30s flooded the entire station yard and floated the fuel tanks in the engine room, breaking fuel-line connections and stopping the engines.

To keep the engines running and the horn blowing under ordinary conditions, the keepers gave on-going care, repairs and replacements, adjustments and oilings. The horn must not only blow, it must blow to the second, for the correct duration and at the right air pressure. A fine hand and ear were needed since too much air pressure, though causing a loud blast, could, under certain conditions, interfere with the final action of the vibrators and produce a "grunt' at the end of the signal. At a great distance, especially in calm weather, this phenomenon might be the only part heard.

During World War II a German U-boat apprehended the fishing vessel LUCILLE M. (Percy Richardson, Master). Before sinking the vessel, the enemy ordered the crew into dories and left them to make shore as best they could. Knowing their position to be 110 miles south of Cape Sable, they set compass course towards it. Rowing is a quiet means of travel and the sea and wind were calm, which permitted a smotheringly-thick fog that added to the stillness. The crew, being right on the still water, had the benefit of good sound-conduction. While still 45 miles from land, and listening hard, they could hear a low note sometimes, which, when timed, proved to be their well-known guide.

This marvelous horn depended on the engine-room equipment: two diesel generators and two air-compressors running alternate 48-hour shifts. A network of belts, pulleys, pipes and valves brought fuel in, carried air out to the storage tank (thence to the horn), regulated air pressure and roughly adjusted the timing and length of blast. The first diesels generated 1,200 watts of power, enough DC current to light the engine room. This was the only electricity on the station until 1960 and was of great value since the engine room equipment was a not a safe place to walk without any lighting. Keepers walked among flywheels whizzing at 680 rpm, with the heavy leather belts zipping and flapping between engines and compressors. When the system broke down at night, the start-up of the alternate equipment was done by flashlight, with all haste to get the station 'on the air' again.

The change over from the main system to its relief called for fast hand and footwork to maintain the fog signal's timing without missing a blast. The keepers acquired this skill by making many switch-overs during prolonged periods of fog. A really solid stretch of 28 consecutive 24-hour days of operation, in July, 1967, may be the record for East Coast stations. (Of the three remaining days of that month, two had considerable fog and one was clear.)

Who knows how many wrecks the lights and fog alarms have prevented? But records are available for most wrecks that did happen despite these aids to navigation. This one has an amusing side:

"The ABERDEEN was a Canadian Government Steamer built in 1894, and used to supply light stations and to attend buoys...She stranded in a dense fog off Seal Island on October 13, 1923. The ABERDEEN was carrying the new light apparatus for Cape Sable..." (All 48 souls on board survived). [2]

The old light lens and apparatus continued to function splendidly for years atop the new 86 foot tower, built in 1923, which still stands today. With the lantern, its height is 101 feet. The tower was constructed using reinforced concrete to its best advantage here. While other towers built in this era often had distracting flying buttresses outside, or interior framing members, Cape Sable's "...relied on an overall grid of horizontal and vertical bars to resist stresses of various types, including stresses produced by wind forces, and the compressive stresses produced by the tower's own weight and that of the lantern on top. The tapered design of the tower's shaft contributed to the strong support of the lantern.".[1]

The tower was equally unadorned inside. Steep, steel ships' ladders connected five above-ground floors, the 3 lower floors being 20 feet apart provided a nerve-jangling climb. The bare, chill walls echoed and amplified every gasping breath of a new climber. Old climbers ran up and down, in daylight or dark (lighting was not installed until later). Climbing higher there were two more floors each 10 feet apart, then the lantern. This consisted of 9 feet of concrete and iron and then 5-foot panes of heavy glass set in cast-iron and brass sashes, all covered by the iron roof.

From a narrow catwalk just inside the lantern windows, keepers cleaned the lens exterior and the window interiors, painted, and put up or took down heavy dark curtains used to protect the prisms from destructive sunlight. Set in one of the lantern's 8 sides was a door leading to the deck; a narrow, slightly sloping ledge ringed by wooden (later steel) railings. During winter, keepers scrambled out to clear snow or frost from the outer surface of the panes.

Inside the lantern, the concrete and iron walls, and the floor, were painted grey or red, as issued by Department of Transport stores. The ceiling and canopy just above the lens were white to reflect light back down to the lens and increase the signal's strength.

Outside, the lantern was entirely Marine Red and the tower white, refreshed every third year with a coat of special cement wash. High winds frequently scrubbed it with salt spray and all forms of precipitation, so that by the third year, personnel became so annoyed by the distressed appearance of the tower that even the hard and dangerous job of repainting it was welcomed. For years a bo'sun's chair suspended from the deck was used for this. In 1954, the keeper (B.F. Smith) and his assistant (Sidney Smith) built a safer lift; an open box of sturdy wood, large enough to hold two painters, brushes with extension handles and scrapers. The sides were high enough to prevent a man from falling out, but nothing could prevent the uneasy feeling when one reached up to work on the overhanging deck, or far to the side. The box had wheels which helped it move easily up and down the tower sides. At the top of the light the rig held the box off so that it swung freely.

A tractor provided the power to raise the box which was much heavier than the bo'sun's chair. A harness of rope encircled the lantern base and extended over the edge of the deck, ending in a block through which the rope, to hoist and lower the box, was run. A similar pulley was tied into the ropes of the box. Since the station buildings were close together the tractor had to drive through fields, away from the southern sides of the light, when they were being painted. The driver, however could not see how high the box was getting, so a signal man stood where he could see both the box and the driver. A dreadful suspense reigned for everyone as painter and signal man watched the blocks drawing closer together. The driver imagined it and feared that somehow he might miss the signal and drive too far. When the top part of each side was scraped and painted and the first "Lower away" call heard, relief and joy took over. The lower laps, still dangerously high, seemed much safer. It normally took one man using brushes 10 hours to paint each of the eight sides above the string course; later, two men using rollers could complete two sides in a day.

This method of painting was used during the 1960's when Cape Sable had a staff of three; one man to tend the tractor and two to paint. A hundred years after the first keeper, John Hervey Doane, lit the new beacon. His son Isaac seems to have been his assistant, but was not a government employee. Until 1959, head keepers were appointed to the Civil Service and responsible for hiring, training, and paying their helpers. When Mr. J. H. Doane died, in 1871, Isaac became keeper until 1902. The following is a list of the lightkeepers at Cape Sable:

John Hervey Doane	1861 - 1871
Isaac Doane	1871 - 1902
Arthur Cunningham	1902 - 1916
Albert Wise	1916 - 1927
Hugh Nickerson	1927
H. Lloyd Johnson	1927 - 1931
Benjamin F. Smith	1931 - 1945
Albert Smith	1945 - 1952
Benjamin F. Smith	1952 - 1970
Sidney Smith	1970 - 1979
Reginald Smith	1979 - 1984
Francis Casey	1984 - 1986
A. Dugandzic	1986

Cape Sable Light and Fog Alarm Station, 1952,
Left to right: Fog alarm building; old steam boilers; old light, shortened and used for storage; duplex dwelling; new light, with radar reflectors on deck railing; and barn. From the east.

Cape Sable keepers and families lived in Mr. Doane's home, bought by the government as the station dwelling, until 1910 when a large new duplex replaced it. Even then, several generations of station children went to school in a new part of the former home. Its stone foundations are still visible today.

Built without wiring or plumbing, the duplex interior was sheathed with, apparently, unseasoned lumber. The walls were much cracked, as were the board floors, and the uninsulated building was drafty and cold. Through the 1940's through to the 1980's, on–going improvements resulted in a comfortable and attractive home. In 1960, a single dwelling for the new third keeper was built several hundred yards north of the rest of the station, and it doesn't appear in scenes of the station herewith.

Technological changes came thick and fast. Ships were using radar, so radar reflectors were installed, then replaced by a racon transmitter (a radar response beacon which sends a station-identifying code in response to radar signals from passing ships). A solar switch was installed. Could it be trusted to start and stop the light? It couldn't and had to be replaced (lights run at all times now). The hand-wound weights to turn the lens were replaced by electric motors. Electric horns, replacing the diaphone, were mounted on the lighthouse. A fog-detection device was also placed nearby to sample air density and trigger start-up when needed.

The tower was also used as a fall-out reporting post during the Cold War, since the Department of National Defence felt that the tapered sides of the tower would cause radiation fall-out to slide down and accumulate near the base and in the event of nuclear disaster, a series of posts measuring fall-out and reporting it by radio-telephone to HQ (site unknown) would permit our leaders to remain underground until it was safe to emerge. The post here was never equipped with a roentgen meter, or survival rations to provide for the (one) human monitor. It did however, receive its full complement of shelves, very sturdy and wide. At last the families had ample storage for beachcombed treasures.

Power now reaches the station by underground cable. Standby generators also went into the lighthouse, with panels holding the programs to start, stop, and service all equipment. With near perfection reached in the technology of aids to navigation, two hazards still remained: human error and insurmountable weather conditions.

Three ships have recently grounded on Cape Sable or its ledges: MV MAID OF LAHAVE; the freighter RYTHME; and the bulk carrier EL PASO COLUMBIA.

The small coastal freighter MAID OF LAHAVE was empty the night of February 4, 1957, returning to Canadian waters after an engine room refit in the United States. She approached Cape Sable from the west at slow speed in thick fog, moderate on-shore winds, and heavy ground swell. Radar showed the station clearly and sonar revealed plenty of water below. Suddenly a fire broke out in the engine room amidships, spread to the cargo hold and sent billows of smoke from packing material there. The Captain (Jules Jourdain) and his crew of five were trapped aft, unable to drop anchor; the captain did not want to abandon ship. Charts showed there was a clear way to a rock-free gravel beach at Cape Sable. Captain Jourdain notified Yarmouth Marine Radio station of his intention to run in and put his little ship, a converted World War II landing craft, ashore west of the light. The wind went west and cleared the fog somewhat as the swells began breaking in shallower water; the crew readied the dory lifeboat.

Meanwhile, notified that a burning ship was making for shore, Keeper B.F. Smith called his assistant, Sidney Smith, who set out up the beach at 4 a.m. into a smoky wind. About a mile along the shore he came upon the scene just as the crew was landing in heavy surf.

Following tradition and Department of Transport rules, the keepers gave assistance to the wet, cold and frightened 'wreckees'. This consisted of food, shelter and contact by phone with authorities and families (even something for severe toothache, to which some would prefer stormy seas). Basic though these services sound, their value becomes clear when compared to the treatment of those in a similar wreck, which this crew knew about. In that case local 'wreckers' had stolen cargo and gear, terrorized the crew and killed one crew member. This time the RCMP stood guard as needed.

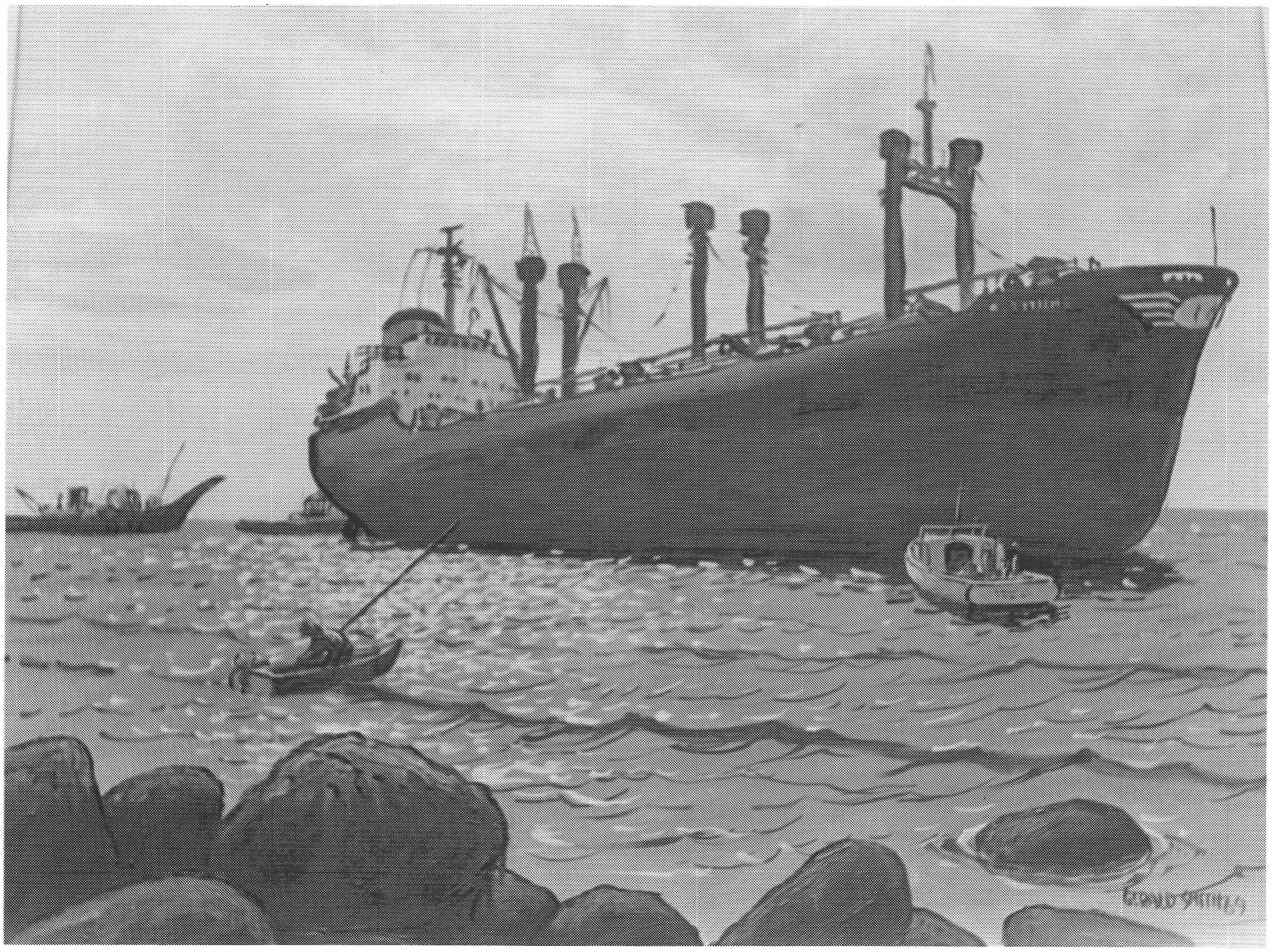
Official investigation into the wreck of the MAID OF LAHAVE concluded that faulty new wiring had caused the fire. The MAID was towed off the beach, repaired, reused as a barge and then sprang a leak while crossing over Cape Sable's Horse Race Shoal and sank, but suffered no loss of life in any of her peace-time adventures!

The MAID OF LAHAVE

Moral error, perhaps, put the Greek freighter RYTHME ashore on Cape Sable's Black Point in August, 1969. Though spokespersons for owners and captain blamed malfunctions of direction-finding gear, etc., for the "accident", local seamen believe it was a deliberate, unnecessary grounding for suspect reasons, and one helped by functioning radar and depth-sounders, at that. Unbelievably, in extremely dense fog, this 10,000 ton ship worked her way in through *"tous marains"* (all the shoals) without snagging, and drove herself on shore at high water so forcefully that at low water she was practically high and dry.

Fog had covered the area for days previous. From time to time fishermen, coming upon her lying-to or idling about, had spoken to her, offering help which was always refused. When the fog cleared, people on the mainland and station saw a great, high hull that appeared to be sitting atop the Point (one of Cape Sable's heights of land, 10 feet) and everyone who could, visited the site. Seamen predicted the RYTHME could never be towed off, or make it back to deep water, however, ocean tugs freed her, tearing out her keel, and after time in drydock she returned to service.

In December 1981, the JOSHAU T. towed the 63,000 ton bulk fuel carrier EL PASO COLUMBIA eastward near Cape Sable in severe weather. The forces of wind and sea against the high sides of the empty ship broke the towing cable and drove her shoreward for miles and finally onto Outer Shoal, less than a mile east of the lightstation. Was the towmaster not familiar with the North Atlantic in winter? His course left



The RYTHME

Painting by Gerald Smith, showing the ship at low water, tugs standing by, and men in boats raking Irish Moss.
(Photo by Kathy Johnson)

no margin of safety for the worst possible scenario; sailing even five miles farther out than he did would have given the EL PASO COLUMBIA room to drift past Cape Sable outside of the ledges and on to open ocean and deep water.

Surely had his tow been loaded he would not have made that error; in the first news reports of the situation it was stated that she normally carried liquid natural gas and it was not known if she was loaded but if she was, and struck hard, the volatile fuel would ignite and explode, causing total devastation of the coast for a radius of 30 miles, and considerable destruction over a larger area.

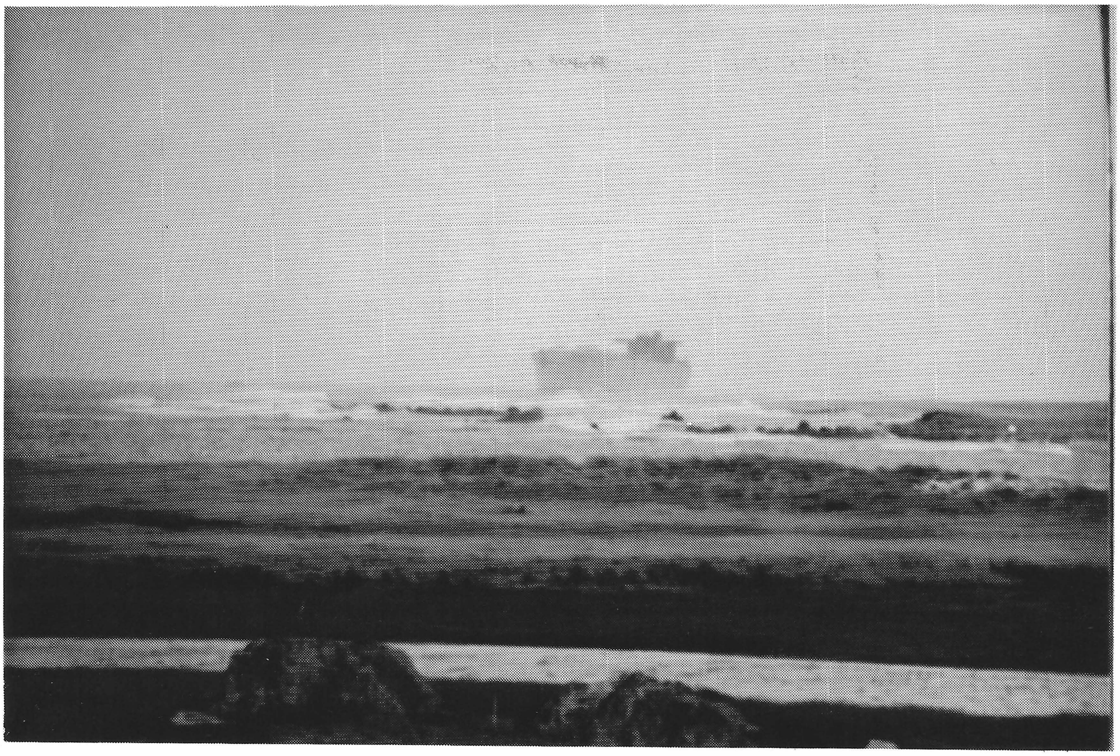
Soon, however, radio broadcasts indicated that the EL PASO COLUMBIA was empty; but there was a skeleton crew aboard and winds now of 100 mph were building monstrous seas and driving the ship directly towards Cape Sable. Whatever error the captain of the JOSHUA T. may have made earlier, he now displayed the greatest seamanship and with his crew the greatest possible personal bravery too, because in those terrible conditions he took the EL PASO's crew off safely.

From A.J. Provan, A/District Manager, Canadian Coast Guard, Saint John, N.B.: "Mr. A. Dugandzic was the last permanent lightkeeper to serve at Cape Sable ... Cape Sable Lightstation was permanently destaffed on May 30, 1986. The station has been remotely monitored from Cape Forchu Lightstation since that date on a continuous 24 hour basis."

Of all the buildings, only the new light remains; the station is radically different from the busy, well-kept workplace and home loved by many keepers and families. We are thankful that the Federal Heritage Building Review Office designated this light tower a 'Classified Building', July 28, 1989, as this provides the highest level of on-going protection.

The Cape Sable Lighthouse has been designated 'Classified' because of its impressive design and its importance.

The design represents an early and unusually successful adaptation of reinforced concrete technology to the particular functional requirements of lighthouse construction. The 30 metre height was used to advantage to create a structure of elegant proportions and classical balance. The strength of the tower design ... provides a strong architectural presence on the open landscape of Cape Sable. The critical location of the lighthouse in one of the busiest inshore fishing grounds in the world and adjacent to some major shipping lanes makes it an important landmark.[1]



EL PASO COLUMBIA
Apparently sitting pretty, actually aground on a reef that is tearing her bottom out as waves force her over it. Later freed, repaired, and no lives lost.

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1. Mattie, Joan, "Federal Heritage Building Review Office Report"
2. Richardson, Evelyn M., "The Wreckwood Chair".

About the Author:
This article was prepared for the Chapel Hill Historical Society by Betty June Smith. Mrs. Smith lived at Cape Sable from 1953 to 1979 as the wife of former lightkeeper Sidney Smith. Mrs. Smith grew up at the island lightstation of Bon Portage, Nova Scotia, where her mother, Evelyn M. Richardson, wrote the award-winning book "We Keep A Light".

Mrs. Smith had originally discovered the photo of the Cape Sable Lighthouse on the cover of LIGHTHOUSE in 1991 and had requested a copy for use in her article for the Chapel Hill Historical Society. Upon the editor's request she has graciously allowed us to reprint this article in our Journal.

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Land Settlements and Aboriginal Self-Government

by

Peter D. Knight

Introduction

The syllabus for the examination of Canada Lands Surveyors now includes a topic entitled Native Government Issues. This new topic is a timely and welcome addition to surveying education. It has always been the responsibility of Canada Lands Surveyors to survey on Indian reserves. For this reason alone an understanding of the issues surrounding the relationship of native people to the administrative system, and the relationship of both to the land is necessary. More recently, and in addition to the work of surveying on Indian reserves, many Canada Lands Surveyors are now engaged in the survey of Comprehensive Land Claims. This term is used by the Department of Indian Affairs and Northern Development to signify claims made in areas that have never been dealt with in the past by treaty. The areas are primarily in the north of the country, where the majority of the population are native. There are however other territories, such as that of the Nishga Indians of B.C., to which Comprehensive Land Claims have been advanced.

The first Canadian Comprehensive Land Claim was agreed upon in 1975 (the James Bay Agreement with the Cree and Inuit of northern Quebec). There have been two later claims; the Western Arctic Inuvialuit Claim (1985), and the Yukon Claim (1990). These land claims cover very large areas (16,000 sq. km. in the case of the Yukon Claim). The surveys of the claim boundaries, carried out under the Canada Lands Survey Act, provide a great deal of work for the surveyors. In addition to the ground survey, Canada Lands Surveyors may be involved in negotiations surrounding the claims, and in processes such as land selection.

The role of the Canada Land Surveyor in native land settlements need not be limited to strictly technical matters. The challenge to the surveyor is to question how appropriate traditional survey methods are to the holding of Indian land. This will require an understanding of his/her responsibility to native people, and an ability to adapt to new ways of working. This paper suggests that the Indians themselves must contribute some of their own wisdom and traditional ways to the administration of their lands. The way in which land settlements are presently handled relies almost exclusively on the white man's concepts, laws, and technologies. But why is this the case? Surely the Indian nations of Canada will, as part of their current renaissance, have a contribution to make to the way in which we understand our relationship to the land and perhaps even to the practice of surveying itself.

Land Settlements and Aboriginal Self-Government

All cultures are land based, though the relationships between people, society and land are different. Nowhere is this difference greater than between aboriginal, and modern civilizations. Modern civilization is based on the private ownership of land, and exclusive right to develop its wealth. Aboriginal civilization is communal: the main principle is sharing rather than exclusion. Aboriginal culture is also more directly and physically related to the land than modern culture. Material existence is achieved through a delicate harmony of people, animals, and land. The spiritual order reflects this balance; it features wholeness and interrelationships; it does not recognize linear time, nor does it separate dreams from waking, or the people from their sources of sustenance. [1]

Modern society, like aboriginal culture, is able to recognize the sacred character of the earth. Until recently this sanctity has been preserved through the co-evolution of the society's beliefs and its administration. It is when these two go awry that the trouble begins. For example, belief in protection of the unspoiled beauty and wonder of the natural world, a suitable ideal of modern civilization, is continually undermined because a dominant motive of our society's administration is the generation of profit [2]. When we speak of the earth as a *resource* we call up the bent of our society toward the exploitation of its richness. Lately this has come to mean exploitation at any cost. Language itself becomes part of the system, and one has to be careful using a word such as *resource* that one is not unwittingly fostering exploitive attitudes.

Aboriginal cultures that have become dominated by the administrative mechanisms of a foreign civilization find the most basic elements of their cultures and traditions, their deepest beliefs, immediately threatened. They themselves fall prey to the contradictions and suffer not only the evils of the dominant society but also its criticisms. Traditionally, native people did not consider the earth a *resource*. Though they may use the word today through adaptation to our language, the history of their relationship to the land is much different than that of the white men. When native people use the word *resource* they cannot be held responsible for invoking a cultural attitude whose history they do not share.

But mainstream white society is always talking about *resources*. It is usually the attack on the land that results from this talk that provokes native people to cry out 'Stop what you are doing; this is our land!'. The land claim of the Teme Augama Anishenabe in Northern Ontario is currently being asserted in a fiery controversy surrounding the cutting of the last remaining stand of old growth red and white pine in the province. In a similar situation, prior to the James Bay Agreement in 1975, the Cree of northern Quebec were forced to obtain a court injunction that halted work on the James Bay Hydro-electric project. The injunction was overturned on appeal by the province a week after it was won. It nevertheless had the effect of requiring the Quebec Government to reach an agreement with its native people, before proceeding with a project that was to have enormous effects on the ecology of the region.

The Western Arctic Inuvialuit Claim (1985), and the Yukon

Claim (1990) have evolved because of the interest in offshore oil and gas in the Beaufort Sea, and the need for access to this wealth via the Mackenzie River valley. The intent of natives in asserting land claims and demanding land settlements is to protect their traditional economies, and to obtain compensation for the inevitable losses they sustain as a result of industrial encroachment on their lands.

On the other hand the Canadian Government is supportive of oil company bids to operate in the Beaufort Sea. In order to encourage investment certainty over the ownership of the land is needed. This is the key to the policy of extinguishment which is central to the Government's handling of land claims. Once native people sign an agreement, their rights to certain key areas no longer exist in law.

Native people strongly resist the idea of extinguishment. Extinguishment of the bonds to the land which are at the heart of native identity, is a repugnant idea to people striving to survive two centuries of assimilative policies. Extinguishment is only one of many conflicts which make the present land claims process adversarial. At the heart of the problem is the confrontation of two completely different relationships to the earth, hence two different approaches to life: The way of industry epitomized by the *resource management* approach, and that of traditional native leaders which is a filial, i.e., parent/child relationship (e.g. Mother Earth).

White people mark out boundaries to establish the limits of their possessions, but this is an effort which may be meaningless in the native scheme. An Alaskan native has stated that "We did not have a concept of boundaries, of unseen lines traced over the earth and dividing the land..." [3]. The establishment of the boundaries of a land claim under the Canada Lands Act may serve to protect the exclusive interests of an oil lease, but in no way can it be said to be representative of the native way of life.

In conversation recently with a Canada Lands Surveyor, who had worked on the boundary of the Inuvialuit claim, I learned that on a particular portion of the boundary the native help had to be taught how to snowshoe. It must have appeared odd to the natives that they were led into a situation that they had traditionally had the sense to avoid. Little wonder also that the native help (to the complaint of the surveyor) seemed unenthusiastic about the work. If a land settlement is to protect the native interest as well as that of government and industry then the concept, language, and technology of the claim must reflect both worlds.

At present the technology of land claims is that prescribed by the Canada Lands Survey Act, and the interests (estates) which the boundaries of this Act delimit are derived from English Common Law. The current practice is to apply this non-native system in areas vital to the lives and traditions of native people despite the obvious one-sided nature of its origin and development.

Native people have only recently acquired the expertise to operate within the white man's system, and there is question as to whether the voice of traditional native people or native women will be heard in such a system. The problem is made worse by the unequal strengths of the parties at the negotiating table. The government is apt to make 'take it or leave it' offers which Natives feel obliged to accept because without a settlement there is nothing to halt the ongoing destruction of their lands. [4]

The Alaska Native Claims Settlement Act (ANCSA)
The ANCSA was the first large modern land claim to be settled in the Americas. This agreement between the Alaska Federation of Natives and the United States Government was reached in 1971. It provided that the fee simple title to forty million acres (ten percent of Alaska's area), would become vested in native corporations. In addition a cash settlement of $962.5 million was provided in compensation for the extinguishment of native title in the remainder of Alaska. The native corporations were intended as the means by which Alaska natives would enter the mainstream of American society.

In 1983, Thomas Berger, former Justice of the Supreme Court of British Columbia, and veteran of the Mackenzie Pipeline enquiry, was appointed to lead the Alaska Native Review Commission. The Commission was co-sponsored by the World Council of Indigenous People and its mandate was to review the impact of ANCSA on the native people of Alaska (The findings of Justice Berger were published in a book entitled "Village Journey" [3]).

Justice Berger travelled to all parts of Alaska holding village meetings where the native people were asked to present their thoughts and feelings about ANCSA. This native input proved startling and an overwhelming rejection of ANCSA emerged. Many people felt that they were never consulted before the agreement came into effect, and that rather than securing their interest in traditional lands, ANCSA was quickly becoming the instrument by which they could lose these lands.

Native corporations were faced with the task of creating dividends for their shareholders (the native population of Alaska) in a land where little opportunity existed. The result was that many of the corporations incurred large debts. Because the land was now a corporate asset it was at risk of falling to the corporation's creditors. In addition, ANCSA provided that twenty years after the signing of the agreement all the native lands of the settlement would become alienable. The sale of native lands is now imminent, and a significant loss of tribal land is feared.

The trouble with ANCSA was that it had very little to do with the traditional structures and the traditional existence of the native population. It followed the policy of assimilation of native people which has been much resisted and discredited in recent years (e.g.. native reaction to the Government of Canada's White Paper on Indian Affairs 1971). Native people have an economy of their own which they practise, and which continues to be more viable than the land-owning corporations which were set up under ANCSA. The natives fish, hunt, and gather food. This has always been the way they have lived and they wish to pass this way of life on to their children.

But children born after 1971 are not parties to the ANCSA settlement. This means that there is no guarantee that the 'after-borns' will have automatic rights to land as part of their native heritage. As the inevitable shrinking of native land takes place (this is a phenomenom well known in Canada) a class of dispossessed natives is created. This creates a division in the community and a disruption in the concept of sharing with past and future generations. The main concern of Alaskan villagers is the maintenance of their way of life. They wish this security for themselves and for future generations.

In order to protect the land and their traditional economies, the native people of Alaska are turning to tribal governments. One of the recommendations made by Thomas Berger is that the land which is now in the possession of the native corporations, and the state chartered local governments should be transferred immediately to the tribal governments.[3]

Tribal governments in the United States are recognized by federal and state governments as sovereign entities. Berger urges that tribal governments assert their sovereignty by making laws that protect the land, and assure its use for future generations

ANCSA failed because it attempted to impose non-native institutions on the native societies in Alaska. In effect it was a form of social engineering carried out on the people of Alaska. This fundamental mistake is reflected in the way in which the land was divided for the purposes of ANCSA:

> "The state surveyed and divided lands without regard to natural features, such as the course of rivers and their associated drainage basins, that are important to subsistence activities. For Alaskan natives it was an inappropriate model of land survey and selection."[3]

The negotiators of ANCSA should have gone directly to the traditional tribal governments (existing in many native societies), that are now becoming instrumental in protecting Alaskan natives from the worst effects of the agreement. It is these self-governing, independent, and sovereign bodies that are best able to embody the cultural values and the living traditions that any agreement over land must serve.

Aboriginal Self-Government

The current political thrust of native people toward legal recognition and protection of their land base (i.e.. land settlements) parallels the movement to have their right of self-government recognized. The question of self-government is a subject fundamental to the process of land settlement. There is no point in making elaborate provisions for land settlement if there is not an effective and secure means of administering the land well into the future. Furthermore, if a contribution from native people concerning the way in which their lands are to be defined is forthcoming, then it follows that a self-governing institution would be the means of providing such direction. Indeed the chances of native people having direct influence over these matters would appear to depend upon the institution of self-government.

The issue of aboriginal self-government is gaining momentum in Canada, to the point of occupying the centre stage of Government-Native dialogue [5]. For this reason, and because of the interrelationship of land settlements, self-government, and the survey of native lands, a short analysis of some of the issues surrounding aboriginal self-government is necessary.

Indian nations within Canada have long asserted their sovereignty and right to govern themselves. In the early years of Canada, the Indians had their rights recognized and protected through Imperial legislation, Imperial Orders in Council, and Royal Commission Instructions. The Royal Proclamation of 1763, for example, described large areas as lands reserved for Indians; upon these lands the native people were not to be molested or disturbed (i.e. their right to govern themselves was to be respected). Throughout the treaty-making years the Indians engaged in government-to-government negotiations with Canada. These treaties were believed to be part of a process of accommodation, and a sharing of their land with the white people.

In the United States the aboriginal right of self-government is established. The right is recognized through the Common Law, and through legislation affirming this body of law. Tribal governments are, "autonomous political bodies capable of maintaining themselves against the power of the state as a third sovereignty". [3]

The situation in Canada is different; the Canadian Government, and the Canadian courts have not recognized native sovereignty in recent times. They recognize only the type of municipal government already familiar to most Canadians. The Government of Canada is willing to delegate municipal government to native people, but not willing to recognize inherent-traditional government based on sovereignty [6]. Delegated municipal government poses a threat to native people for several reasons:

- non-native institutions and structures are inappropriate for native people;

- acceptance of delegated municipal government may block recognition of the inherent-traditional form; and

- because governmental powers are delegated, Canada or the Provinces may make laws which override native authority.

Self-government for aboriginal people is a highly contentious, contemporary issue. A booklet entitled "Comprehensive Land Claims Policy" published by the Department of Indian Affairs and Northern Development [7], suggests that the Canadian government is working toward self-determination for native people. However, a reading of Bruce Clark's recently published "Native Liberty Crown Sovereignty" [6], shows that native people and the Canadian government have fundamentally different ideas on self-government. Conflict was apparent in the recently signed Yukon claim. Self-government was a key issue for the natives, but the Government of Canada was able to have it struck from the agreement.

The Canadian Government wants certainty with respect to its dealings with the land in order for development to follow the pattern it sees as necessary. The Government sees the aboriginal right to land and to self-government as destructive to this certainty. Negotiations on aboriginal rights, and aboriginal self-government at the First Ministers Conferences from 1983 to 1987, failed to make headway on these issues, with the Government appearing ready only to maintain the present status-quo.[4]

'The Existing Aboriginal Right of Self-Government' - Clark's Legal Argument.

In his book. Clark analyses the Imperial legislation, and constitutional Common Law precedents, that form the legal basis of the aboriginal right to self-government. Clark argues that unless specifically repealed by an act of the now sovereign Government of Canada (Canada was not itself a sovereign government until the proclamation of *The British North-*

America Act 1867, and until that time authority was delegated from the Imperial crown) the Imperial legislation which acted as a buffer between the Indian nations and the colonial governments is still in force today. [6]

A principal argument of the Canadian Government has been that the aboriginal right to self-government has been superseded by law. According to this theory, the rights of native people may be extinguished if, over a period of time, legislative enactments have either ignored or conflicted with the native interest.

Long before Clark's book was published, a task force commissioned by the Department of Indian Affairs to study the Comprehensive Land Claims process made the following statement, "the proposition that aboriginal title can be implicitly superseded by law lacks a solid legal basis"[8]. Clark provides the legal research to justify this statement. He reasons that it is impossible to supersede the Imperial law, or the constitutional Common Law, by a legislative act of lesser authority. He summarizes his argument as follows:

> "Actually, the natives have had the right of self-government all along, under the previously established imperial legislation and constitutional common law precedents, and this is what the word 'existing' should be taken to signify in the Constitution Act, 1982, which enacted in section 35(1). 'The existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed.' This 'existing' aboriginal right of self-government is, however, *inherent* and *full*, in that its essence is that the natives should not be molested or disturbed upon any pretext. The federal government is not now - nor since the time of Sir John A. Macdonald has it been - in favour of any form of self-government except where it is of the delegated-municipal type. This is what has made the subject of law reform and the negotiation process a very tortuous issue in Canada." [6].

The Land Claims Policy of the Canadian Government
In 1985 an extensive review of land claims policy was undertaken by the then Minister of Indian Affairs and Northern Development, David Crombie. The report of the task force, (entitled "Living Treaties: Lasting Agreements") was released in March 1986 [8]. George Erasmus, chief of the Assembly of First Nations, said that the report, "met a number of our objections to the present process, and was broadly acceptable to us and to other Canadians who keep watch over these matters." [4].

The task force report stated that the government should abandon its policy of seeking extinguishment of aboriginal rights and title. The report denounced the theory of supersession outlined above, and recommended that the government actively seek the establishment of native self-government.

It is remarkable that David Crombie was precipitously removed from his position as Minister of Indian Affairs. The policy announced by his replacement Bill McKnight in the booklet "Comprehensive Claims Policy" [7], contained none of the recommendations of the task force. George Erasmus describes this policy as "even more reactionary than the one we had before." [4].

Conclusion
In his book Justice Berger makes the remark that "Attitudes are more important than constitutions, laws, and regulations." [3]. Unfortunately, a Supreme Court ruling in favour of aboriginal self-government may be required in order to change the attitude of the Canadian Government. The argument for the existing aboriginal right of self-government put forth by Clark has yet to be tested in the courts. It is a strong argument and will have to be addressed in future cases.

Native leaders are now insisting on their right to self-government in order to create administrative systems that will honour the cultural and spiritual values upon which their nations are founded. Whether or not the government takes a more favourable view toward native self-government will not alter the belief by aboriginal people that this right exists for them. Native people will continue to find new paths for themselves independently of government policy. This is illustrated by the efforts of the Nishga in British Columbia. Proceeding on an assumption that they are a sovereign nation, and deeply aware of their traditions and the extent of their land, they have begun converting their oral tradition to a scientific form suitable for presentation in a court of law. This is being accomplished with the help and consultation of specialists, such as cartographers [9].

The present claims procedure makes use of the Canada Lands Survey Act to delimit the boundaries of a claim. Question arises as to the legitimacy of applying a non-native system of boundary surveying in a situation where a native alternative might be sought. The surveyor will not have to abandon his/her technology, but will have to ensure that this technology will adequately serve the native interest. Research will have to be done in which native people themselves have the opportunity to study and comment upon different methods of surveying in relation to their own traditions of land occupancy.

Sovereign self-government carries with it the authority to establish boundaries. It follows that the way in which the boundaries of Indian territories are to be established will spring from the Indians themselves. If full inherent-traditional self-government is realized by native people, then the appropriate technology to implement land settlements will also have to evolve, in part, from the native people themselves.

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Author's Note

I wrote this article in winter of 1990-1991. Since that time I have continued my research on Native issues at the University of Toronto, Department of Surveying Science. I am presently working on a paper about aboriginal boundary systems. It is my belief that aboriginal boundaries have social, ecological and spiritual components which may be best honoured by allowing them a degree of indefiniteness and movability not generally provided for in our own system.

Of particular interest to the hydrographer are the land utilization and occupation studies already accomplished for parts of the Canadian Arctic and Coasts of Quebec and Labrador. It is these sociological and anthropological records that provide the best attempt, to date, to delineate the extent of Native land use.

(Editor's note: Peter Knight won the 1991 CHA, Central Branch Gerry Wade Essay Award with this paper.)

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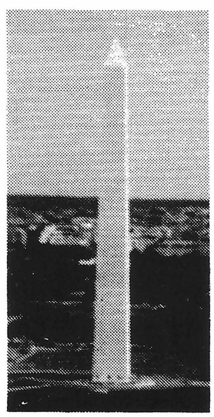

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A Field Evaluation of the KAE Fansweep - A Portable, Shallow-Water, Multi-Beam Sonar System

by

P.R. Milner and J.L. Galloway

Introduction

The Fansweep is a small, portable, shallow-water, multi-beam sounding system manufactured by Krupp Atlas Elektronic (KAE) of Germany. It is designed for gapless coverage with a swath width of up to four times the depth, in water between three and one hundred metres deep. A series of tests, discussed in detail later, was designed to investigate the suitability of Fansweep as a primary sounding tool. A secondary objective was to assess the system's usefulness as a sweep tool for shoal detection and examination.

Editor's note: Since this paper was written 'Krupp Atlas Elektronic' has changed it's name to 'Atlas Elektronik'. Readers should refer to Atlas Elektronik's comments and update on the Fansweep which immediately follow this paper.

System Description

The Fansweep multi-beam swath survey system is designed to chart relatively shallow (to about 100m) coastal regions. Minimum hardware consists of a pair of transducer arrays, each mounted at 40 degrees to the horizontal, a signal processing cabinet, and an operator's terminal. Optional, but generally necessary auxiliary devices include a pitch/roll sensor assembly, heave and gyro instrumentation, an accurate positioning system, an on-line plotting package and a mass storage device.

Fansweep can select up to 52 separate beams yielding a bathymetric swath of four times water depth, and has other selections of three, two and one times the depth. Sector angles scanned are 126°, 112°, 90°, and 45° respectively. The 200 kHz transducer arrays are small and easily mountable on a nine-metre survey launch. The balance of the equipment can be installed in a launch if packaged suitably. The acoustic footprint for each beam is 2.5° cross-track and 6° in the direction of motion. Effective operating depth can exceed 100 metres for restricted scan angles and hard bottoms, but accuracy is a strong function of vessel motion, especially for deeper water.

The signal processor performs beam-forming, contains the analog electronics to transmit and receive the sonar signals, and digitizes return echoes. Fansweep is unique in implementing beam-forming on the transmit rather than on the more conventional receive end. The beam-formed transmitted pulse is dynamically compensated for roll, and the echo is received using a wide-beam hydrophone assembly. Only four of the maximum 52 beams are transmitted at the same time, each on a slightly different frequency to prevent cross-talk. Each group of four beams is then fired in a stepped sequence starting at the centre and ends of the swath so that the resulting cross-track swath is not linearly shaped.

The operator's terminal operates in a window environment and provides real-time results such as cross-track depth for the current swath, along-track depth below the vessel, and numerous auxiliary data such as temperature, sound speed, profile number, etc. One window is used to enter control parameters such as sound speed, which is currently entered as a single averaged value. Krupp Atlas specifies accuracy as: +/-(0.15m + 0.5% of the depth) at 1σ.

Installation and Calibration

The Fansweep testing was conducted between July 8 and August 2, 1991, at the Institute of Ocean Sciences (IOS) in Patricia Bay, British Columbia. A KAE engineer arrived with the equipment and remained for the duration.

The system was installed on a nine-metre, aluminum, semi-displacement hull survey launch. The Fansweep water portion consisted of two transducer blocks attached to a steel post and mounted on the bow (figure 1). The cables connected to a signal processing electronics cabinet (figure 2). There were two video displays; one to monitor all pertinent parameters and also show a cross profile of the bottom, and the other to monitor the incoming data. A Toshiba lap-top PC was used for parameter input and screen control.

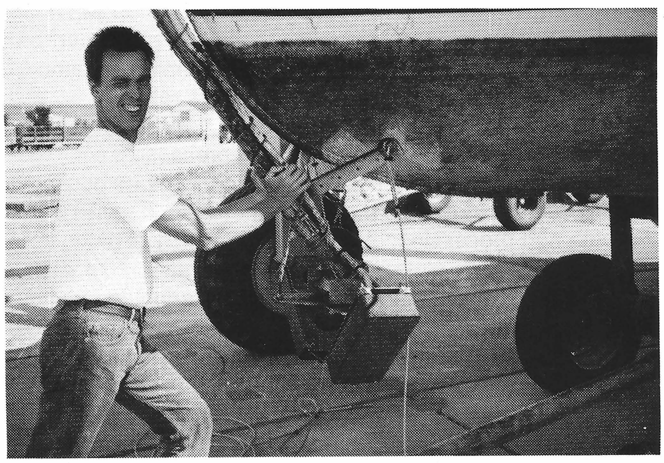


Figure 1: Fansweep Transducer Mounting

Positioning was provided by KAE's Polartrack, a laser range-azimuth auto-tracking system. It measures vertical angles, horizontal angles and range, and transmits these over a UHF data link at 450 MHz. The vertical angle feature was used to correct for tides, after determination of instrument height above sounding datum and the height of prisms above water line. A TSS 335 was used for heave and roll compensation, and a Robertson RGC50 gyro compass for direction. A Tracker 1600 tape drive was used for data storage. The data string for each sweep is 817 characters long and includes: time, northing, easting, height, course, roll, speed, heave, and up to 52 depths and lateral distances. The sweep cycle is

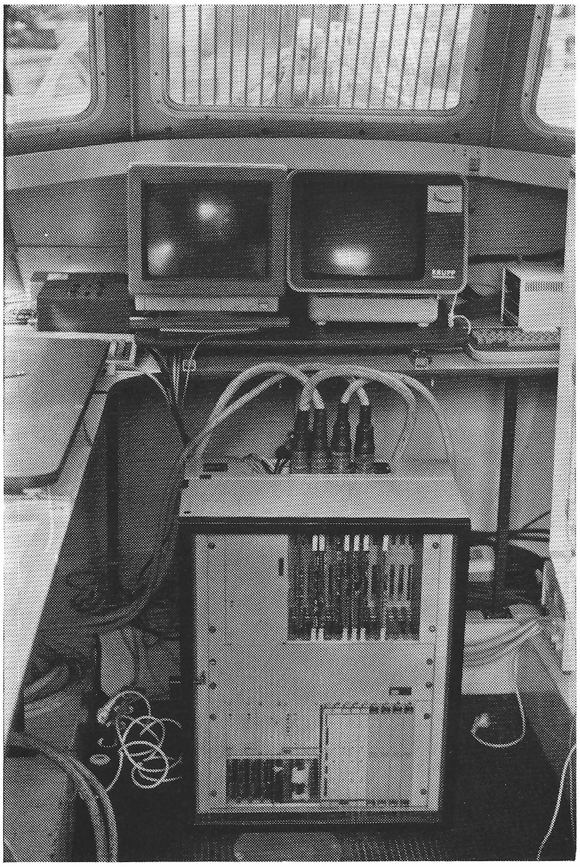


Figure 2: Signal Processing Electronics Cabinet

depth dependent, and varies between 4 and 0.5 seconds. The corresponding data rates are approximately 0.7 MBytes/hr to 5.8 MBytes/hr respectively. The data string can be viewed on the data monitor, but the screen must be temporarily frozen to be read due to the high data rates.

KAE normally supplies a sophisticated processing package called Hydromap 300. It is a UNIX-based software package incorporating three main modules; one which handles data logging and processing, including real-time track plots, colour-banded depth plots, coverage plots and contour plots; another for data editing, including depth filtering and plausibility checks; and a third for off-line processing using Digital Terrain Modeling with either gridding or Triangular Irregular Networks.

Hydromap 300 processing software could not be used in the test because of incompatibility problems with the CHS-supplied computer hardware. Instead, an alternate but less sophisticated processing package called Naviline was used. The Naviline software generated the DTMs from which most of the plots were created that appear in this paper. The incompatibility, which was due to different microprocessor chips and also different UNIX versions, revealed a certain system inflexibility that needs to be addressed.

The alignment of the transducer arrays is critical, especially in the roll direction. Figure 3 shows the depth error as a function of positive roll error for four of the beams, when the water depth is 100 metres. The transducer bracket, which holds both arrays, was installed as near to vertical as possible by eye, with the boat out of the water. Installation errors in the roll direction can be corrected electronically, in increments of 0.1°, through a range of +/- 6.3°. There is a screw-type mechanical adjustment on the bracket for pitch, and swath alignment can be adjusted through a correction to the gyro. These adjustments, however, cannot be made to the transducers individually; only collectively. It would be advantageous to have a mounting bracket which would allow individual adjustments for all three axes.

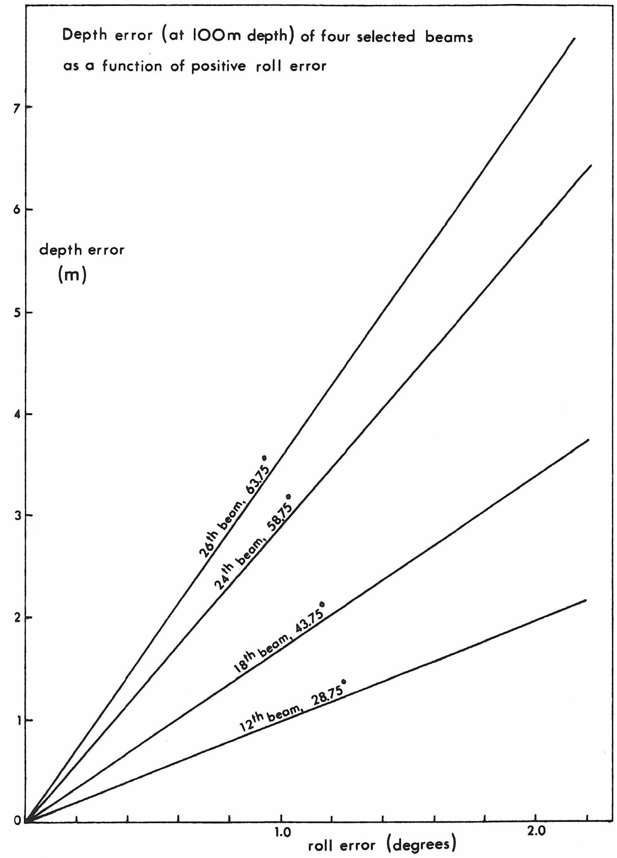


Figure 3: Depth error (at 100 m depth) of four selected beams as a function of positive roll error.

Calibration of the transducer alignment followed a method outlined in the Fansweep manual. A line was run repeatedly in both directions in a fairly flat area, and the cross profiles of each sweep were summed and averaged. Up to 1000 cross profiles can be averaged this way, resulting in a smooth cross profile made up of 52 short segments that appears as a blue line on the same video screen as the individual, most current cross profile. The averaged line should be horizontal, unless there were errors in the roll alignment or in sound velocity causing the line to have a characteristic shape and indicating the error. The alignment was checked later with a patch test.

At the time of testing, the Fansweep system had the capability of using only a single average sound velocity. The average speed of sound, 1485 m/s, was found by velocimeter measurement at 5 metre increments to 50 metres, and then by extrapolation of the velocity profile to 100 metres. Confirmation by bar check was made for the vertical beams. A single velocity input is inadequate for this (or any) fan-type system, as there are two unaccounted for measurement errors. The first is ray-bending caused by refraction through a layered medium. The second is a beam-steering error caused by using an average velocity to steer the transmitted and received beams, rather than the actual velocity at the transducer face. The combined effect of these errors in the outer beams, at a depth of 100 metres, produced depth errors that were over 2 metres too short, and lateral distance errors that were over 1 metre too long. Since these tests, KAE has modified the Fansweep to allow for input of both the average velocity and the transducer level velocity. A real-time correction for ray-bending is then computed by a first-order linear approximation. This reduces, but does not eliminate, the error.

The actual testing of Fansweep was conducted under severe time constraints. Installation, calibration, demonstrations, problems due to computer incompatibility and a faulty gyro consumed the first three weeks. This left only five days for testing and meant no time to repeat tests for verification.

Noise Test

An attempt was made to determine the noise level of each beam by securing the stern of the boat to the end of the wharf at IOS, in a water depth of approximately 9.5 metres. Fansweep returns were logged for several minutes while boat movement was kept at a minimum. For convenience, the data was separated into three files, and the standard deviation of the first 200 or so sweeps were examined on each file. The averages of the three standard deviations were plotted against the beam number and are shown in Figure 4.

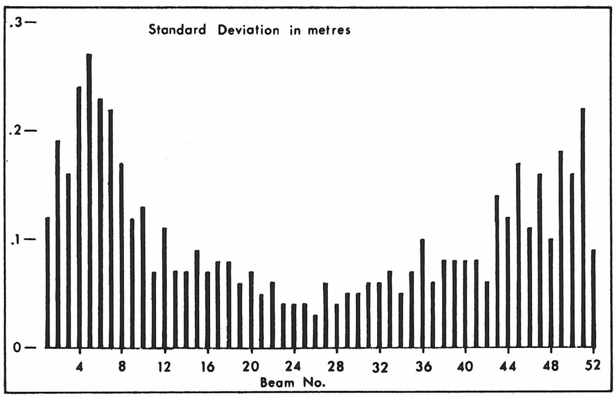


Figure 4: Standard Deviation (in metres)

The graph shows the expected shape, with higher standard deviations in the outer beams. If the stated accuracy specifications,+/-(15 cm + 0.5% depth) at 1σ (which is 20 cm at 9.5 metres), are used as a limiting criteria, then only the 51st beam was over the limit on the starboard side, while beams 4, 5, 6 and 7 were over the limit on the port side. The outer port-side beams were noisier since they were insonifying a bottom that was falling away due to dredging, with the result that the beams were impacting the bottom about 5° more acutely than they would have if the bottom were flat. Even though measures were taken to limit boat movement, there was nevertheless some slight rocking due to wave action. This produced an increase in the noise level which was seen to be the most pronounced in the outer beams.

Patch Test

In order to determine the transducer orientation errors, a patch test was conducted. The sounding pattern used consisted of two parallel lines, 110 metres apart, approximately perpendicular to the contours, with depths ranging from 40 metres to 80 metres, and a third line at right angles to the first two, crossing them about 200 metres downslope from the shallow end. All lines were run reciprocally, for a total of six swaths. Figure 5 shows a sketch of the lines.

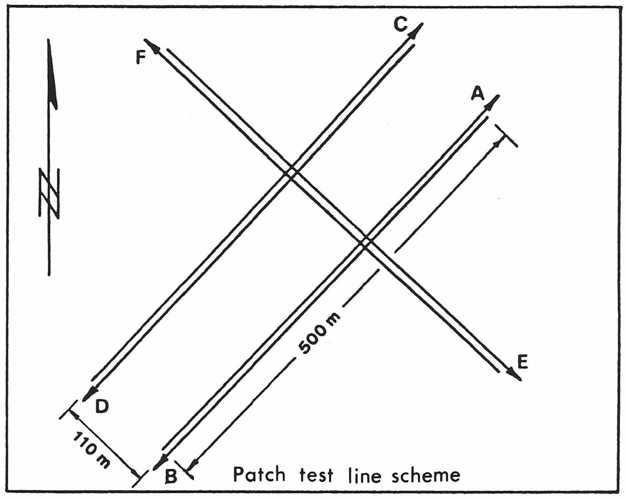


Figure 5: Patch test line scheme.

The line pattern chosen was loosely based on a scheme outlined in "NOAA's Sea Beam System Patch Test" [1]. This method was used to estimate pitch and swath alignment errors, but not for roll errors since it is inappropriate for a system with two, angled, independent transducer arrays. An alternative method for estimating roll errors was devised.

For each swath sounding plot, contours were interpreted every 2 metres from 44 to 82 metres. The contours were manually smoothed due to the irregularity of the interpreted contour lines. The twenty smoothed contours were used to estimate the orientation errors.

Pitch error (α), was determined by averaging the along-track displacement (X), of corresponding contours for reciprocal lines A and B, then C and D. The following formula was used:

$$\alpha = \arctan[(X*\text{scale factor})/(2*\text{depth})]$$

the pitch error was found to be +2.1° (standard deviation = 1.0°). The plus sign means the transducers are looking forward by 2.1°.

For port roll error and port swath alignment error the contours of lines A and D were superimposed on the same plot, with UTM grid marks in coincidence (see figure 6). A parallel line was drawn halfway between the lines. The positions of the true contour lines were modeled by drawing a straight line between the crossing points of the contours with the two track lines (after a shift was applied to remove pitch error). The distances a and d, measured along the centre line between the contours and the assumed true contour line, were scaled off. A similar procedure was used for the starboard fan to find distances b and c. For each contour line the quantities, a-d, b-c, (a+d)/2 and (b+c)/2 were determined.

The swath alignment error (γ) was found by:

$$\gamma = \arctan[x/(2*H)]$$

where x = a - d, (or b - c), and H = 55 metres, the distance between the track line and the centre line.

The values found for swath alignment error were 0.3° (standard deviation = 2.3°) for port, and 6.8° (standard deviation = 2.2°) for starboard. Errors for both transducer arrays were in the counter-clockwise direction.

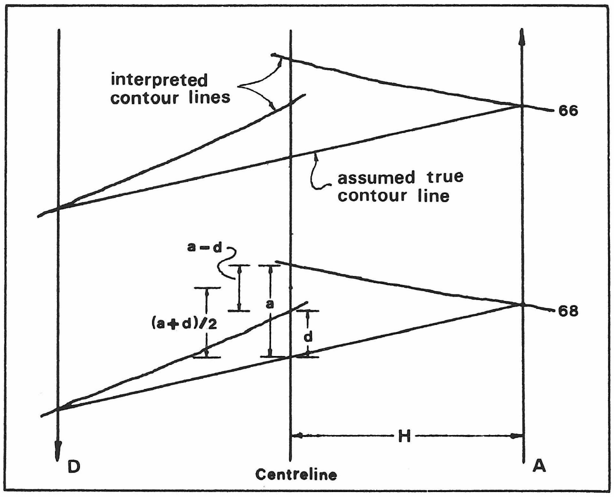


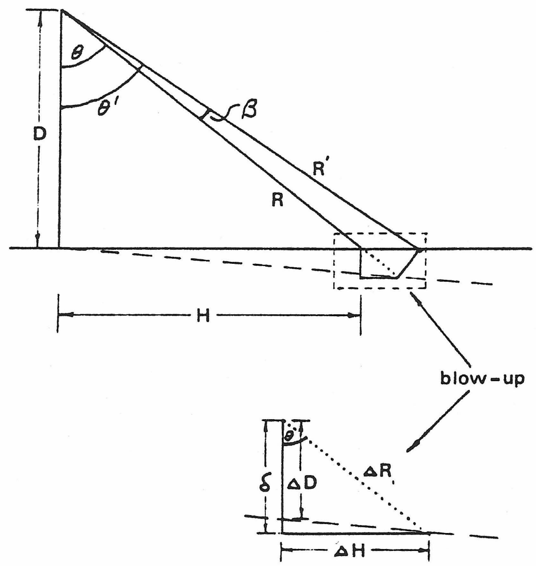
Figure 6: Roll and Swath Alignment Error Determination

For roll, the mean quantity (for port), of (a-d)/2 was divided by the distance between contours, measured along the centre line, then multiplied by 2 to find a proportional depth error (ΔD). An expression, derived in Figure 7, was used to determine the roll error (β) using ΔD, the depth D, and the distance between the track line and the centre line (H). Values found for roll error were +1.24° (standard deviation = 0.42°) for port, and +0.17° (standard deviation = 0.44°) for starboard. The plus sign meant that the array was pointed higher (i.e. toward the surface) than it should have been.

All of the error estimates had large standard deviations which limits the credibility of the calculated value. It did, however, give an indication of how much to adjust the transducer arrays before repeating the test. Unfortunately, time constraints did not permit this recourse. The large standard deviations can be attributed to the fact that the contours were interpreted from very noisy sounding plots, caused in part by position spikes which would shift soundings by several metres (in some cases several tens of metres). There was no routine in the software for position spike removal. Furthermore, the heave/roll compensator did not appear to be correcting for all possible boat movements, including horizontal accelerations. It is absolutely critical for the heave/roll compensator to be installed in perfect vertical alignment with the transducer arrays, otherwise a constant roll error will be generated.

The lines E and F (figure 5) were used in the NOAA literature to compare soundings in the same position obtained from different lines (and different beams). These same objectives were met by using the Accuracy and Repeatability Test and the Beam Accuracy Test. The contours drawn on the E and F swaths did, however, reflect a positive port roll error. Pitch and swath alignment errors were not evident in these lines since the effects of these errors are minimized by running parallel to the contours.

Although the patch test proved useful, it requires an area with a gently sloping bottom. If this kind of bottom is unavailable in the survey area, another method needs to be found. Perhaps a procedure of running reciprocal lines past one or more acoustic targets of known position and depth would be appropriate. Since the elimination of roll error is critical, further effort is necessary in establishing a well-defined, field procedure for calibration and alignment checking.



given: D = depth

ΔD = an estimate of the depth error

H = the distance from trackline to centreline

$$\theta = \tan^{-1}(H/D)$$

$$\theta' = \cos^{-1}(D/R') = \cos^{-1}\left[\frac{D}{R+\Delta R}\right]$$

$$R = D/\cos\theta \qquad \Delta R = \delta/\cos\theta$$

$$\therefore \theta' = \cos^{-1}\left[\frac{D}{D/\cos\theta + \delta/\cos\theta}\right]$$

$$= \cos^{-1}\left[\frac{D}{D+\delta}\right] * \cos\theta$$

$$= \cos^{-1}\left[\frac{D}{D+\delta}\right] * \cos(\tan^{-1}(H/D))$$

now $\Delta H \cong \Delta D \tan\theta$ since $\delta - \Delta D$ is very small, and by similar triangles: $\delta = \frac{H+\Delta H}{H} * \Delta D$

$$\text{so: } \delta = \frac{H+\Delta D\tan\theta}{H} * \Delta D$$

$$= \frac{H+\Delta D^{*}H/D}{H} * \Delta D$$

$$= \Delta D + \frac{\Delta D^2}{D}$$

$$\therefore \frac{D}{D+\delta} = \frac{D}{D+\Delta D+\Delta D^2/D} = \frac{1}{1+\Delta D/D+(\Delta D/D)^2}$$

$$\therefore \beta = \theta' - \theta = \cos^{-1}\left[\frac{\cos(\tan^{-1}(H/D))}{1+\Delta D/D+(\Delta D/D)^2}\right] - \tan^{-1}(H/D)$$

Figure 7: Derivation of Beta (β)

Accuracy and Repeatability Test

To test the accuracy and repeatability of Fansweep, a test area of 800 metres² was chosen in Patricia Bay. The bottom in this area is gently sloping with depths ranging from 17 metres at the north end to 72 metres at the south end. The bottom type is mostly gravel, pebbles and sand in the shallower areas, with fine sand and mud in the deeper water.

The area was surveyed twice, on different days. Repeatability was checked by examining differences between the two surveys, and accuracy was checked by examining differences between each survey and existing CHS data (Field Sheet 1237-L, 1:4000, NAD 27, 1988/89 - available in digital format).

For the first run (July 31) a sounding pattern of lines running northwest-southeast (more or less parallel to the contours) was chosen. The line spacing was 100 metres in the southwest half, and 50 metres in the northeast half. On the next run (August 2) lines were run at right angles to the first set and the spacing was again 100 metres in the southwest half and 50 metres in the northeast half. The line spacing was arbitrary, but chosen to ensure a gapless survey. Launch speed was maintained at about 5 knots. Figure 8 shows the swath coverage of the second set.

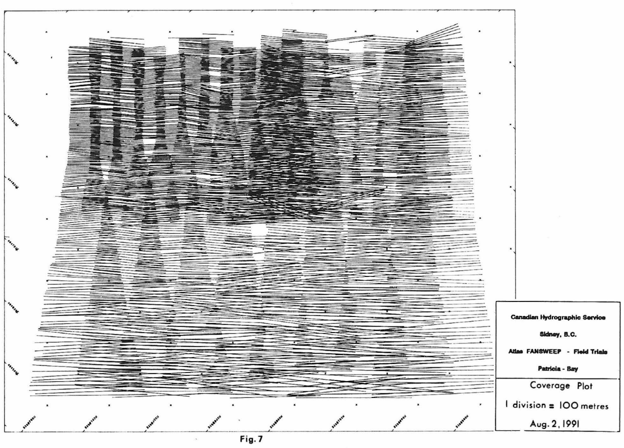


Figure 8: Swath Coverage Plot

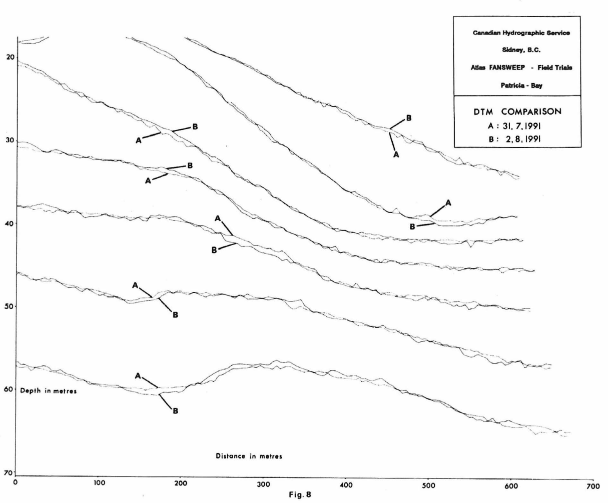


Figure 9: DTM Comparison

A Digital Terrain Model (DTM) was computed for each of the two data sets based on a gridding technique provided in the Naviline software, using a 5 metre by 5 metre grid size. At this grid resolution the two DTMs were calculated from 25,688 model points each (array size 152 X 169). A smoothing algorithm was used to filter out depth spikes of more than 0.5 metres. A contour plot with 5 metre intervals was generated from each DTM, and superimposed on a plot for comparison. The contour match was fairly good, but the actual depth comparison was done by examining the profiles of a series of 600 metre east-west lines cut through the two DTMs (figure 9). Depth differences were scaled off every 10 metres on each line, and the resulting mean difference, (based on 396 data points), was -0.6 cm, with a standard deviation of 33 cm, (July 31 DTM - August 2 DTM). Table 1 shows the results when separated into 10 metre depth layers.

Depth (m)	Difference (cm)	Standard Deviation (cm)
10 - 20	0.6	30.7
20 - 30	-11.8	0.5
30 - 40	-2.1	29.1
40 - 50	9.5	0.6
50 - 60	-10.7	39.3
60 - 70	8.9	40.5

Table 1: DTM Comparison (July 31 - August 2)

The table shows the standard deviation of the difference of the two DTMs, which incorporates a factor of $\sqrt{2}$ since it is the standard deviation of the difference of two data sets with identical distributions. In order to compare with International Hydrographic Organization (IHO) standards (30 cm, < 30 m; 1%, > 30 m), for the 90% confidence level [2], the computed standard deviations are multiplied by 1.645 to bring them to the same level, and are shown in Figure 10. The IHO standard is multiplied by the $\sqrt{2}$ to account for the data difference pairs and the KAE specifications (+/-(15 cm + 0.5% depth) at 1σ) are multiplied by the $\sqrt{2}$ and 1.645 so that all comparisons are at a common level. Figure 10 shows that the KAE specifications are slightly less stringent than IHO standards throughout the measured depth range. The Fansweep data meets KAE specifications for repeatability, but falls slightly short of IHO standards for depths less than 30 metres.

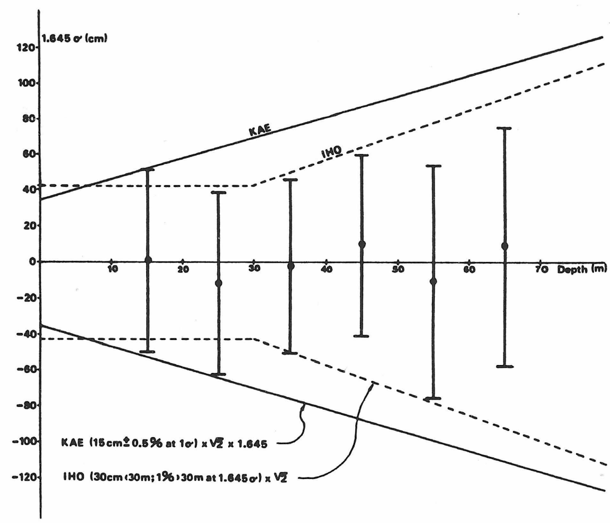


Figure 10: Repeatability Comparison

A comparison of closely positioned soundings from existing CHS data with the sounding plots produced with the Naviline software indicated a pronounced deep bias in the Fansweep data. Comparisons were restricted to depths less than 30 metres so that comparisons to the nearest decimetre could be made. From a selection of 80 soundings, the July 31 Fansweep data was deeper than CHS data by 1.4 metres (standard deviation = 0.5 m), and the August 2 data was deeper than CHS data by 2.0 metres (standard deviation = 0.6 m).

In an attempt to explain these differences the usual sources of error were examined. A bar check for the vertical beams confirmed the measured depth. The CHS data was checked by independent soundings which showed an excellent match. The Polartrack's vertical angle was checked and it gave good results for the height of a known survey monument. The Polartrack did suffer from interference and would often produce position spikes, so it is conceivable that the vertical correction could also have been affected. The most likely cause of the depth difference however, was probably a positive roll error in the Fansweep port transducer. This would make roughly half of the depths deeper by an amount that varies with depth and with beam angle. Since there was no time to adjust the port transducer and repeat the test, the KAE accuracy specifications could not be confirmed.

The apparent difference between the two Fansweep data sets (0.6 metres) could not be explained.

Beam Accuracy Test

This test compared the accuracy of the various outer beams to the centre beam. Ten parallel lines were run, 400 metres long, 10 metres apart, in depths of 27-31 metres. Five lines were selected for a starboard comparison and five for a port comparison.

For the five starboard lines, a DTM was generated for each swath. A common vertical slice of 220 metres in length was cut through them such that it was coincident with the centre of the right-most DTM, and cut through the other four DTMs off-centre by 10, 20, 30 and 40 metres. At an average depth of 28 metres, the off-centre distances represented angles of about 20°, 36°, 47° and 55°. This meant that the vertical beam was approximately compared with the 8th, 15th, 20th and 23rd beam respectively. The profiles of these four DTMs were then plotted against the profile of the first. Figure 11 shows a comparison of the vertical profile and the 40 metre (23rd beam) profile. The above procedure was repeated for the port side. Depth differences were scaled off these profiles every 2.5 metres, and means and standard deviations were obtained and are shown in Figure 12.

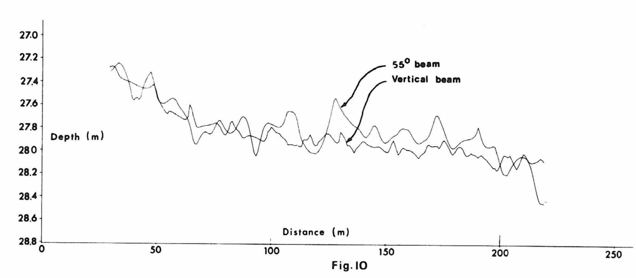


Figure 11: Beam Accuracy Test

Vertical beam vs 55 beam. (Vertical to horizontal ratio 1:50)

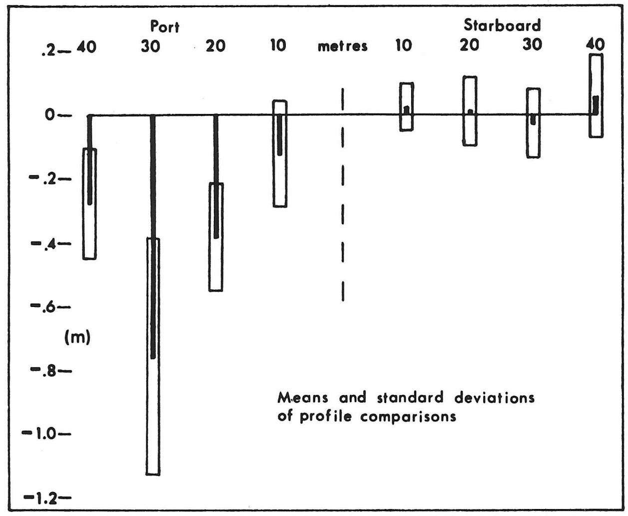


Figure 12: Means and Standard Deviations of Profile Comparisons.

The results for the starboard side were extremely good. Mean differences did not exceed 6 cm, and standard deviations were less than 13 cm for the outer beams. A general increase in standard deviation was seen as a function of beam angle, which was to be expected, but the entire side was well within the stated KAE tolerance of (+/-(15cm + 0.5% depth) at 1σ) * $\sqrt{2}$. The $\sqrt{2}$ is used here since KAE states that all beams should meet their specifications, even though it is understood that the variances for the outer beams will be larger than the inner beams. In addition to excellent beam-to-beam repeatability, the starboard results indicated that the starboard transducer array was accurately aligned in the roll direction.

In contrast, the port transducer results indicated a positive roll error. Port beams, therefore, had longer ranges, resulting in deeper depths. The separation reached a maximum of 1.2 metres in the worst case, 30 metres. The profile comparisons suggested that the errors were both depth-dependent and beam-angle-dependent. Estimates for the roll error were in the order of +1°. This supported the roll error calculation from the patch test. In fact this test presents itself as an additional method for checking roll alignment. The apparent inconsistency of the outermost profile was unexplained.

Another objective of the Beam Accuracy Test was to determine the amount of overlap that adjacent sounding lines should have. However no clear indication was obtained. Taking into consideration the increase in noise of the outer beams and, more importantly, the increase in footprint size, it is suggested that at an absolute minimum overlap should include the 23rd beam (numbered from centre). The 23rd beam has three times the footprint width and six times the footprint area of the vertical beam. The maximum line spacing would therefore be 3.5 times the depth. This means that, given fairly flat terrain, 14% of the bottom would be covered twice. More overlap may be required however, depending on survey objectives, ruggedness of the bottom, desired grid size in the DTM, etc. Specifications for CHS contract swath surveys call for 200% bottom coverage, that is 100% of the bottom is to be covered twice [3]. Moreover, for survey planning purposes, ensuring a constant minimum overlap is much easier if the lines are run in the direction of the contours, maintaining a fairly constant swath width.

Shoal Test

This test involved sounding in an area where a shallow, prominent, charted shoal existed. The objective was to see how Fansweep handled rugged terrain with steep, defined features. The chosen shoal was in the entrance to Tsehum Harbour, at the north end of Saanich Peninsula. It was recorded on the field sheet (completed in 1963) as 1 fathom 4 feet (3.0 metres). The area sounded was 560 metres by 190 metres and consisted of 14 lines, 10 metres apart, in a northwest-southeast direction. This would ensure a gapless survey and also include some surrounding terrain.

The sea state was unfavourable for Fansweep, with a 0.5 to 1 metre chop and a strong wind. Some lines could be run only in one direction since the transducers would occasionally come out of the water when travelling into the sea. The heave compensator also had trouble handling the pounding of the boat. The launch speed, due to the sea state, was about 2 knots.

Two DTMs were generated, consisting of 106,400 model points each, with a 1 metre by 1 metre grid resolution. One was created from the full data set, and the model point was the average of all the soundings in the grid cell. The other was created from a thinned data set which had only a third of the original soundings, and the model point was the shoalest sounding in the grid cell. Contour plots and 3D perspective views were created from each DTM. Figure 13 shows the contour plot for the average depth model.

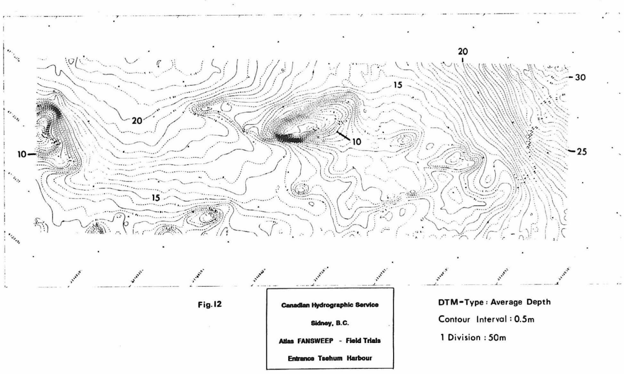


Figure 13: Contour Plot for the Average Depth Model

An input error in the height of Polartrack resulted in all recorded depths being 1.8 metres too deep. The depth of the shoal was recorded as 4.5 metres. After applying the correction, the shoal depth became 2.7 metres, or 0.3 metres less than charted.

The 3D view indicated a definite roughness of the bottom which was probably influenced by the sea conditions and not topographical in nature. The roughness of the shoal-biased DTM 3D view was even more pronounced.

The rugged terrain did not appear to cause any problems for Fansweep. The system is an ideal tool for shoal examination, given appropriate sea conditions. The position and depth of the peak was determined and the surrounding terrain was well covered, giving a clear understanding of the overall shape of the shoal.

Wharf Test

The objective of this test was to determine how Fansweep performed when it encountered sudden changes in depth, e.g. piles, concrete piers, and other obstructions that are generally found in populated areas. This was tested by running three lines about 9 metres apart, parallel to a wharf face at IOS, with the closest line about 3 metres off the face. A DTM was generated, from which a contour plot (figure 14) and a 3D perspective view (figure 15) were created.

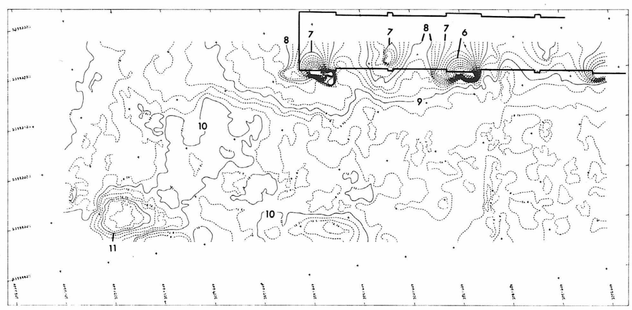


Figure 14: Wharf Test Contour Plot
Contour Interval = 0.25 metres. 1 Division = 10 metres

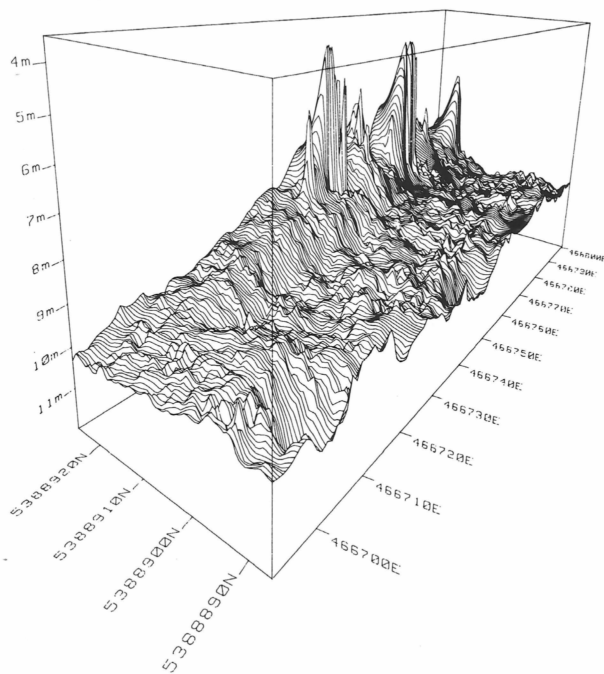


Figure 15: Wharf Test Perspective View.
Viewing Direction = 65°

The contour plot (figure 14) has the wharf outline drawn on it, and shows three large, 7 metre wide abutments, alternating with two small 1 metre wide abutments. Although Figures 14 and 15 were products of the DTM software, and not of the Fansweep system itself, it was still interesting to see what the software could do with the data. It treated the abutments as very steep, spiky shoals.

Fansweep will accept soundings where the changes in depth are sudden and extreme, but depth filtering must first be turned off. Only then will narrow features such as broken piles be recorded and not treated as bad data. Under these conditions, Fansweep offers the ability to sound around wharves and even look underneath them.

Conclusions

The Fansweep system did meet KAE specifications for repeatability, but fell slightly short of meeting IHO standards for depths less than 30 metres. The results were no doubt influenced by the misalignment of the port transducer array in the roll direction. The accuracy tests were therefore inconclusive due to this misalignment.

The calibration of this equipment is awkward and time consuming. It is absolutely critical that the transducer arrays be oriented correctly, as well as the heave/roll compensator and the gyro compass. A more definitive field procedure is needed to ensure that these conditions are met.

Although the problem of ray-bending has been addressed by KAE, the errors have not been eliminated. Modeling the refraction error in real-time may be impractical due to the high data rate, but the possibility for doing so as a post processing procedure exists. This would be desirable for sounding in water bodies with steep temperature gradients.

Fansweep requires a stable platform for best results. A 9 metre survey launch proved to be too dynamic (and also too cramped regarding equipment space). A larger vessel would solve this, but may hamper the usefulness of Fansweep in restricted waterways. Another concern is the safety of the transducer arrays which jut out from the bow. It is noted that John E. Chance & Associates Inc., in the U.S.A., has addressed these concerns by installing the transducer arrays on the end of a ram in the centre of a catamaran.

The system proved to be capable of performing shoal examinations in rugged terrain while providing the user with a clear picture of the surrounding bottom. This, of course, implies the use of digital terrain modeling software, which is necessary for most applications of Fansweep because of the very large data sets that are collected.

Fansweep met the initial objectives of this evaluation; suitability as a primary sounding tool and a shoal detection and examination tool, with the aforementioned qualifications.

Acknowledgements

The authors wish to express their gratitude to the Panel for Energy, Research and Development (PERD) for providing the bulk of the funding for this project. They also express their appreciation to Universal Systems Ltd. and Hewlett-Packard (Canada) Ltd. for providing the necessary computer equipment. Finally, thanks go to T. A. Curran for his valuable advice in reviewing this paper.

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Fansweep Tests - Manufacturer's Comments

by

Ingo Harre and Volkhard Meyer

Introduction

Tests of the first dedicated shallow water multi-beam echosounder, the "Atlas Fansweep", were carried out by the Canadian Hydrographic Service, Pacific Region, in July 1991. These tests are described in the paper immediately preceding this article [1]. For the readers of this journal, our following comments may be interesting.

Difficulties during the Test

Hardware

A live demonstration of a multi-beam echosounder must be considered as quite a comprehensive task. In order to show the full performance of the system, several items of auxiliary equipment are required. Inputs to the Fansweep from the following systems were needed: roll and heave from the TSS 335 device, ship's heading from a Robertson gyro compass, and x/y/z position (z is tide level) from the Polartrack. Measured data were intended to be logged and post-processed on an HP/UNIX workstation.

Getting the system ready for the actual tests took longer than expected due to the reasons described in the above mentioned paper. Hardware faults, e.g. with the gyro compass, can unfortunately never be excluded. Although we received a replacement from Europe within one week, valuable time was lost. We suffered even more from the incompatibility problem of the workstation. This meant that data could not be collected on-line by the data processing system. The Atlas Hydromap software we brought along is specially designed for processing of multi-beam data and offers various editing and processing facilities which we unfortunately could not use.

Installation and Calibration

The use of the Fansweep's portable transducer rig necessitates careful calibration of the system. The area of Patricia Bay was anything but ideal for using the Fansweep's built-in calibration function as there is no flat bottom but only slopes. This explains the residual calibration errors, especially in the roll direction. In the enclosed area of the bay there is also a pronounced sound velocity profile which, as described in the above-mentioned paper, made the calibration even more difficult.

Improvements

System tests like the one in Patricia Bay always lead to new perceptions. As a result the following improvements have since been added to the Fansweep and the auxiliary systems:

- Menu input of a second sound velocity value to minimize errors caused by refraction. Studies show that the residual depth error can be kept as low as 0.2%.

- Within the A/D converter of the Fansweep, the resolution of the roll signal has been doubled and is now better than the precision provided by any applicable roll measuring device. This leads to a higher precision in all depth measurement beams, with a greater effect on the outer beams.

- At our request, TSS have incorporated improved software, reducing the time delay error of the signal output.

- The Hydromap software will soon allow the determination and eliminaton of all systematic errors by incorporating the Fansweep's on-line calibration method as an off-line data correction process.

New Test Results

Test in the Netherlands

The hardware modifications described above were tested in September/October 1991 in the Netherlands. By means of the multi-beam data analysis software, 'LOCDEV' [2], standard deviations of the measurement data across the swath width were established. The results of a track consisting of 50 complete cross profiles together with horizontal lines for the Fansweep and the International Hydrographic Organisation (IHO) specifications are shown in Figure 1. In the diagram, the y-axis represents standard deviation as a percentage of depth and the x-axis the beam number counted from port to starboard. The Fansweep specification states:

Standard deviation: +/-(0.15 m + 0.5% of depth).

At an average depth of 15.2 metres this corresponds to a percentage of 1.49% in Figure 1.

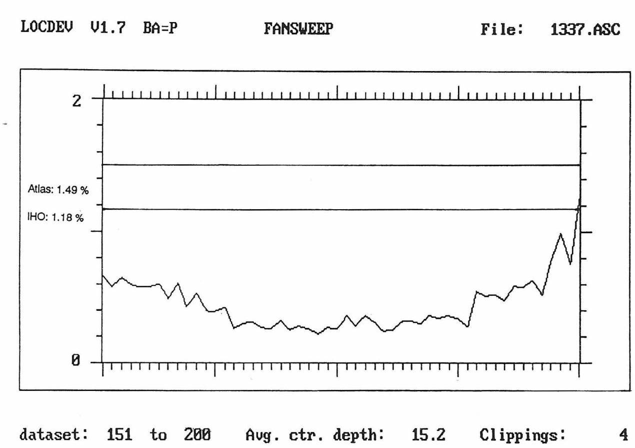

Figure 1: Netherlands Test Results

The IHO specifies in Special Publication SP44 / 1987: "The total error in measuring depth should, with a probability of 90%, not exceed:

(a) 0.3 metre from 0 to 30 metres
(b) 1% of depth greater than 30 metres."

To convert the probability level from 90% to that of the standard deviation (68.3%), the IHO values have to be divided by 1.6, with the following result:

(a) 0.18 metres from 0 to 30 metres
(b) 0.6% of depth for greater depths.

The specification lines in the diagram are obtained if the average depth in the profile section, i.e. 15.2 metres, is used in the Fansweep as well as in the reduced IHO specifications, and the resulting absolute depth errors are converted back to a percentage of the average depth.

Figure 1 shows clearly that the Fansweep's precision is not only better than specified but also fulfils the IHO requirement well, allowing additionally for a calibration error.

<u>Test in the United States</u>
The U.S. survey company, John E. Chance Inc., performed a thorough test for the U.S. Army Corps of Engineers, with their purchased Fansweep [3]. The test report stated that the Fansweep fully meets the Corps' accuracy requirements. During the tests, the Fansweep surveys were compared (inter alia) with surveys performed by a 2.75°, 200 kHz narrow-beam echosounder. The results of the comparison were:

200 kHz echosounder vs. Fansweep
Mean: 0.032 feet (approx. 1 cm)
Average deviation: 0.4 feet (approx. 13 cm)

The water depth range in the test site was 0 to 40 feet. These results are not only in accordance with the Netherlands data but also confirm the fulfilment of the IHO specifications in shallow water areas.

Acknowledgements
We hereby wish to thank the personnel of the Institute of Ocean Sciences, especially Mr. P. R. Milner, for their friendly cooperation and patience during the tests; Hewlett Packard Canada for lending us their equipment; and Universal Systems Ltd. for their support in getting our Hydromap, including the CARIS software, running. We are grateful to LIGHTHOUSE for giving us the opportunity of supplementing the IOS Fansweep paper with our comments.

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The CHA/CB Heritage Launch Project

by

Andrew E. Leyzack

Introduction
A number of significant anniversaries in Canadian History occur in the early part of this decade. 1991 marked the 200th anniversary of the establishment of Upper Canada, which later became Ontario. The 125th anniversary of Canada's Confederation will occur on July 1, 1992. Toronto's Bi-Centennial year will be celebrated in 1993.

In recognition of these historic events the Canadian Hydrographic Association/Central Branch (CHA/CB) has undertaken the 'CHA/CB Heritage Launch Project'. This project will involve the construction of a replica of the launch used by Joseph Bouchette to conduct the first hydrographic survey of Toronto Harbour in 1792. Bouchette's survey is recognized as one of the principal foundations in the development of Toronto. It is hoped that this project will draw public awareness to the early development of Toronto and Ontario.

The Project
The Heritage Launch concept was first introduced by Mr. Ian Morgan to the CHA Central Branch membership at it s Annual General Meeting in December, 1990. Ian Morgan is an expert in heritage marine design. This project was introduced in the hope that the Central Branch membership would take the initiative and spearhead this adventurous task. An ad hoc committee was formed under the direction of Mr. Jim Berry to research and verify the authenticity and feasibility of the proposed project. The committee presented a positive report to the Branch membership and received approval for the project in October, 1991.

The 'Heritage Launch' will be constructed this coming summer (May - September) at Toronto's well known 'Harbourfront' recreational facility (situated at John Quay Park at the foot of John Street). The construction site will be a covered, open air structure complemented by graphic displays to provide an interpretive exhibit. It will be an integral part of Harbourfront in 1992. Harbourfront draws approximately 100,000 visitors each summer and includes events such as Children's Fest, Canada Day and Coast Guard Day. The exhibit will be manned by volunteer CHA members and associates who will field questions from the public. A few willing to volunteer more time will be engaged in the construction of the launch under the direction of our consulting builder, Ian Morgan.

A highlight of the following summer (1993) will be the re-enactment of Bouchette's survey of Toronto Harbour complete with period costume and replica hydrographic instruments. The re-enactment (June - July, 1993) will demonstrate 18th century hydrographic techniques and seamanship. Other Toronto events committed for the launch exhibit include the CHS/CISM Surveying and Mapping Conference (Royal York Hotel, June 8 - 11, 1993, see pages 46, 47), and the Simcoe Day Celebrations sponsored by the Toronto Historical Board, at the Marine Museum (August 1993). Future events may include displays at Toronto's Fort York and the Toronto International Boat Show. It is the intention of the CHA Central Branch to eventually donate the launch to the Marine Museum of the Toronto Historical Board, who will promote and maintain the launch in the fashion intended; for the promotion of hydrography and local heritage to the general public.

A Historical Sketch
Joseph Bouchette was born May 14, 1774 in Quebec, as the eldest son of Jean-Baptiste Bouchette and Marie Angelique Duhamel. What formal education he may have had remains only to speculation but it has been suggested that Joseph was tutored (perhaps by his mother). Such practices were not uncommon in colonial times. Bouchette also served an apprenticeship aboard ship. This, and the fact that his father was a distinguished sea officer would explain his readiness for the survey profession and his choice of a military career.

Figure 1: Joseph Bouchette

The earliest record of Bouchette's involvement in surveying comes from a resumé of his in which he states he had assisted Deputy Surveyor William Chewitt surveying in the Montreal area in 1788 and from Vaudreuil to Long Sault in 1789. In March 1790, Bouchette's name appears on the list of employees of his uncle, Samuel Holland, the Surveyor General of Quebec. It is here that as an assistant draughtsman, redrawing the survey plans of the province, he is said to have begun his formal survey education. One year later, on March 25, 1791, Bouchette qualified as a deputy surveyor, but chose not to continue his employment in the Surveyor General's office in favour of enlistment in the Provincial Marine. The Provincial Marine was a naval militia charged with the exclusive purpose of ship-building and transportation for the province. Joseph Bouchette sailed to Toronto, that same year, to serve aboard his father's flagship, the Onondaga.

At this time, a massive influx of United Empire Loyalists (settlers seeking land under crown rule in the aftermath of the American Revolution) emphasized the need for a more orderly settlement of Canada. On December 26, 1791, the Constitutional Act dividing the province of Quebec into Upper and Lower Canada went into effect (officially known as the Canada Act). The legislature of the newly formed province of Upper Canada (Ontario) was to parallel Great Britain. Colonel John Graves Simcoe, Upper Canada's first Lieutenant Governor, was responsible for the administration of provincial land grants and establishing a capital. Simcoe proposed the establishment of three new settlements: Long Point, Toronto, and London. He proposed that London (approx. 170 km southwest of Toronto) would be his provincial capital and Toronto Harbour his naval base. He thought that Newark (Niagara-on-the-Lake) and Kingston were too close to the uneasy American border and that Toronto was the best location from which to command the Lake Ontario naval force. He wrote to Major-General Alured Clarke, the Lieutenant Governor of Quebec and Canada's acting Governor-in-Chief:

> "I found it [Toronto] to be without Comparison the most proper situation for an Arsenal in every extent of that word that can be met with in this Province. The Spit of Sand which forms its entrance is capable of being so fortified with a few heavy Guns as to prevent any Vessel from entering the Harbour, or from remaining within it." [1]

Curiously, the Governor-in-Chief, Lord Dorchester, for whom Clarke was acting, shared neither Simcoe's ideas for a capital nor an arsenal but wanted Toronto as the capital and Kingston as the main naval base on the Lake. In preparation for his move to what he considered the province's temporary capital, Simcoe requested a hydrographic survey of Toronto Harbour. From a list of duly appointed Deputy Surveyors obtained from the Surveyor General, Simcoe commissioned eighteen-year-old Joseph Bouchette to conduct the survey.

Bouchette completed the survey in November 1792 for a sum of 15 pounds, 16 shillings and 8 pence. His "Remarks" accompanying the chart include a description and sailing directions into the harbour:

> "Toronto Harbour is very Safe for the Shipping that can Enter into it. The Least Water at the Entrance being two Fathoms and a half. It is Sheltered from every wind except the SW which Blows directly into the Harbour, but it does not occasion much Sea, the said Harbour being perfectly Shut up by the Bar." [2]

Figure 2: Joseph Bouchette's Plan of Toronto Harbour [2]

While this survey predates the establishment of the Hydrographic Office of The British Admiralty (instituted in 1795 for the collection and production of navigational charts and sailing directions), Bouchette's chart contains many of the symbols and conventions presently adopted by the International Hydrographic Organization as the standard for modern day hydrographic charts. For example, his symbols delineating marshes, rocks and suitable anchorages are consistent with today's standards. He includes his observations of prominent features which may be useful when fixing a position on approach to the harbour. These features include shoreline relief, St. John's House (the cabin of Jean-Baptiste Rousseau, a successful fur trader who had resided at the mouth of the Humber River for many years prior to Simcoe's arrival), the Blacksmith's House referred to in his sailing directions, Toronto Fort (better known as the ruins of the French Fort Rouille, which was burned to the ground by the retreating French garrison in 1758 after the Seven Years War, between Great Britain and France) and an Indian Hut, perhaps the residence of the natives described in Bouchette's following recollection:

> "I still distinctly recollect the untamed aspect which the country exhibited when first I entered the beautiful basin, which thus became the scene of my early hydrographical operations. Dense and trackless forests lined the margin of the lake, and reflected their inverted images in its glassy surface. The wandering savage had constructed his ephemeral habitation beneath their luxuriant foliage- the group then consisting of two families of Messassagas [sic],- and the bay and neighbouring marshes were the hitherto uninvaded haunts of immense coveys of wild fowl: indeed they were so abundant as in some measure to annoy us during the night."[3]

Colonel John Graves Simcoe and his family arrived at Toronto aboard the schooner Mississaga in the early hours of July 30, 1793. Jean-Baptiste Rousseau rendezvoused with them to pilot their vessel into the harbour. Simcoe's regiment (the Queen's Rangers) had already begun clearing an area for a camp west of the Don River's mouth. The Lieutenant-Governor's first home was a large tent formerly used on Captain James Cook's expeditions to the South Pacific. On August 24, 1793, while the schooners Mississaga and Onondaga crashed out a 21 gun salute, Governor Simcoe officially changed the name of Toronto to York to commemorate the Duke of York's recent victory over the French in Holland. This act was consistent with Simcoe's policy of replacing Indian place names with English, however many locals continued to call their home Toronto. Regardless, it marked the official founding of the city of Toronto.

Colonel Simcoe was completely satisfied with Bouchette's survey of Toronto Harbour and included the following recommendation in a letter to the acting Governor-in-Chief, Clarke:

> "I beg in a particular manner to recommend to your Excellency's protection, and future favors, the Son of Captain [Jean Baptist] Bouchette. He is now in one of the Gun Boats [armed schooners]; and by employing him in Surveying the Coasts and Harbours I propose to render him a most useful servant to the Crown in that branch of Naval Duty, Pilotage, so essential to the navigation of the Lakes..." [5]

Early Maps

Although Joseph Bouchette's Plan of Toronto was the first hydrographic survey of Toronto Harbour this historical sketch would not be complete without mention of the maps and plans depicting Toronto that preceded his work. The Seneca village

Figure 3: Toronto Harbour in 1793 [4]

of Teyeyagon and what appears to be Toronto Island are depicted on a map of 1680 (by Claude Bernou). Teyeyagon (also spelled Teiaiagon) was situated inland from Lake Ontario on the east side of the Humber River at the "Toronto Carrying Place", a stepping-off point for a well-travelled portage to "Lac De Taronto" (now called Lake Simcoe).

In 1757, nearing the end of the French regime, naval officer Pierre Boucher de Labroquerie produced a southward view of Lake Ontario. Labroquerie's chart depicted the French Fort Rouille, the "pres ille de Toronto" (the Toronto island as a peninsula) and the "R. de Toronto" (now the Humber River). This chart included a larger scale inset with soundings at the mouth of the Niagara River (across the lake) and sketches of the ships of the English and French fleets, then occupying the lakes.

Following the Toronto Purchase of 1787 (land purchase of Toronto town site by Great Britain from the Mississauga tribe), Deputy Surveyor Alexander Aitken by order of the Governor-in-Chief, Lord Dorchester, produced his Plan of Toronto to show the boundaries of England's purchase. Completed August 1788, Aitken's map showed the west and east boundary lines of Toronto at the "Tobicoak River" (Etobicoke Creek) and the western edge of the "High Lands" (Scarborough Bluffs), respectively. On this large scale map, the Toronto Island is depicted as a "Sandy Beach" peninsula with marshes to the east and the boundaries of a small town on the north shore of the harbour.

That same year, during his military reconnaissance surveys of the Great Lakes, an officer of the Royal Engineers (Captain Gother Mann) produced a plan entitled "Plan of Proposed Torento [sic] Harbour, with the Proposed Town and Port by the Settlement" (dated at Quebec, December 6, 1788). Mann's plan resembled a sectional township layout, with a public common at the centre and a reserved government ground fronting the bay. In the interest of constructing wharves, Mann took soundings near the ruins of Fort Rouille and near the shores of the bay. A report by Deputy Surveyor-General John Collins which accompanied the plan stated that due to the shoalness of the north shore, the erecting of wharves or quays would be impractical and because of the nature of the prevailing west wind, ships would find difficulty in leaving the harbour.

Coincidentally, Simcoe's method for laying out the settlement at Toronto shows some semblance of the Gother Mann plan, but whether or not he read John Collins' assessment of Toronto harbour, it certainly did not deter him. Today, with the prevailing west winds, sailors frequently have to power up to make their way out of Toronto Harbour's Western Gap. It is obvious from the Toronto Harbour of today (see figure 4) that Bouchette's survey and Governor Simcoe's determination proved the Deputy Surveyor-General wrong.

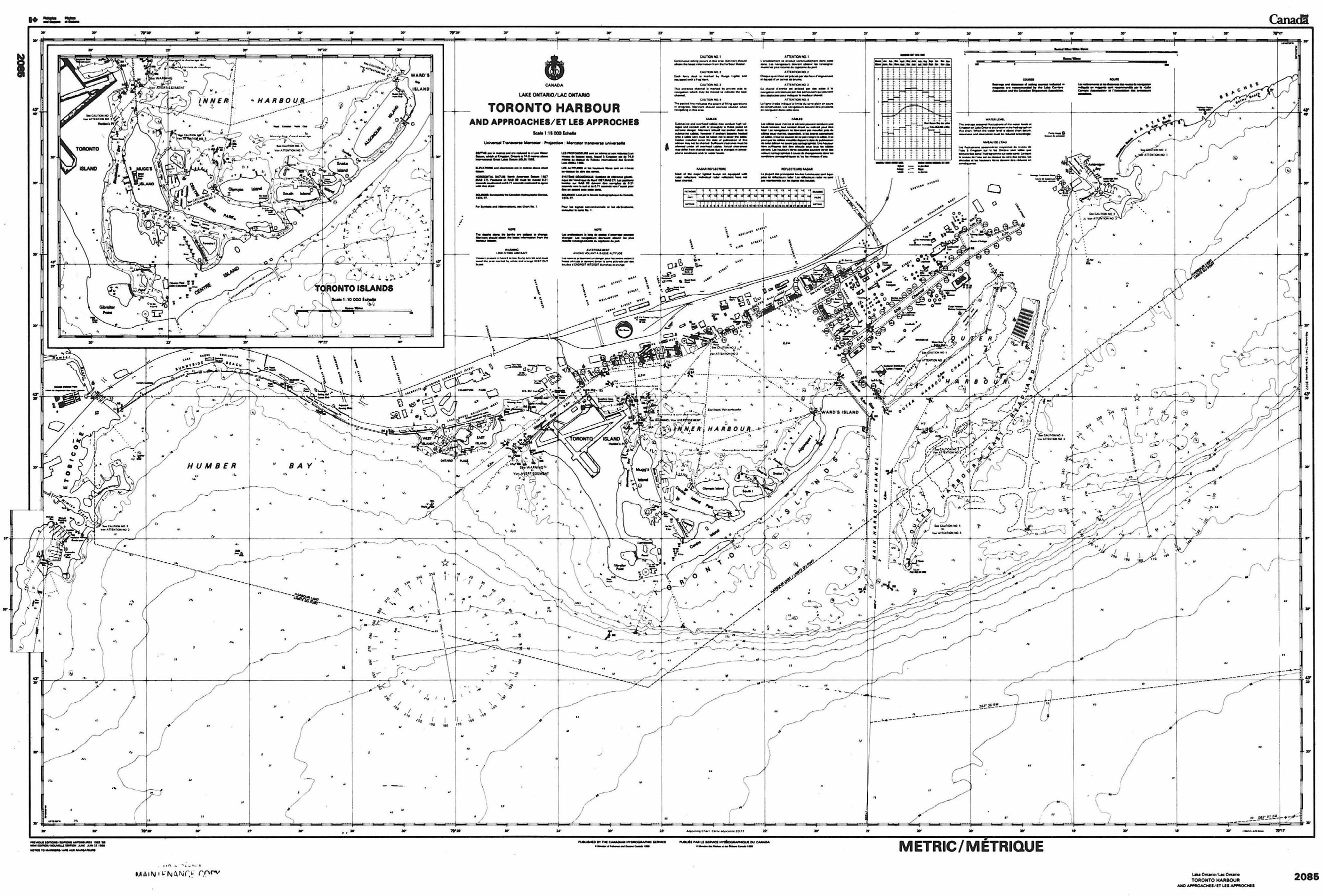

Figure 4: Toronto Harbour 1992.
Reduction of Canadian Hydrographic Service chart 2085.

The Survey Vessels

Joseph Bouchette, in draughting the Plan of Toronto Harbour, gives evidence of a prevailing westerly not only in his remarks of the harbour but also in his illustration of a schooner anchored at the northeast end of the bay. Upon close examination (see figure 5) one can see the schooner's mainsail was partially hoisted; a technique used at an anchorage to maintain the ship's head to windward while maintaining an even strain on the ground tackle. Flying astern is the Red Ensign, a British naval flag which saw service between the years 1707 and 1864. Flying from the truck of the main mast is a broad, 'swallow-tailed' pennant. The pennant served not only as a means for vessel identification but as a symbol of the senior officer's rank. Unlike the Onondaga, the schooner depicted here is smaller, and carried only one square sail on her foremast. She is thought to be an armed schooner named the "Buffaloe".

The schooner's coarsesail yard (a spar normally crossed at or below the fore-topmast) appears to have been lowered. This may have been done to reduce windage or to be employed as a derrick. A boat which appears to be the survey launch (the'Heritage Launch') is tethered astern of the schooner. Our consultant and builder, Mr. Ian Morgan, has determined that an open launch of this nature would normally carry a spritsail schooner sailing rig, two or three sets of sweeps (large one-man oars), and would have to be quite seaworthy to tackle open-water tasks. The launch depicted by Bouchette shows the latter two traits; two sets of oarlocks and a high stem are visible. The replica will be built to 23 feet (7 metres) in length (excluding the bowsprit)and have a beam of 6.9 feet (2.1 metres). It will draw 2.9 feet (0.9 metres) and its rig will stand 18 feet (5.5 metres) in height (see figures 6 and 7).

Conclusion

The period 1991-1993 has been designated the 'Heritage Years' in Ontario. We see this as an opportune time to provide the public with a greater appreciation of the role played by hydrography in Canadian history. The true value in this project is the opportunity to bring our Canadian history to life. For most people (especially our children) history is a textbook experience. In today's fast-paced world of computers and futuristic trends our heritage is often overlooked.

The 'Heritage Launch' will be an interpretive tool to address the events surrounding the founding of Toronto and their affect on the early development of Ontario. The 'CHA/CB Heritage Launch Project' will be an educational and inspirational experience for CHA members and the Canadian public.

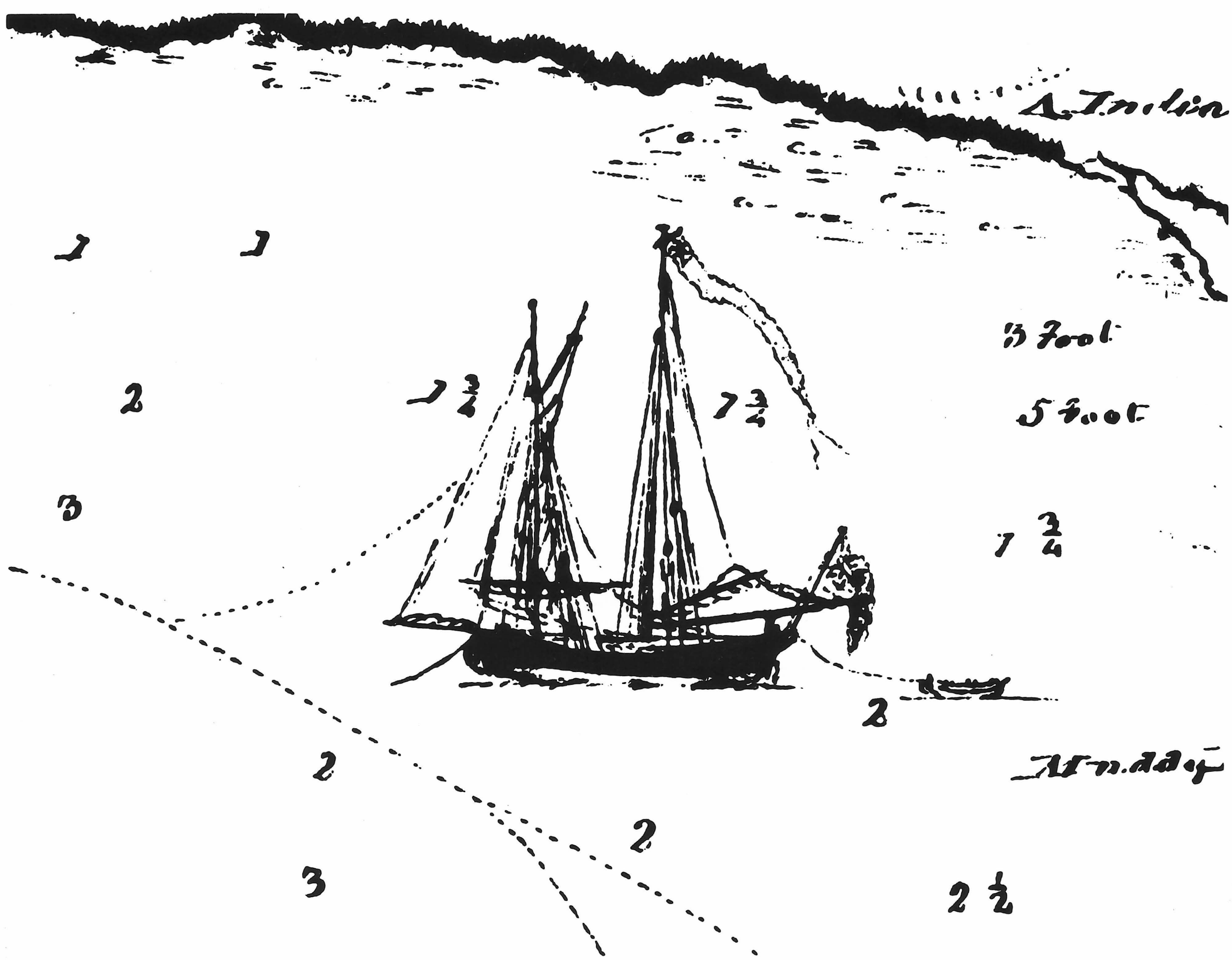

Figure 5: The Schooner "Buffaloe" at Anchor with Launch.
Enlargement of Bouchette's Plan of Toronto Harbour (see figure 2).

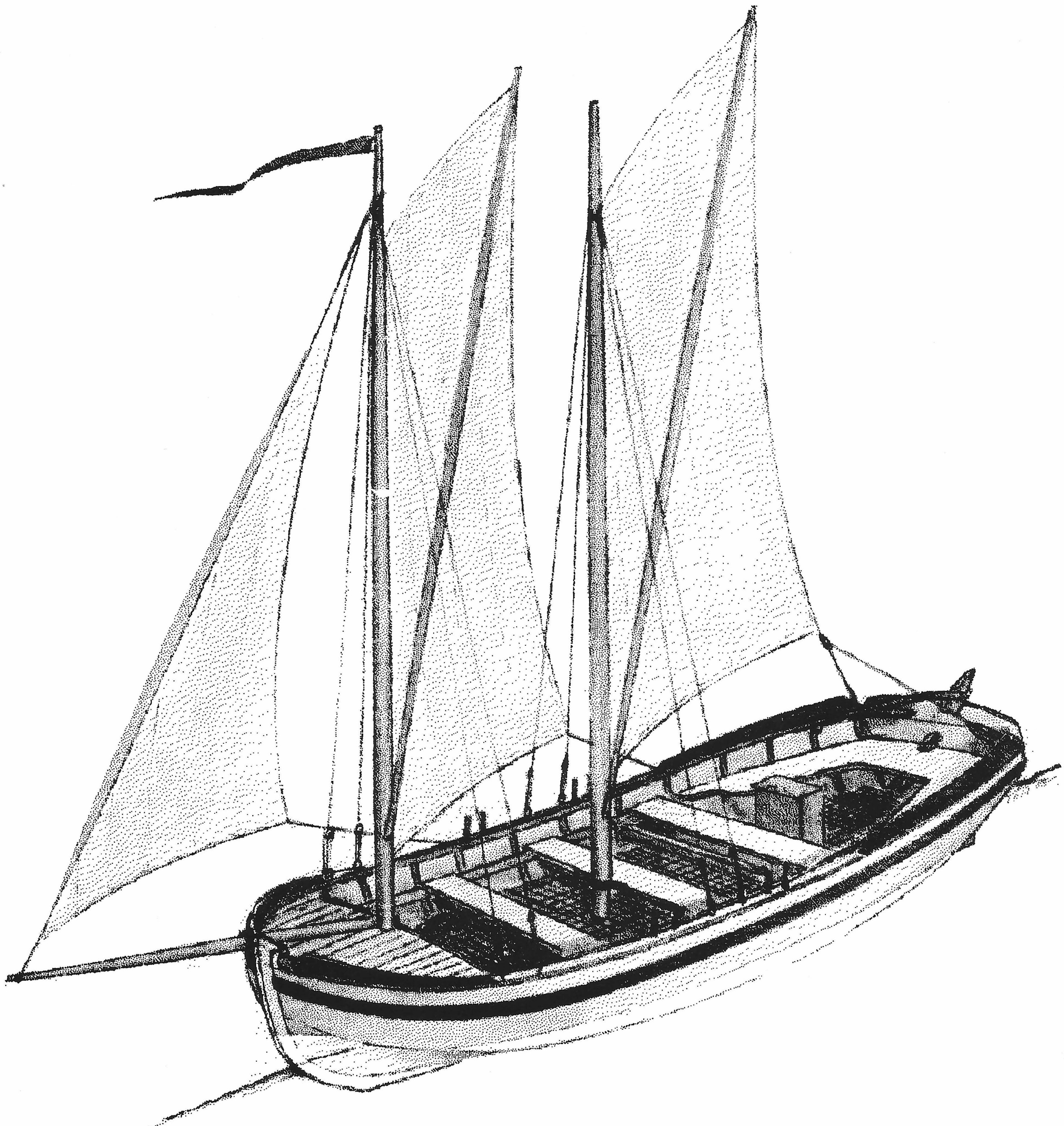

Figure 6: 1792 Hydrographic Launch. Sketch by Ian Morgan.

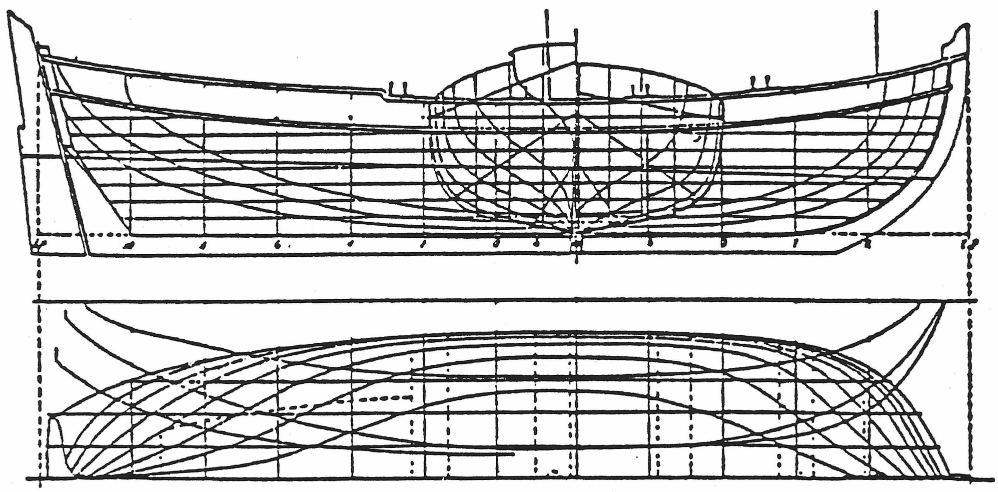

Figure 7: Launch Lines (by Ian Morgan).

The CHA/CB Heritage Launch Committee
Chairman: Mr. Sean Hinds is a Hydrographer with the Canadian Hydrographic Service and Vice-President of the CHA Central Branch.

Secretary: Mr. Jim Berry is the Supervisor of Waterfront Development with the Metropolitan Toronto Region Conservation Authority.

Treasurer: Mr. Ken McMillan is the President of McQuest Marine Sciences Ltd.

Survey Re-enactment: Mr. Brian Power is a Hydrographer with the Canadian Hydrographic Service.

Promotion and Publicity: Mr. Andrew Leyzack is a Hydrographer with the Canadian Hydrographic Service. He has trained, with accumulated sea time, in square rig sail.

Heritage Consultant: Mr. Ian Morgan is a graduate in Industrial Design whose 25 years experience in marine and related heritage has made him an expert in the field. He has numerous projects to his credit and has lectured on this subject to Ontario Colleges and Universities. Mr. Morgan has drawn the plans for the replica launch from his knowledge of 18th century boat construction.

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About the Author

Andrew Leyzack is a member of the CHA/CB Heritage Launch Committee, involved with Promotion and Publicity. He is a hydrographer with the Canadian Hydrographic Service, Central and Arctic Region, based out of Burlington, Ontario (approximately 50 kilometres southwest of Toronto).

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LORAN-C Signal Analysis in the Lower St. Lawrence Using a Mobile GPS System

by

B. Townsend, G. Lachapelle and D. Hains

Introduction

This paper is a progress report of Loran-C investigations being sponsored by the Canadian Hydrographic Service (Québec Region) in the Lower St. Lawrence area (Figure 1). The overall objective of the project is the performance analysis and calibration of Loran-C under a wide range of climatic conditions and atmospheric noise present in winter and summer, and mixed land-sea path conductivity variations typical of Loran-C in the above area. This performance analysis and calibration procedure will hopefully result in a greater understanding of Loran-C propagation effects under the conditions prevailing in the Lower St. Lawrence and in more reliable and more accurate Loran-C navigation for marine users in that part of the river.

The three Loran-C chains available over the area of interest are shown in Figure 1 and relevant parameters are listed in Table 1. The propagation paths relevant to this study are either entirely over land or over mixed land and sea. The propagation is further complicated by the fact that the salinity of the water in the St. Lawrence progressively increases downstream. The ground conductivity in the coverage area is considered poor, with an average of 0.003 siemens m^{-1} [2]. The conductivity of fresh water is 0.005 siemens m^{-1}, and normal sea water (35 ppt) is 5 siemens m^{-1}. The relatively poor ground conductivity is expected to result in lower field strengths, as the distance from a transmitter increases. The predicted average atmospheric noise in the coverage area is of the order of 25 to 50 dB (referred to 1 μv m^{-1}), with diurnal variations of up to 15 dB and seasonal variations of up to 12

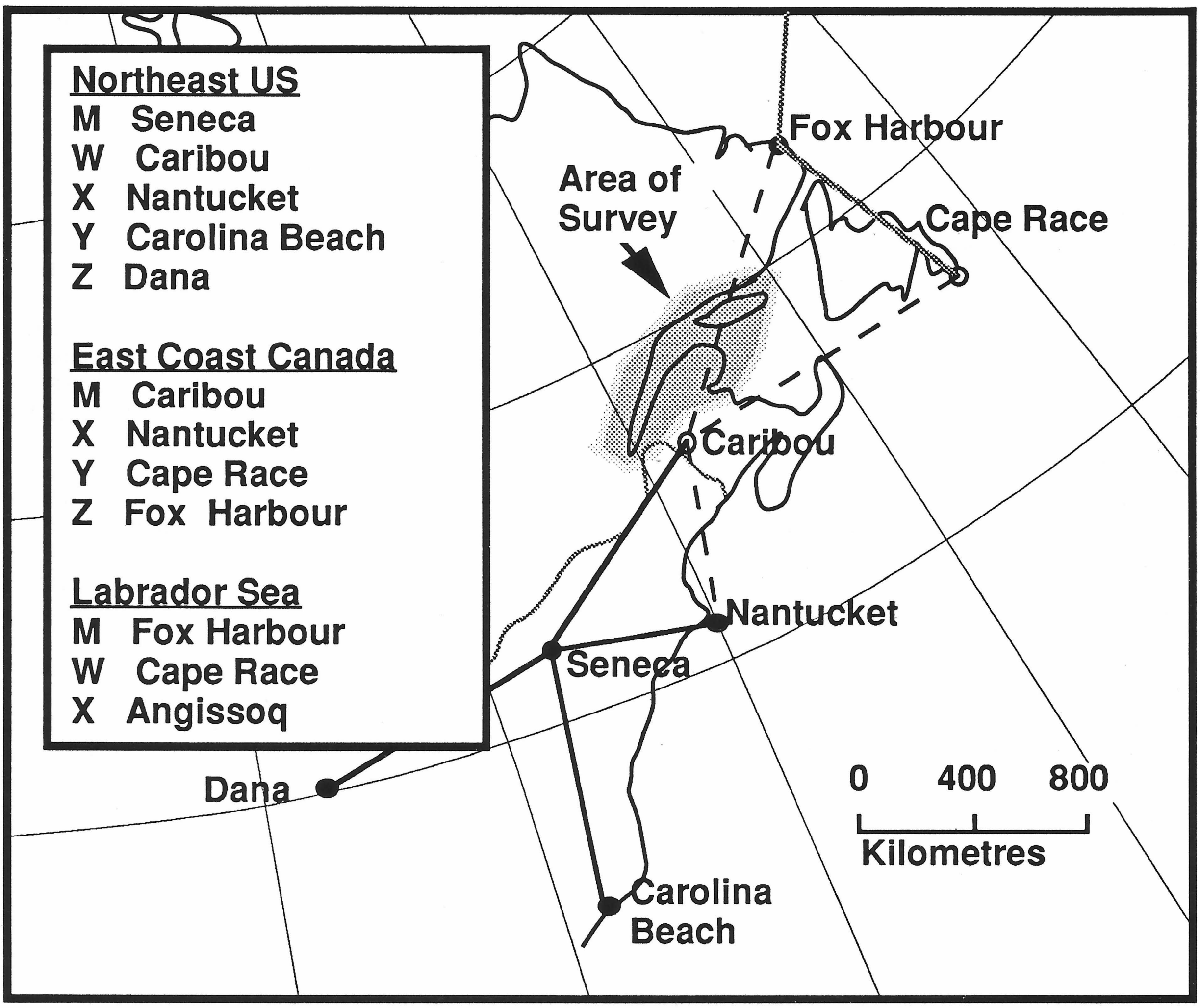

Figure 1: Loran-C Chains available in the Lower St. Lawrence Area

CHAIN	STATION	COORDINATES (WGS84)	POWER (kw)
East Coast Canada GRI 5930	(M) Caribou, ME	46° 48' 27.30" N 67° 55' 37.16" W	800
	(X) Nantucket, MA	41° 15' 12.05" N 69° 58' 38.54" W	400
	(Y) Cape Race, Nfld	46° 46' 32.29" N 53° 10' 27.61" W	1000
	(Z) Fox Harbour, Labr.	52° 22' 35.25" N 55° 42' 27.86" W	800
Labrador Sea GRI 7930	(M) Fox Harbour, Labr.	52° 22' 35.25" N 55° 42' 27.86" W	800
	(W) Cape Race, Nfld	46° 46' 32.29" N 53° 10' 27.61" W	1000
	(X) Angissoq, Greenland	59° 59' 17.35" N 45° 10' 26.92" W	760
Northeast US GRI 9960	(M) Seneca, NY	42° 42' 50.72" N 76° 49' 33.31" W	800
	(W) Caribou, ME	46° 48' 27.30" N 67° 55' 37.16" W	800
	(X) Nantucket, MA	41° 15' 12.05" N 69° 58' 38.54" W	400
	(Y) Carolina Beach, NC	34° 03' 46.21" N 77° 54' 46.10" W	800
	(Z) Dana, IN	39° 51' 07.66" N 87° 29' 11.59" W	400

Table 1: Loran-C Chain Parameters [1]

dB [3]. Lower atmospheric noise prevails in winter and during the daytime between approximately 8:00 and 18:00. The measurements reported herein were taken in March, generally between 8:00 and 21:00. The predicted atmospheric noise was therefore generally minimum. Despite this favourable condition, not all transmitters could be received due to excessive attenuation caused by the long distances from these transmitters.

Methodology

The field measurement campaign reported herein was conducted during March 1991, along the roads shown in Figure 2. In this figure, the roads surveyed are subdivided into segments of up to about 200 km for analysis purposes. The North Shore part consists of some 900 km of road, including 250 km up and down the Saguenay River. The South Shore part also consists of some 900 km along the St. Lawrence and around the Gaspé Peninsula to Restigouche. Each of the above routes was observed twice to provide an adequate quality control of the results. The observations were taken during two periods each day when the GPS satellite coverage was sufficient to have a Horizontal Dilution Of Precision (HDOP) of ≤ 7.

The following measurements were made with the LORCAL^2 system [4] of the University of Calgary at intervals of about 100 metres to provide the continuous profiles required for a thorough analysis of the Loran-C signals:

- Loran-C Field Signal (FS) Strength;
- Signal-to-Noise Ratio (SNR) of the incoming Loran-C signals;
- Loran-C Time Differences (TDs);
- Envelope-to-Cycle Differences (ECD); and
- single point and Differential GPS positions.

The LORCAL^2 system configuration used during the Winter '91 campaign is shown in Figure 3. The vehicle-mounted system, as used in the field, is shown in Figure 4. Each single-chain receiver was dedicated to one of the three chains available in the area, as shown in Tables 1, 2 and 3, respectively. The error budget of the system is estimated as follows:

(1) internal Loran-C receiver noise, ≤ 10 metres;
(2) dynamic effects due to receiver motion, ≤ 50 metres;
(3) effect of GPS time synchronization error, ≤ 5 metres;
(4) single point GPS, 20 - 40 metres, 2 drms, HDOP ≤ 7 metres (with Selective Availability off during Winter '91); and
(5) differential GPS, 5 - 10 m.

The system was tested in a mountainous area north of Vancouver, B.C., in early Winter '91. In that area, the TD distortions were relatively large, namely several hundred metres over distances of less than a few kilometres. Such an area is therefore well suited to evaluate the repeatability of the system. Comparisons of forward and backward runs resulted in an agreement of about 50 metres in DGPS mode [5]; this accuracy level is consistent with the above estimates. The forward and backward road segments measured along the St. Lawrence were also compared to assess the consistency of the measurements. The standard deviations of one measurement generally varied between 0.1μs and 0.3μs.

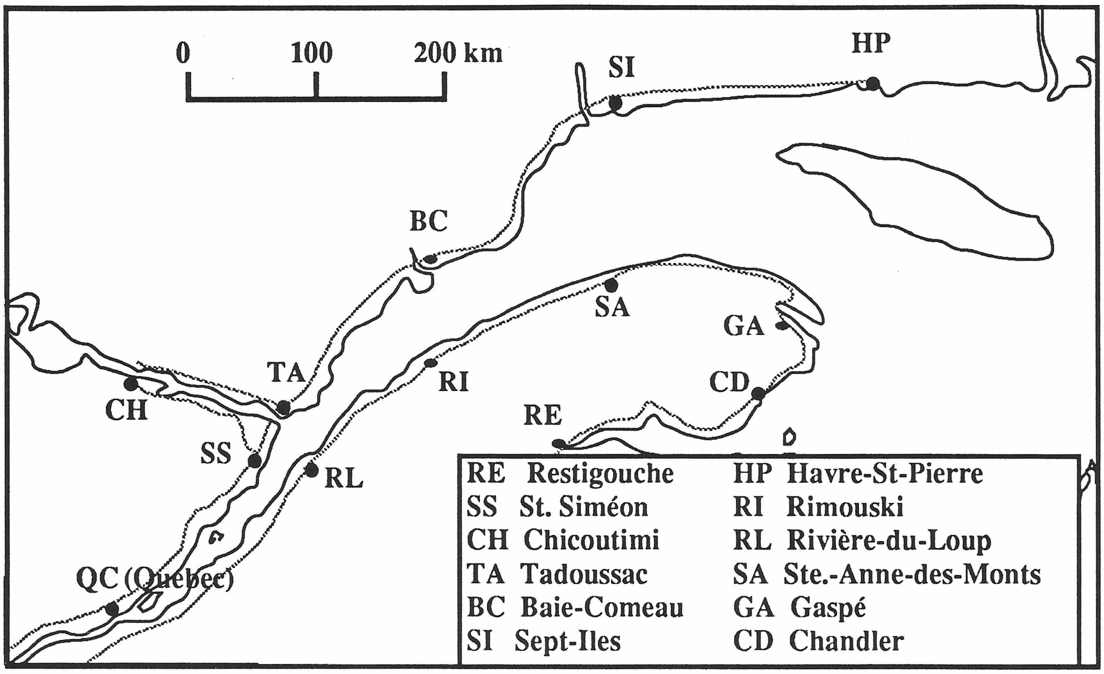

Figure 2: Land Roads Observed During the Winter '91 Campaign

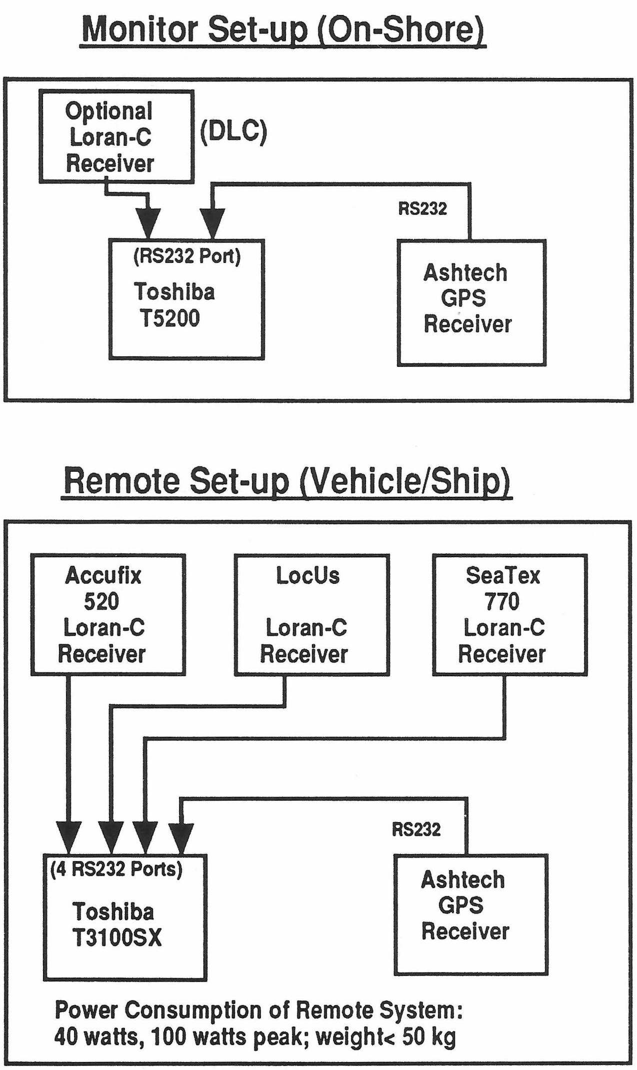

Figure 3: LORCAL^2 System Configuration

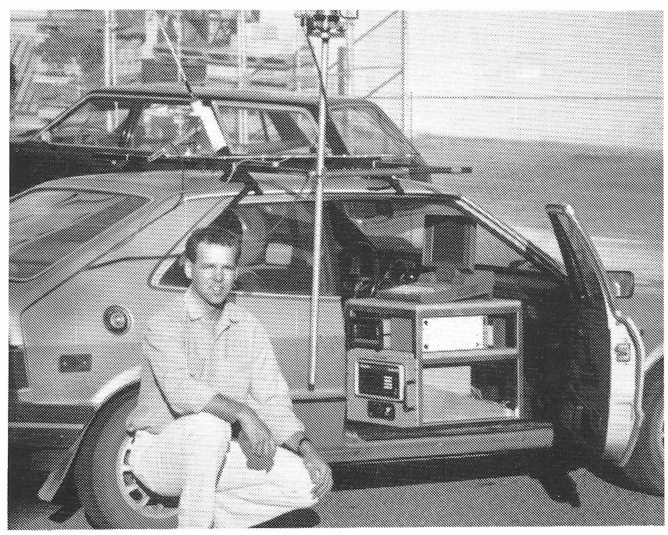

Figure 4: Vehicle-Mounted LORCAL^2 System

Data Reduction and Preliminary Analysis

The parameters examined during the preliminary analysis conducted up to now included the SNR and SNR variations along the routes selected, the field strength (FS), the Envelope-to-Cycle Differences (ECD) and the Normalized Time Differences (NTD). The NTD is defined as:

$$NTD = TD_{Loran\text{-}C} - TD_{GPS}$$

where TD_{GPS} is the time difference calculated using the single point GPS fixes and the RF wave propagation velocity in vacuum, and $TD_{Loran\text{-}C}$ is the time difference measured by the Loran-C receiver.

The primary, secondary and additional secondary factors, due to tropospheric refractivity, sea conductivity and mixed land/sea conductivity, respectively, were not removed from the $TD_{Loran\text{-}C}$ values used to calculate the NTDs listed in the tables. The effect of the primary factor on the TD is estimated to be of the order of 0.5 µs in the test area. This effect will subsequently be removed to analyse separately the effect of overland and mixed land/water propagation (i.e., the combined effect of the secondary and additional secondary factors). In this analysis, single point GPS fixes were used to calculate the TD_{GPS}s. These are accurate to about 30 to 50 metres (2drms, HDOP $\leq$ 7), i.e. 0.1 to 0.17 µs. Selective Availability was found to be nominal during the March 1991 observation period.

The ranges of the above parameters are given for the East Coast Canada Chain (Table 2), the Northeast U.S. Chain (Table 3) and the Labrador Chain (Table 4), for each of the road sections identified in Figure 2. Preliminary findings which can be deduced from these tables are as follows:

East Coast Canada Chain (GRI 5930):
The measured field strength is generally within 5 dB of corresponding values predicted using an overland propagation path with a conductivity of 0.003 siemens m^{-1} [2]. The SNR was generally $\geq$ -10 dB for M (Caribou), X (Nantucket) and Y (Cape Race). These measured SNR values are usually within the values calculated using the predicted atmospheric noise (N_{atm}) and measured field strength (FS), namely:

$$SNR = FS - N_{atm}$$

The lower X and Y field strengths measured in the Saguenay area were most likely the result of excessive signal atttenuation caused by the surrounding rugged topography, an effect also measured in other parts of Canada [6].

The reception of Z (Fox Harbour) was marginal except around the Gaspé Peninsula. In this case, reception likely benefitted from the recovery effect of the sea water between Anticosti Island and the Peninsula. In the other areas, the signal reception of Z was below expectations and was likely due to the very poor ground conductivity in Labrador and the north-eastern part of Québec. Interestingly, the field strength of Z along the south shore of the lower St. Lawrence was relatively higher than on the north shore, despite a longer distance from Fox Harbour; this was also likely due to the recovery effect of the salt water in the St. Lawrence along the propagation path. This recovery effect was still, however, insufficient to bring the SNR above the minimum -10 dB required for effective Loran-C reception.

Section of Road	5930 - M		5930 - X		5930 - Y		5930 - Z	
	SNR	FS	SNR	FS	SNR	FS	SNR	FS
QC - RL	> 10	> 75	-5 ↔ 5	50 ↔ 60	-15 ↔ -5	45 ↔ 55	< -10	35 ↔ 45
RL - RI	> 10	> 75	0 ↔ 5	55 ↔ 65	-10 ↔ -5	45 ↔ 55	< -10	35 ↔ 45
RI - SA	> 10	> 75	-5 ↔ 5	50 ↔ 60	-5 ↔ 0	45 ↔ 55	< -10	35 ↔ 45
SA - GA	> 10	> 70	-10 ↔ 0	50 ↔ 60	-5 ↔ 0	50 ↔ 60	-10 ↔ -5	45 ↔ 55
GA - RE	> 10	> 70	-5 ↔ 5	55 ↔ 65	0 ↔ 10	60 ↔ 70	-15 ↔ -5	30 ↔ 50
QC - TA	> 10	> 70	0 ↔ 10	55 ↔ 65	-15 ↔ -5	40 ↔ 50	< -10	30 ↔ 40
SS - CH	> 10	65 ↔ 75	-10 ↔ 0	45 ↔ 55	< -10	30 ↔ 40	< -10	30 ↔ 40
CH - TA	> 10	65 ↔ 75	-10 ↔ 0	45 ↔ 55	< -10	30 ↔ 40	< -10	30 ↔ 40
TA - BC	> 10	> 70	-5 ↔ 5	50 ↔ 60	-10 ↔ 0	40 ↔ 50	< -15	25 ↔ 35
BC - SI	> 10	> 70	-10 ↔ 0	45 ↔ 55	-10 ↔ 0	45 ↔ 55	< -15	30 ↔ 40
SI - HP	> 10	> 70	-10 ↔ -5	50 ↔ 55	-10 ↔ 0	50 ↔ 60	< -10	35 ↔ 45
	ECD	NTD	ECD	NTD	ECD	NTD	ECD	NTD
QC - RL	-2 ↔ 1	--	-2 ↔ 1	1 ↔ 3	-1 ↔ 2	4 ↔ 5	--	--
RL - RI	-2 ↔ 0	--	-2 ↔ 1	2 ↔ 3	-1 ↔ 2	4 ↔ 5	--	--
RI - SA	0 ↔ 2	--	-1 ↔ 1	2 ↔ 3	-1 ↔ 1	4 ↔ 5	--	--
SA - GA	0 ↔ 2	--	-1 ↔ 1	2 ↔ 3	-1 ↔ 1	3 ↔ 4	--	0 ↔ 2
GA - RE	-1 ↔ 1	--	-2 ↔ 1	1 ↔ 3	0 ↔ 2	0 ↔ 3	-4 ↔ 1	2 ↔ 1
QC - TA	-3 ↔ 1	--	-4 ↔ -2	2 ↔ 3	--	4 ↔ 5	--	--
SS - CH	-3 ↔ -1	--	-3 ↔ -1	2 ↔ 3	--	--	--	--
CH - TA	-3 ↔ -1	--	-4 ↔ -2	2 ↔ 3	--	4 ↔ 5	--	--
TA - BC	-3 ↔ -1	--	-4 ↔ -2	2 ↔ 3	--	4 ↔ 5	--	4 ↔ 5
BC - SI	-3 ↔ 0	--	-3 ↔ 1	2 ↔ 3	-3 ↔ 0	4 ↔ 5	--	3 ↔ 4
SI - HP	-2 ↔ 0	--	-3 ↔ 1	2 ↔ 3	-2 ↔ 2	3 ↔ 5	--	3 ↔ 4

Table 2: Summary of Loran-C Measurements - Canadian East Coast Chain (5930).
Using a LocUS Pathfinder Loran-C Receiver.
SNR & FS (Field Strength) in dB. ECD & NTD (Normalized Time Difference) in milliseconds (ms).

The ECD variations within the 200 kilometre road segments, shown in Figure 2, reach 5 ms. These observations were to be interpreted with caution as they varied widely over relatively short distances and were measured with a relatively low accuracy. Such variations were however within the ranges expected in view of the overland propagation paths and rugged topography that prevailed along some of the road segments (e.g., Saguenay area and Gaspé Peninsula).

The NTDs, which were due to the combined effect of the primary, secondary and additional secondary phase lags, reached 5 ms in some cases. The variations within the 200 kilometre road segments reached 3 ms in the Gaspé Peninsula. Most of these variations were the result of a rapidly varying ASF caused by the local topography. The primary phase effect was less than 0.5 µs, as stated earlier.

<u>Northeast U.S. Chain (GRI 9960)</u>:
The SNR was generally ≥ -10 dB for M (Seneca), W (Caribou) and X (Nantucket). Reception of Y (Carolina Beach) and Z (Dana) was marginal due to the relatively long over-land propagation paths from these transmitters. As the SNR values were consistently below - 10 dB, the measurements related to these transmitters are not listed.

The SNR and FS values for Caribou (W) and Nantucket (X) should theoretically be identical to those measured on M and X of the East Coast Canada chain, since the transmitters, propagation paths and observation times are identical. The differences, which are of the order of 5 to 10 dB, constitute a measure of the FS and SNR measuring accuracy of the two different Loran-C receivers used.

Section of Road	9960 - M		9960 - W		9960 - X	
	SNR	FS	SNR	FS	SNR	FS
QC - RL	0 ↔ 5	60 ↔ 70	5 ↔ 10	> 75	0 ↔ 5	55 ↔ 65
RL - RI	-5 ↔ 5	55 ↔ 65	5 ↔ 10	> 75	-5 ↔ 0	50 ↔ 60
RI - SA	-10 ↔ 5	50 ↔ 60	> 10	> 75	-10 ↔ 0	50 ↔ 60
SA - GA	-10 ↔ 0	40 ↔ 50	5 ↔ 10	70 ↔ 75	-10 ↔ 0	40 ↔ 50
GA - RE	< -10	30 ↔ 60	5 ↔ 10	> 75	-5 ↔ 0	50 ↔ 60
QC - TA	-5 ↔ 5	50 ↔ 65	5 ↔ 10	70 ↔ 75	0 ↔ 5	55 ↔ 65
SS - CH	-15 ↔ 0	30 ↔ 50	0 ↔ 10	50 ↔ 75	-15 ↔ -5	30 ↔ 50
CH - TA	-10 ↔ 0	30 ↔ 50	0 ↔ 10	60 ↔ 75	-15 ↔ -5	30 ↔ 50
TA - BC	-10 ↔ 0	40 ↔ 50	5 ↔ 10	> 70	-5 ↔ 0	50 ↔ 60
BC - SI	< -10	< 40	0 ↔ 5	50 ↔ 70	< 0	< 50
SI - HP	-10 ↔ -5	40 ↔ 50	5 ↔ 10	65 ↔ 75	-10 ↔ -5	45 ↔ 55
	ECD	NTD	ECD	NTD	ECD	NTD
QC - RL	1 ↔ 2	--	1 ↔ 2	-3 ↔ -2	0 ↔ 2	0 ↔ 1
RL - RI	0 ↔ 1	--	0 ↔ 2	-5 ↔ -4	1 ↔ 2	-2 ↔ 0
RI - SA	-1 ↔ 1	--	-1 ↔ 0	-5 ↔ -4	-2 ↔ 2	-2 ↔ 0
SA - GA	-1 ↔ 1	--	-1 ↔ 1	--	-1 ↔ 1	--
GA - RE	-1 ↔ 0	--	0 ↔ 2	-6 ↔ -5	-2 ↔ 1	-3 ↔ -4
QC - TA	1 ↔ 2	--	1 ↔ 3	-5 ↔ -4	1 ↔ 3	-3 ↔ -2
SS - CH	1 ↔ 5	--	-3 ↔ 3	-5 ↔ -4	2 ↔ 4	-3 ↔ -2
CH - TA	-2 ↔ 4	--	0 ↔ 3	-5 ↔ -4	0 ↔ 3	-2 ↔ 0
TA - BC	-2 ↔ 0	--	0 ↔ 2	-5 ↔ -4	0 ↔ 2	-3 ↔ -2
BC - SI	--	--	0 ↔ 3	-5 ↔ -4	0 ↔ 2	-3 ↔ -1
SI - HP	-1 ↔ 1	--	-1 ↔ 1	-5 ↔ -4	-1 ↔ 1	-3 ↔ -1

Table 3: Summary of Loran-C Measurements - Northeast U.S. Chain (9960). Using a Megapulse Accufix 520 Loran-C Receiver. SNR & FS in dB. ECD & NTD in ms.

The ECD variations are similar to those observed on the East Coast Canada Chain transmitters.

The NTD variations within the 200 kilometre road segments reach 3 ms in the Gaspé Peninsula. The reasons are likely the same as for the corresponding variations observed on the East Coast Canada Chain.

<u>Labrador Sea Chain (GRI 7930)</u>:
Only M (Fox Harbour) and W (Cape Race) could be observed around the Gaspé Peninsula. No direct measure of the SNR is available on the SeaTex receiver. Instead, a good/poor signal reception indicator was used. The results obtained for M and W are generally consistent with those obtained on Z and Y on the East Coast Canada Chain, respectively. These are the same transmitters. The use of this single TD measurement from the Labrador Sea Chain in the Gaspé Peninsula would require the use of a multi-chain receiver and result in only marginal improvements since there would be no gain in geometry.

Section of Road	7930 - M		7930 - W		
	SNR	FS	SNR	FS	NTD
QC - RL	--	--	--	--	--
RL - RI	--	--	--	--	--
RI - SA	OK most of the time.				--
SA - GA	OK	OK	OK	OK	0 ↔ 1
GA - CD	OK	OK	OK	OK	-1 ↔ 0
CD - RE	--	--	--	--	--
QC - TA	--	--	--	--	--
SS - CH	--	--	--	--	--
CH - TA	--	--	--	--	--
TA - BC	--	--	--	--	--
BC - SI	--	--	--	--	--
SI - HP	OK most of the time.				--

Table 4: Summary of Loran-C Measurements - Labrador Sea Chain (GRI 7930).
Using a SeaTex Loran-C Receiver

Conclusions
The method presented herein is effective to collect the data required for the analysis and calibration of Loran-C signals over large areas. A preliminary analysis of the results collected over some 1800 kilometres of road in the Lower St. Lawrence region during March 1991 revealed a fairly constant signal availability along the roads measured and significant TD distortions in many areas, presumably due to the effect of the additional secondary phase factor.

Another field observation campaign was conducted in the summer of 1991 along the same shore roads and in the St. Lawrence River, from Québec City down to Anticosti Island. These results are currently being assessed to determine if the higher atmospheric noise predicted for summer limits signal reception in the area. Seasonal differences in the measured TDs and related effects on Loran-C derived positions are also being assessed.

Different models for the combined effects of the secondary and additional secondary factors are being tested to determine their level of agreement with the TD distortions observed in the area. The effects of the residual distortions on the Loran-C positions are being analysed. Two-dimensional modelling of these residual distortions is being investigated to determine how the absolute accuracy of Loran-C positions could be improved through such a calibration process. Various combinations of transmitters are being tested to determine the potential advantages of using multi-chain versus single-chain receivers.

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About the Authors

Brian Townsend has a BSc in Surveying Engineering from the University of Calgary and is currently completing his MSc on "Calibration of LORAN-C Using GPS". Dr. Gerard Lachapelle P. Eng, CLS, is a professor of Surveying Engineering at the University of Calgary, involved in hydrographic surveying, LORAN-C and GPS navigation. He has been involved in GPS research and development for the past twelve years and LORAN-C for two years. Denis Hains has a BSc from Laval University and is currently the Director of Hydrography in the Canadian Hydrographic Service (Québec Region).

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Lighthouse Puzzler / Casse-tête du Lighthouse

by
Beth Weller

The CHA Central Branch Heritage Launch Project is progressing well and a group of interested dignitaries is touring the construction site at Toronto's Harbourfront. Four CHA volunteers (one of them is from Grimsby, Ontario) are busy working on the launch. This is a replica of the boat used by Joseph Bouchette to survey Toronto Harbour in 1792.

From the rather rambling descriptions given by the guide, can you figure out who is doing what?

The clues:

1. The Student, not Terese, is from Ottawa.
2. The man from New Zealand was not picking oakum, nor is he the student.
3. Jennifer; the person from Edinburgh; the woman sawing timber; and the International Member were working together for the first time.
4. The person rigging the mast is not the hydrographer or from Edinburgh.
5. Andrew was sewing canvas but is not from New Zealand.
6. The cartographer has never been overseas.

Andrew, the ______________________, from ________________ was ___________________________
Jennifer, the ______________________, from ________________ was ___________________________
Ken, the ______________________, from ________________ was ___________________________
Terese, the ______________________, from ________________ was ___________________________

	Hydrographer	Int'l Member	Student	Cartographer	Sewing Canvas	Rigging the Mast	Picking Oakum	Sawing Timber	New Zealand	Edinburgh	Ottawa	Grimsby
Andrew												
Jennifer												
Ken												
Terese												
New Zealand												
Edinburgh												
Ottawa												
Grimsby												
Sewing Canvas												
Rigging the Mast												
Picking Oakum												
Sawing Timber												

Solution to Fall Puzzler

Geomatics is on Monday (Clue 1). The Friday lecturer is not George (Clue 2), Bernard (Clue 3), Frank (Clue 4) or Keith (Clue 6) so must be Carol. The Friday seminar is not Photogrammetry (Clue 5) so DeskTop Publishing, Frank's seminar, and Photogrammetry must be on Tuesday, Wednesday and Thursday respectively (Clue 4). The Friday seminar is not on Range Positioning (Clue 6) so it is Hydrography of the Future, and Frank's Wednesday seminar is on Range Positioning. Keith's seminar is on Geomatics on Monday (Clue 6). Carol's locale is Hotel Chimo (Clue 5). Frank, who lectures on Range Positioning, was not at the Rose and Crown or on the Parizeau or at the Institut Maritime so he lectured at the Maritime Museum. Keith was not on the Parizeau or at the Institut Maritime so he must have been at the Rose and Crown. Bernard's seminar is earlier in the week than the seminar at Institut Maritime (Clue 3) so Bernard must be lecturing on DeskTop Publishing on Tuesday. By elimination, George must have his Thursday seminar on Photogrammetry at the Institut Maritime, and Bernard's seminar is on the Parizeau.

THE CANADIAN HYDROGRAPHIC SERVICE

and

THE CANADIAN INSTITUTE OF SURVEYING AND MAPPING

Invite you to the

1993 SURVEYING AND MAPPING CONFERENCE

LE SERVICE HYDROGRAPHIQUE DU CANADA

et

L'ASSOCIATION CANADIENNE DES SCIENCES GEOMATIQUES

vous invite à la

CONFERENCE DES SCIENCES GEOMATIQUES 1993

TORONTO, CANADA JUNE 8-11 JUIN, 1993

The conference theme "Celebrating Our Heritage, Charting Our Future" *will allow in-depth discussions on tomorrow's predictions, today's advances and yesterday's achievements, and will feature the culmination of the year-long authentic construction and in-conference demonstration of a 1792 vintage sounding launch.*

National and international authors *are currently being invited to present papers on hydrography and related survey disciplines at plenary, concurrent and poster sessions.*

Look for new opportunities at the exhibition *of latest equipment and services by companies from surveying and related disciplines.*

The classic Royal York Hotel *in downtown Toronto will be your host. Enjoy the comfort of the hotel's modern facilities, just a short walk or ride from a wide variety of entertainment, restaurants, dinner theatre or a Blue Jays baseball game at the SkyDome.*

Renew old friendships and make new contacts *at a variety of social events. Luncheon and evening events are planned to ensure an unforgettable experience.*

The annual general meetings *of the Canadian Institute of Surveying and Mapping and the Canadian Hydrographic Association will be held during the conference.*

Le thème de la conférence "Fêtons notre héritage, traçons l'avenir" *assurera des discussions sur les prédictions de demain, les progressions d'aujourd'hui et les succès d'hier, incluant le résultat de la construction d'un bateau de levé authentique de l'époque 1792, de même qu'une démonstration hydrographique des années passées.*

Des auteurs nationaux et internationaux *seront demandés de présenter des exposés hydrographiques et sciences connexes à des sessions d'affichage, plénières, et concurrentes.*

Des expositions de compagnies commerciales *seront de la partie; ceux-ci identifieront leurs derniers services et nouvelles techniques offertes par rapport aux levés et sciences connexes.*

L'hôtel "Royal York" *localisé au centre ville de Toronto est l'hébergement officiel de la conférence. Profitez du confort et des facilités modernes de cet hôtel situé à quelques minutes de marche d'une variété de divertissements, restaurants, théatres ou partie de balle au SkyDome avec les "Blue Jays".*

Renouvelez d'anciennes amitiés et profitez de nouvelles relations *par une variété d'engagements sociaux. Les déjeuners et les diners sont organisés afin d'assurer une visite mémorable.*

La rencontre annuelle *de l'Association canadiennes des sciences géomatiques et l'Association canadienne d'hydrographie aura lieu lors de cette conférence.*

FOR MORE INFORMATION ABOUT ATTENDING, PRESENTING PAPERS, EXHIBITING EQUIPMENT AND SERVICES, AND OTHER CONFERENCE DETAILS, CONTACT:

POUR PLUS D'INFORMATION CONCERNANT PARTICIPATION, PRESENTATION, EXHIBITION D'EQUIPMENT OU SERVICE, ET AUTRES DETAILS DE LA CONFERENCE CONTACTEZ:

1993 Surveying and Mapping **CONFERENCE** des Sciences Géomatiques, 1993
P.O. Box 186, Station Q, Toronto, Canada, M4T 2M1
Phone (416) 336-4812 / FAX (416) 336-8916

Coming Events / Événements à venir

The 1992 Canadian Institute of Surveying and Mapping (CISM) 85th Annual Meeting

The CISM 85th Annual Meeting will be held in Whitehorse, Yukon from June 23 to 26, 1992. The theme of this meeting will be *"Surveying and Mapping the New Age"*.

The conference will be preceded by the Association of Canada Lands Surveyors (ACLS) Seminar Series June 21 and 22. These will be followed by the ACLS Annual Meeting, CISM icebreaker and midnight sun golf tournament on June 23. Other entertainment highlights include an 1898 Klondike theme casino night and the President's Salmon BBQ with a 1940's style Big Band.

For further infromation, contact:
Miss Debra Ryan, Conference Coordinator, CISM 92
P.O. Box 3937
Whitehorse, Yukon
Canada Y1A 5M6
Telephone: (403) 668-6039
Fax: (403) 668-3421

XVII Congress of the International Society for Photogrammetry and Remote Sensing (ISPRS)

The ISPRS Congress will be held in Washington, D.C. from August 2 to 14, 1992. This quadrennial event is hosted by the American Society of Photogrammetry and Remote Sensing for the first time in forty years.

The XVIII ISPRS Congress will showcase the latest science and technology for monitoring, analyzing, and understanding the world we live in.

(see the advertisement on page 19)

27th International Geographical Congress

The U. S. National Committee of the International Geographical Union announces that the 27th Congress of the International Geographical Union and General Assembly will be held in Washington, D.C. from August 9 to 14, 1992. The theme of the congress is "Geography is Discovery".

For further information write to:
The 27th IGU Congress Secretariat,
1145 17th Street, NW,
Washington, D.C.
20036 USA

HYDRO '92

The Eighth Biennial International Symposium of the Hydrographic Society will be held November 30 to December 3, 1992, in Copenhagen, Denmark. The symposium is co-sponsored by the International Hydrographic Organization and the International Federation of Surveyors, Commission 4, Hydrographic Surveying.

The HYDRO '92 Symposium will have a variety of papers on subjects related to hydrographic surveys for offshore operations, seabed exploration and navigation.

For further information, contact:
International Conference Services
P.O. Box 41
Strandvejen 171
DK-2900 Hellerup, Copenhagen, Denmark
Telephone: +45 + 3161 2195
Telefax: +45 + 3161 2068

Canadian Conference on GIS

The Fifth International Conference on Geographic Information Systmes will be held in Ottawa, Canada from March 23 to 25, 1993. This conference is organized by the Surveys, Mapping and Remote Sensing Sector of Energy, Mines and Resources Canada, in cooperation with the CISM and The Inter-Agency Committee on Geomatics.

Conference paper themes include Management Issues, Applications and Case Studies, Technology Issues, and Education and Training. The deadline for abstracts is August 20, 1992.

For further information contact:
Canadian Conference on GIS
GISD, SMRSS, EMR Canada
615 Booth Street
Ottawa, Canada
K1A 0E9
Fax: (613) 952-0916

1993 Surveying and Mapping Conference

The 1993 Surveying and Mapping Conference is jointly sponsored by the Canadian Hydrographic Service and the CISM. This combined conference (Canadian Hydrographic Conference and the CISM 86th Annual Meeting) will be held at the Royal York Hotel in Toronto, Ontario from June 8 to 11, 1993.

The conference theme is *"Celebrating Our Heritage, Charting Our Future"*. National and international technical papers on hydrography and other survey disciplines will be presented in plenary and concurrent sessions. The Royal York Hotel is just a short walk from a wide variety of restaurants, entertainment and the SkyDome (home of the Toronto Blue Jays).

A number of daytime and evening social events are scheduled.

For further information, contact:
1993 Surveying and Mapping Conference
P.O. Box 186, Station Q,
Toronto, Canada
M4T 2M1
Telephone: (416) 336-4812 (Burlington)
Fax: (416) 336-8916 (Burlington)

(see advertisement on page 46)

Canadian Hydrographic Association / Association canadienne d'hydrographie

The **Canadian Hydrographic Association (CHA)** is a non-profit, scientific and technical group of about 500 members with the objectives of:

- advancing the development of hydrography, marine cartography and associated activities in Canada
- furthering the knowledge and professional development of its members
- enhancing and demonstrating the public needs for hydrography
- assisting in the development of hydrographic sciences in the developing countries

It is the only national hydrographic organization in Canada. It embraces the disciplines of:

- hydrographic surveying
- marine cartography
- marine geodesy
- offshore exploration
- tidal and tidal current studies

The Canadian Hydrographic Association is formally affiliated with the Canadian Institute of Surveying and Mapping. It is informally associated with the Hydrographic Society.

<u>What the CHA Can Do For You</u>

- advance your knowledge of hydrography, cartography and associated disciplines and keep you abreast of the latest development in these disciplines;
- enable you to develop and maintain contacts with others involved with hydrography, nationally and internationally.

These benefits are provided through the publication of LIGHTHOUSE (one of only three journals in the world devoted exclusively to hydrography), through the sponsorship of seminars, colloquiums, training programs, national conferences and branch and national meeting.

<u>Lighthouse</u>
The journal of the Canadian Association, LIGHTHOUSE, is published twice yearly and distributed free to its members. Timely scientific, technical and non-technical papers and articles appear in the journal with authors from national and international academia, industry and government. Present circulation of LIGHTHOUSE is approximately 900.

<u>Membership</u>
Membership is open to all hydrographers, those working in associated disciplines, and those interested in hydrography and marine cartography.

<u>Branch & Regional Activities</u>
The Canadian Hydrographic Association has eight (8) branches located across Canada. National headquarters is located in Ottawa.

For further information write to:

National President
Canadian Hydrographic Association
P.O. Box 5378, Station F
Ottawa, Ontario
Canada
K2C 3J1

L'Association canadienne d'hydrographie (ACH) est un organisme sans but lucratif réunissant un groupe scientifique et technique de plus de 500 membres ayant des objectifs communs, comme:

- faire progresser le développement de l'hydrographie, de la cartographie marine et de leurs sphères d'activités au Canada
- permettre les échanges d'idées et le développement professionel de ses membres
- rehausser et démontrer l'importance de l'hydrographie auprès de public
- assister au développement des sciences de l'hydrographie dans les pays en voie de développement

Au Canada, l'Association est la seule organisation hydrographique qui embrasse les disciplines suivantes:

- levé hydrographique
- cartographie marine
- géodésie marine
- exploration extra-côtière
- étude des marées et courants

L'Association canadienne d'hydrographie est affiliée à l'Association canadienne des sciences géodésiques et cartographiques, et non-officiellement liée à la Societée de l'hydrographie.

<u>Ce qu'elle peut faire pour vous</u>
L'ACH vous offre des avantages tels que:

- parfaire vos connaissances de l'hydrographie, de la cartographies et des disciplines connexes, tout en vous tenant au courant des nouvelles techniques et des derniers développements réalisés dans ces domaines;

- établir et maintenir des contacts avec ceux qui oeuvrent en hydrographie, au niveau national et international.

Ces avantages sont transmis par l'entremise de LIGHTHOUSE (une des trois revues au monde traitant exclusivement d'hydrographie) et par la tenue de séminaires, de colloques, de programmes de formation et d'assemblées régionales et nationales.

<u>Lighthouse</u>
La revue de l'Association canadienne d'hydrographie. LIGHTHOUSE, est publiée deux fois l'an et distribuée gratuitement aux membres. Des articles scientifiques, techniques et non techniques, provenant du milieu de l'industries ou du gouvernement autant national qu'international, apparaissent dans cette revue. Le tirage actuel de la revue est d'environ 900 copies.

<u>Comment devenir membre</u>
Le statut de membre est offert aux hydrographes et à tout ceux oeuvrant ou ayant un intérêt dans des disciplines associées à hydrographie ou à la cartographie marine.

<u>Sections et activités régionales</u>
L'Association canadienne d'hydrographie possède huit (8) sections à travers le Canada. L'administration central se trouve à Ottawa.

Pour plus d'informations, s'adresser au:

Président national
Association canadienne d'hydrographie
C.P. 5378, station F
Ottawa, Ontario
Canada
K2C 3J1

Sustaining Members / Membres de soutien

In 1987 the CHA defined a new form of membership to allow companies, closely linked with the hydrographic field, to become more involved with the activities of the CHA and to maintain closer contact with users of their products. Through LIGHTHOUSE these Sustaining Members are also able to reach a world-wide audience of people involved with hydrographic work. The benefits of Sustaining Membership include:

- a certificate suitable for framing;
- three copies of each issue of Lighthouse;
- copies of the local Branch newsletters, where available;
- invitation to participate in CHA seminars;
- an annual listing in Lighthouse;
- an annual 250 word description in Lighthouse; and
- discounted advertising rates in Lighthouse.

The annual dues for Sustaining Membership in the CHA are $150.00 (Canadian).

Current Sustaining Members are listed below.

Aanderaa Instruments Ltd.
4243 Glanford Avenue
Victoria, British Columbia
Canada V8Z 4B9
contact: Gail Gabel

ATLAS ELEKTRONIK
1075 Central Avenue,
Clark, New Jersey,
USA 07066
contact: Karl Wm. Kieninger

EG&G Marine Instruments
P.O. Box 498,
1140 Route 28A,
Cataumet, Ma,
USA 02534
contact: Paul Igo

Garde Côtière canadienne
104 rue Dalhousie, Suite 311,
Québec, Québec,
G1K 4B8
contact: Claude Duval

l'Institut maritime du Québec
53 St-Germain Ouest,
Rimouski, Québec,
G5L 4B4
contact: Claude Jean

Quester Tangent Corporation
9865 West Saanich Road,
Sidney, British Columbia
V8L 3S3
contact: John Watt

Racal Positioning Systems Ltd.
118 Burlington Rd.,
New Malden, Surrey, U.K.
KT3 4NR
contact: Paul Deslandes

SIMRAD Mesotech Systems Ltd.
202 Brownlow Avenue
Dartmouth, Nova Scotia
B3B 1T5
contact John Gillis

SURNAV Corporation
89 Auriga Drive,
Nepean, Ontario,
K2E 7V2
Contact: Harold Tolton

terra surveys ltd.
1962 Mills Road,
Sidney, British Columbia,
V8L 3S1
contact: Rick Quinn

Sustaining members of CHA are offered space in Lighthouse each year for a 250-word description of their services.

SIMRAD Mesotech Systems Ltd.

SIMRAD Mesotech, of Dartmouth, Nova Scotia is a new Sustaining Member, with Central Branch.

ATLAS ELEKTRONIK

Krupp Atlas Elektronic announces that it has changed its name to Atlas Elektronik as a result of a merger with Bremer Vulkan. Their address remains the same as listed.

Quester Tangent Corporation

Quester Tangent Corporation is pleased to announce exciting additions to their management team. Dr. Robert Inkster has been named Chief Executive Officer and Mr. John Neville will become Chairman of the Board. Rob Inkster, with a strong background in airborne and spaceborne remote sensing and in technical management, comes to Quester Tangent from Intera Information Technologies of Calgary where he was Vice-President, Business Development. John Neville, who brings to Quester Tangent an extensive background in finance, shipping and technology, was formerly the Senior

Vice-President at SPAR Aerospace. Within this augmented management team, John Watt will retain responsibility for marketing and business development and Paul Lacroix will manage technology development.

The first ISAH system to be delivered to China will be shipped in early April to the Ministry of Geology (MOG). In addition to operating with positioning and depth sensors, this MOG ISAH system has been interfaced to a gradiometer (magnetometer), a gravimeter and a seismic system.

During the first quarter of 1992, four ISAH-HYPS software licenses were delivered to the Canadian Hydrographic Service (CHS), Scotia-Fundy for operation on Sun SPARC stations. The HYPS data processing systems will be used to validate and edit position and depth data prior to down loading to CHS HIPP systems operating on Micro-Vax computers. Systems level training on HYPS was provided to CHS personnel during March with operator training to be provided at the Bedford Institute of Oceanography in early April.

In another business area, Quester Tangent has recently won a contract to develop and supply custom navigation displays for use aboard Canadian Navy submarines.

l'Institut maritime du Québec

l'Institut maritime du Québec et l'A.C.H., Section du Québec - Un dynamisme qui ne se dément pas

Depuis quelques années, la Section du Québec de l'Association canadienne d'hydrographie fait preuve d'un dynamisme remarquable. Parmi ses récentes activités, on peut souligner sa participation à la Conférence hydrographique du Canada, tenue à Rimouski en avril 1991, sa participation à différentes activités de promotion, la production et la distribution d'une publication promotionnelle, le Carnet de bord.

Ce dynamisme n'existerait pas sans bien sur la qualité des ressources humaines dont les dirigeants savent s'entourer mais aussi des collaborations dont ils savent s'assurer. Par exemple, à Rimouski, l'Institut maritime du Québec met à la disposition de l'Association un vaste local et un ameublement. Ceci facilité, entre autres, le maintien d'une permanence et la réalisation de projets d'envergure.

Les liens qui existent entre l'Association et l'Institut remontent à plusieurs années mais ils se sont amplifiés depuis que cet établissement d'enseignement collégial est autorisé par le ministère de l'Enseignement supérieur et de la Science du Québec à offrir différents cours de spécialisation ou de perfectionnement en hydrographie aux personnes oeuvrant en géodésie, en cartographie, en géographie, en géomatique ou en océanographie. Ces cours ont été élaborés de manière à répondre aux normes de l'Organisation hydrographique internationale (O.H.I.) et ont été soumis pour homologation en levés de cartographie marine.

Fondé à Rimouski en 1944, l'Institut maritime du Québec est le plus important centre de formation maritime au Canada. Traditionnellement, l'Institut forme une main-d'oeuvre compétente dans quatre champs de spécialisation, l'architecture navale, la navigation, le génie mécanique de marine, la radiocommunication et l'électronique maritime. L'Institut assure aussi une formation reconnue en mesures d'urgence en mer et répond aux besoins de perfectionnement du personnel de l'industrie maritime canadienne. Depuis le milieu des années 1980, l'Institut étend sa mission à tous les domaines reliés à la mer: l'hydrographie, la plongée avec scaphandre, la plaisance et la logistique du transport intermodal international. L'excellence de ses enseignements est reconnue jusqu'au plan international.

Le soutien et les collaborations que la Section du Québec de l'Association canadienne d'hydrographie suscite et entretient sont prometteurs pour son développement.

terra surveys ltd.

Lidar Projects

Processing is complete for the 1991 LARSEN survey of Lake Huron. Nine field sheets at 1:20,000 were produced. A smaller project, along the shore of Lake Michigan, flown for the National Oceanic and Atmospheric Administration (NOAA) in 1991, has been delivered. Positioning for both projects was achieved through differential GPS, using Terra's in-house developed UHF radio link. For the first time spectral imagery (CASI) was collected concurrently with LIDAR data for part of the Lake Huron Project.

Conventional Surveys

Many large scale sub-bottom and bathymetric projects were completed throughout the winter. Work sites were in Howe Sound, Nile Creek, near Texada Island and Bella Coola (one of which was arrived at without the most basic of survey equipment - a tripod). 'It wasn't me — Jim'. (note: A tripod hasn't moved that fast since the Tom Rowsel - Loks Land incident of 1988.). Also, a bathymetric project was completed for Ontario Hydro in Niagara Falls, Ontario.

Developments

The use of scanners has been implemented to broaden our digitizing capability. Hui Ping Wang in cooperation with Terry Curran (Institute of Ocean Sciences) has completed an analysis of frequency contents of LIDAR returns to establish a suitable sampling rate for a future waveform digitizer. Paul Conrad is continuing work on the second generation LIDAR recording system.

Aanderaa Instruments Ltd.

Aanderaa Instruments (Canada) is pleased to announce the opening of its new facility at 4243 Glanford Avenue in Victoria, British Columbia, Canada. The new building has been specifically designed to better serve customer's needs and includes an expanded service and support capability. As part of the service group, Aanderaa's test and calibration group will be expanded to meet growing requirements in the oceanographic and marine instrument market.

Aanderaa's product line has grown to include a full range of oceanographic and meteorological instrumentation such as current meters, water level recorders, CTD sensors, temperature profilers, data loggers and complete weather monitoring systems. The company continues to market precision acoustic positioning systems from Nautronix.

A recent addition to product line is the SEA Hydro Ultravision camera. This camera is a modular intensified CDD product that can be adapted to a wide variety of sub-sea applications.

News from Industry / Nouvelles de l'industrie

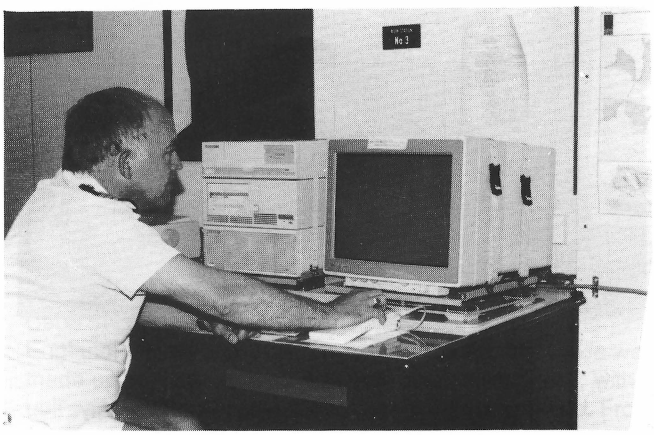
Racal Positioning Systems Ltd.

Racal Positioning Systems Ltd.Racal Positioning Systems Ltd., New Malden, Surrey, UK, report that their Racal System 960 development project for the Hydrographic Branch of the Royal New Zealand Navy has been completed. The project was to develop a modern automated hydrographic system to be fitted in RNZN's principal survey ship HMNZS MONOWAI (a 98 m vessel of 3,900 tonnes) and her three survey motor boats as well as in two 27 m Inshore Survey Craft.

The Project became known as HADLAPS (Hydrographic Automated Data Logging And Processing System) and is based around Hewlett Packard Series 9000 model 360 workstations.

HADLAPS moved smoothly through factory trials and installation. After successful sea trials in November, the HADLAPS system was accepted and a training program set up for RNZN officers.

Thanks to the good offices of the Royal New Zealand Navy, the MONOWAI was at the Second Australasian Hydrographic Symposium, held in December 1991 at the University of New South Wales, Sydney, Australia.



CHA Member Commander Larry Robbins RNZN demonstrating a HADLAPS workstation in the survey chartroom of HMNZS Monowai.

Canadian Hydrographic Service (CHS)

The Canadian Public Review Panel on Tanker Safety and Marine Spills Response Capability, chaired by Mr. D. Brander-Smith, identified spill prevention as the highest priority for protecting the coastal and marine environment. This panel recommended that *"in order to reduce the risks of accidents the Canadian Hydrographic Service: Expedite development of electronic charting technology and the required infrastructure, then introduce regulations requiring the use of electronic charts on all tankers in Canadian waters."*

On June 26, 1991 the Ministers of Transport, Environment and Fisheries & Oceans announced a commitment of $100M for a New Marine Environmental Emergencies Response Strategy. This Strategy specifically calls for *"the development of a new electronic navigation chart capability that can alert ships to possible groundings or collisions".*

CHS is responding to this via four projects.

1. The Electronic Chart Demonstration Project: to place a number of Electronic Chart systems onto ships (including tankers) operating in specific sections of Canadian waters. The project will promote the use of this technology as an inexpensive method for the prevention of oil spills.

2. The Electronic Navigation Chart Data Base Program: to develop the required infrastructure (resources, procedures, expertise...) needed to support the creation, certification and distribution of electronic navigation charts (ENC) in Canadian waters. In the longer term, the knowledge and skills gained from this program will facilitate the development and implementation of an information network that will permit CHS to conduct its business.

3. The IMO/IHO Standardization Project: to ensure that all CHS work conforms to international standards. Since this area is so new, the standards themselves are provisional and the project will further the advance and implementation of them.

4. The Industrial Partnership Program: to involve Canadian industry in the development of this new technology and to ensure that Canadian companies are well positioned to take advantage of any international business oportunities arising from the need to create Electronic Chart products worldwide.

CHS Pacific Region

<u>Tides and Currents</u>

A scheduled January 1992 cruise to Hecate Strait and Dixon Entrance to service current meters and collect CTD data was changed suddenly to December 1991. Despite the short notice, data was collected aboard this, the last cruise of the 'Parizeau', before her departure for the east coast.

In March, Mike Woodward's field party recovered and serviced a current meter, in operation since June 1991, at Heikish Narrows. The data collected by this instrument will be used, along with other measurements to be taken in 1992, to improve the current predictions for Heikish Narrows in the Tide and Current Tables (Volume 6).

Channel Consulting has been contracted to do a reschematization of the Fraser River model. The work is scheduled to be completed by March 31st.

<u>Field Hydrography</u>

The 'Pender', with Hydrographer-in-Charge (HIC) Kal Czotter, will carry out surveys in Tahsis Inlet and the approaches to Nootka Sound. Assisting will be hydrographers

K. Halcro (2nd-in-Charge - 2IC), D. Cartwright and M. Ward together with Cartographers R. Bell, B. Tuck, G. Whincup and B. Wingerter. A second group of Cartographers, consisting of A. Philp, L. Pickell and P. Dew, are to join them in July with a third group, A. Schofield and A. Lyon, arriving in September.

The 'R. B. Young', with HIC, Peter Milner, will be surveying both the Queens Sound and Wales Island areas. Assisting will be hydrographers K. Lyngberg (2IC), D. Thornhill, J. Wilcox and D. Popejoy; and cartographers R. Korhonen, H. Pfluger, G. Kidson and B. Wingerter. Due to budget cuts, the 'R. B. Young' survey will be cut short, returning August 31st.

Local Surveys will be carried out by HIC, Vern Crowley, with assistance from R. Woolley.

Continuing the CHS/NOAA exchange program, NOAA officer, Lt. David Cole will join the 'R. B. Young' on June 17th. J. Lawson and G. Schlagintweit are scheduled to join the NOAA ship 'Rainer' in June and September respectively. They will spend approximately two months each in the Anchorage and Prince William Sound areas.

Barry Lusk is HIC of the Western Arctic surveys of Dolphin and Union Straits, Victoria Passage and Icebreaker Channel. Assisting are R. Woolley and D. Thornhill. They will join the Canadian Coast Guard Ship (CCGS) 'Norman McLeod Rogers' and carry out ground-truthing of Larsen Lidar data, track sounding and shoal examinations, utilizing GPS.

Training and Revisory, with HIC, Alex Raymond and assisted by G. Schlagintweit and J. Lawson is being carried out in the Sidney area. Revisory surveys are scheduled for Howe Sound and Nanaimo, together with a revisory of the 1987 Vancouver Harbour digital field sheet.

Mike Woods is HIC of the Data Management Section; projects include the recovery of Beaufort Sea digital data collected in the eighties, being compiled to provide full bathymetric detail, the investigation of the Provinces' digital topographic mapping (TRIM) as an additional source of data for charting, the digitization, for chart production purposes, of several hand drawn field sheets and the NAD83 readjustment. Assisting are G. Richardson, F. Coldham and J. Larkin, with additional assistance by C. Nowak, M. Ward and D. Popejoy.

G. Eaton and R. Hare are assigned to the GPS/Electronic Chart group. George has attended meetings for the database/electronic chart and the development working group for GPS and aerial hydrography. Rob has been carrying out differential GPS testing of the Magnavox MX4200D together with ISAH. These tests are part of a combined CCGS, CHS, BCIT and Provincial Government project for the establishment of a differential GPS system for the coast of BC. A series of launch tests for the Ashtech 3DF attitude-sensing GPS and the Nov Atel GPS are scheduled in July with Dr. Gerard Lachapelle.

<u>Chart Production</u>
Chart releases included three New Charts, fourteen New Editions, one Rerun and twelve Overprints. The three New Charts are a continuation of the approved New Chart scheme and include the waters of Smith Sound and Rivers Inlet. These charts represent complete digital chart files with the exception of text.

The New Editions include ten strip charts of the Mackenzie River. The Rerun was a reprinting of the previous edition of Chart 3310 was necessitated by the combination of a high volume of sales for this chart and a half on production of the planned new Cruising Atlas of the Gulf Islands.

Chart Production has four new employees; Chris Gibb, Judy Root, John Bertrand and Tim Chad.

A successful display was put on at the Vancouver International Boat Show. Featured was the 1991 Fraser River survey. An excellent display, designed by M. Ward (Hydrography) featured an interactive hydrographic launch. This display has been requested by the Vancouver Maritime Museum, for the Captain Vancouver Bicentennial. The overall display was presented with the assistance of the following; D. Fisher, J. Yee, E. Sargent, G. Schlagintweit, G. Richardson, J. Larkin, F. Stephenson, D. Sinnot, A. Thomson and G. Green under the guidance of both the Regional Chart Superintendent, W.S. Crowther and the Regional Field Superintendent, A. R. Mortimer.

Vancouver International Boat Show
J. Larkin demonstrating the Interactive Launch Display.

CHS - Central and Arctic Region
<u>Chart Production</u>
New charts completed in1991/1992:

Chart	Area/Title	Scale
2048	Port Credit	1: 5,000
2055	Frenchmans Bay	1: 10,000
2165	Wheatley Harbour	1: 4,000

New Editions completed in 1991/1992:

Chart	Area/Title	Scale
1439	Upper St. Lawrence River	1: 30,000
2122	Lake Erie - Central Portion	1: 100,000
2225	Approaches to Parry Sound	1: 20,000
2226	Parry Sound	1: 6,000
5620	Chesterfield Inlet	1: 40,000
5622	Chesterfield Inlet	1: 40,000
5623	Chesterfield Inlet	1: 40,000

Chart Production has three new hydrographers: Peter Wills (Bachelor of Environmental Studies - Honours Geography - University of Waterloo); Michael Johnston (Bachelor of Environmental Studies - Honours Geography - University of Waterloo); and Paola Travaglini (Bachelor of Science - Survey Science - University of Toronto, Erindale).

Eleven Chart Production hydrographers are currently completing a CHS Practical Hydrographic Survey training course in Burlington. Many of these hydrographers will continue with on-the-job hydrographic survey training throughout the remainder of 1992.

CHS - Atlantic

ECDIS Colours and Symbols Workshop (by R.M. Eaton)
Because sea-tests of ECDIS are few and far between, and a well founded set of colours and symbols is urgently needed, the Canadian Hydrographic Service recently funded a 4-week ECDIS Presentation Workshop organized by Mike Eaton of the IHO Colours and Symbols Working Group, in conjunction with CIRM (for IMO).

The aim was to check out the colours of vital chart features such as the safety, contour, traffic routing, etc., and ensure they are in harmony with navigation symbols such as ship symbol, planned route, radar image/synthetics. 7Cs Gmbh of Hamburg was contracted to provide an ECDIS paintshop to go with their extensive North Sea database for use in developing proposals and testing them ashore. This was followed by sea-tests on the Hamburg-Harwich ferry, using the flexible SUSAN prototype ECDIS. In addition, Atlas Elektronik contributed their new radar with chart over/underlay capability.

Workshop participants included Hydrographic Office representatives, German, Norwegian, UK and U.S. industry, Human perception Institutes, etc. Mariners from three German shipping lines evaluated proposed schemes on shore and at sea. The outcome is a provisional colour and symbol set that has been verified at sea, and should not need further major changes in the main items.

Communications and Measurement Technologies Ltd.

Portable differential GPS systems which bring a new flexibility to high accuracy offshore positioning operations have been introduced by Communications and Measurement Technologies Ltd. (CMT), United Kingdom.

Differential GPS can improve the 100 metre accuracy of the standard satellite-based Global Positioning System to typically, five metres. CMT's MTS2000 is a range of portable or permanent land-based reference stations which transmit correction information to a vessel-mounted demodulator which in turn automatically applies it to the vessel's GPS receiver.

Main applications for the MTS 2000 are in offshore surveys to support oil and gas operations and in hydrographic and oceanographic research. There are various hardware and software configurations ranging from stand-alone demodulators to fully racked systems with built-in GPS receivers but in all cases the system integration and packaging has been designed to ensure portability.

For semi-permanent installations a 25 metre radiating mast antenna gives ranges of over 500 kilometres; a portable 10 metre whip antenna is available for 200 kilometre ranges.

Two versions of the reference station are available. In one, RTCM SC104 format differential corrections may be generated by the GPS receiver itself. The second version has an integral 386SX laptop computer to run RTCM SC104 generation software. This gives flexibility of control of the differential data, including display and logging of all raw data sets.

The mobile equipment also comes in two versions. The first is a portable rack mount enclosure with a 286 laptop computer running a survey grade GPS receiver. The second is a simple combined demodulator and power supply unit. Both are supplied with a sectional 5 metre whip antenna and 50 metres of cable.

CMT supplies the MTS 2000 systems on a sale or rental basis and offers a complete planning and installation service.

Del Norte Technology Inc.

Del Norte Technology Inc., announces the introduction of the new Model 2006 GPS system, the latest addition to Del Norte's GPS product line.

The 2006 is a survey quality, 6-channel, L1 C/A code GPS receiver. With a built-in PC and a rugged splash proof case, the 2006 provides the user with flexible data logging and processing capabilities to meet the most challenging applications. Primarily designed as a Differential GPS mobile station, the 2006 offers unparalleled features and value.

Included with the 2006 system is a built-in LCD display, support for external monitors, six user configurable RS 232 serial ports for flexible communication, internal logging memory on non-volatile RAM, and a 3.5 inch floppy disk drive (1.44 MByte).

The system also includes sophisticated application software for navigation and guidance, helmsman graphics, and user selectable interfaces for a wide range of depth sounders. The complete system is competitively priced at $14,995.00 (US).

In business for over 23 years, all Del Norte products are supported worldwide through 12 service centers and through customer service support available 24 hours a day, 365 days per year.

The Hydrographic Society of America

The Hydrographic Society of America announces that Proceedings of the US Hydrographic Conference 92, the National Ocean Service's fifth biennial international conference held in Baltimore, have been published.

They comprise 35 bound and two loose papers presented by leading domestic and international hydrographic experts. Topics covered include Automated Charting, Coastal Mapping, Tides, GPS, Sonar Systems, Nautical Data, Marine Information, Electronic Chart Display & Information Systems (ECDIS) and the US ECDIS Test Bed Project.

Bound copies of the 240-page publication are available at $35 (US) for North and South American subscribers direct from The Hydrographic Society of America, PO Box 732, Rockville, Maryland 20848-0732, USA (Tel-Fax : 301-4604786). Other subscribers may obtain copies L25 from The Hydrographic Society, Polytechnic of East London, Longbridge Road, Dagenham, Essex RM8 2AS, United Kingdom (Tel : 081-597 1946 Fax : 0811-590 9730).

International Association of Lighthouse Authorities

The International Association of Lighthouse Authorities (IALA) has several publications listed in the IALA Bulletin. The IALA Bulletin is produced quarterly. Requests for information and orders for publications should be addressed to: The IALA Secretariat 20ter, rue Schnapper - 78100 St. Germaine en Laye - France.

Laser Plot Inc.

Global Positioning System technology uses satellites at known positions in space as reference points for determining geographic positions on the earth's surface.

The ChartNav 20/20 systems now offer the option of an internal GPS receiver that supplies data on geographic position to the ChartNav. The ChartNav system then displays a highly accurate vessel position on a full-color image of an actual nautical chart published by a hydrographic agency. These charts are stored on SEA-D, each holding an average of 120 electronic nautical charts. The internal GPS configuration eliminates the requirement to purchase, install and integrate a separate GPS receiver on the vessel.

ECDIS '92 Proceedings

The proceedings are now available from the ECDIS '92 Conference and Exposition held in Baltimore, Maryland, USA, on February 28-29, 1992.

The proceedings from this conference, at a cost of $20.00 US per copy (includes shipping and handling) can be purchased by contacting:

ECDIS '92
P.O. Box 265
Buckeystown, MD 21717, U.S.A.
Telephone / Fax (301) 874-2668

Andrews Hydrographics Ltd.

The days when offshore survey data was gathered in specific formats on dedicated marine systems are rapidly being replaced by the move to more 'customer-oriented' data processing. Today's contractors wish to receive and process their data on standard readily-available computers, such as office PC's, in formats such as IBM and UKOOA.

This philosophy lies behind the development of the Andrews Hydrographics 'NAVBOX' portable data acquisition system. The latest version has IBM-compatible software for logging hydrographic, oceanographic and environmental data.

Data gathered on a NAVBOX can be processed on most office PC's. Where necessary, Andrews can provide specially-formatted data discs to suit the user's requirements for mathemetical modelling or special charting. The lightweight system is suitable for use from small survey launches including ones open to the elements. It incorporates all of the necessary computers, disk drives, a video display printer and interfaces in a robust portable box.

The system is controlled through an operator's keyboard by selecting various menu options. System parameters set by the operator are saved in disk files as they are entered so that the system can be re-started quickly and accurately using the saved parameters on subsequent occasions. The operator can select which input devices to use and when they should be logged to the internal disk drives.

All incoming data is time-tagged to the nearest 0.01 second as it arrives from the various sensors so that subsequent processing of the data can interpolate values at precisely synchronised times.

The control software will accept inputs from a wide range of navigation and sensor systems including GPS, Artemis, Trisponder, Decca MK53, Loran and Microfix. These navigation systems can be fully configured by the operator to allow all or selected readings to be used in the computation of X,Y co-ordinates using selected spheroids and projections or simply logged to disk.

The operator can monitor the quality of the position fixes and the raw data and display them in real time together with the values from any selected incoming sensors. The computed vessel position can be displayed graphically on the video screen or chart plotter at user-selected scales. The headings and distances from selected targets and lines can also be displayed numerically and such targets and lines can be predefined and recalled selectively from computer files.

In addition to logging and time-tagging all raw data, position fixes can be recorded at operator-selected intervals (typically every 10-60 seconds) on the internal disks and printer. The navigation update rate is set at 1 Hz.

Andrews Hydrographics 'NavBox'

CHA News / Nouvelles de l'ACH

Central Branch

The Central Branch Executive for 1992 is:

Vice President	- Sean Hinds
Secretary/Treasurer	- Terese Herron
Past Vice-President	- Sam Weller
Executive Members	- Jim Berry
	- Andrew Leyzack
	- Ken McMillan
	- Brian Power
	- Jennifer Thiel
	- Keith Weaver
Foreign Correspondent	- Larry Robbins

Central Branch has had three evening seminar meetings:

January 15 at Keith Weaver's residence, where Bill Key Jr.,President of Klein Associates Seattle, spoke to us about the use of side scan on the HMS BREADALBANE off the coast of Beachey Island in the Canadian High Arctic.

February 26 at Sam Weller's residence, Lorne Joyce of the Mississauga Historical Society spoke to us about Stone Hookers, who plied the offshore of Lake Ontario in the early 1900's looking for Dundas Shale.

March 18 at Brian Power's residence, Ed Lewis ,Manager Engineering & Technical Services DFO, talked about a network of Arctic communication towers to connect the two-man Fisheries patrol units by VHF and HF radio link to their base of operations.

The Central Branch Annual General Meeting was a great success. We had 40 members and ten guests in attendance. The Mimico Cruising Club provided a relaxing and festive atmosphere for the occasion. Our National President, Dave Pugh entertained us with a slide presentation of his trip to Malaysia.

Central Branch was pleased to assist CHA National and Racal Positioning Systems Ltd.in support of a CHA function organized by Commander Larry Robbins FNI at the Australasian Symposium held in January. Six new International Members joined during the function. Thank you Larry and Racal.

The 21st Annual H_2O Bonspiel was a bash, held once again at the Grimsby Curling Club. The winning rink was Michelle Clarke, Dave Ide, Ted Seager and Andrew Leyzack. Forty-eight curlers participated.

The H_2O Bonspiel is one of the major events of the season for Central Branch members and friends. It owes its success to the valued support of our Sponsors. Over the years a distinguished group of companies have supported this event despite the recent economic climate. Warm and hearty thanks to the following for their support in '92:

Aanderaa Instruments Ltd.	Victoria, B.C.
CHA, Central Branch	Burlington, Ont.
Canadian Hydrographic Service	Burlington, Ont.
E G & G Marine Instruments	Cataumet, MA, USA.
Geodimeter of Canada Ltd.	Toronto, Ont.
J. M. Ellis Ltd.	Metcalfe, Ont.
Klein Associates Inc.	Salem, NH, USA.
Leica Canada Inc.	Willowdale, Ont.
Marshall Macklin Monaghan Ltd.	Don Mills, Ont.
Norman Wade Company Ltd.	Hamilton, Ont.
rapid-grafic	Burlington, Ont.
SURNAV Corporation	Nepean, Ont.
Telefix Canada	Richmond Hill, Ont.
terra surveys ltd.	Ottawa, Ont.

Many thanks also to Bonspiel Coordinator Brian Power for another great spiel.

Central Branch H_2O Bonspiel: Winning Rink
Dave Ide, Michelle Clarke, Ted Seager, Andrew Leyzack

Central Branch H_2O Bonspiel: Second Place Rink
Rob Foster, Sue Foster, Cathy Davies, Tim Davies

The CHA/CB Heritage Launch Project is now underway (see page 31). Central Branch has voted to provide $2000.00 seed money for the Launch Project. The launch will be constructed over the summer and will be ready for the CHS/CISM Conference in June 1993.

New members this year include Chris Gorski (CHS), Mike Lloyd (CHS), Craig Fisher (CHS), Mike Johnston (CHS), Peter Wills (CHS) and Dave Wilson of Electromarine Communicatons. We also have a new sustaining member, John Gillis of Simrad Mesotech. Welcome aboard! Membership to date stands at 41 IN-house, 29 OUT-house.

CHA Central Branch would like to congratulate Larry Robbins and his fiance Jane Hickman on the announcement of their engagement. Wedding bells are also in the air for Mike Johnston and his fiance Gisele Sterling, they will be married July 18, 1992 in Chatham, Ontario and will travel to Banff and Lake Louise for their honeymoon.

Central Branch was pleased to have international member Paul Day of Racal UK stop by the Central Branch office for a visit and lunch on his route home from New Zealand.

Pacific Branch

On the west coast we know when we've got a good thing going and that is our own Carol Nowak. Once more she auspiciously accepted the position of vice-president. The Pacific Branch executive for 1992 is:

Vice-President	-	Carol Nowak
Secretary	-	Rob Hare
Financial/Membership	-	Ken Halcro
Seminars	-	Paul Lacroix
Social	-	Art Lyon
Newsletter/Lighthouse	-	Mike Ward
Past Vice-President	-	George Eaton

Paul Lacroix continues to provide excellent seminars:

Mike Woods presented an in-depth look at the CIDA/CHA education project in Jamaica.

Keith Reed, of the Victoria Maritime Museum gave us a glimpse into the activities and events planned for our future museum. Paul Lacroix presented Keith with a CHA pin and in exchange the CHA acquired a corporate membership in the future Maritime Museum - an excellent window to both our past and future within the maritime sphere.

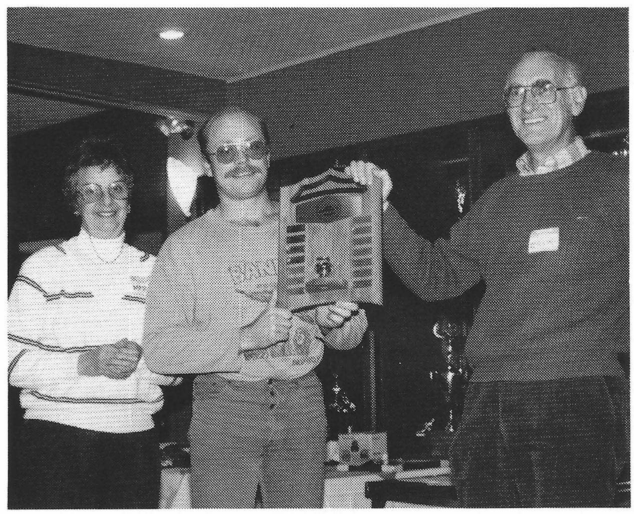
Dr. Larry Mayer, currently a professor and NSERC Chair of Ocean Mapping at the University of New Brunswick presented a fascinating seminar entitled "Ocean Mapping at UNB and the Hydrographic Ground Truthing Experiment". Those who remained after work at IOS were treated to a presentation by Drs. Gerard Lachapelle and Elizabeth Cannon entitled, "Advances in Precise Navigation GPS and Where is the Future". An interesting discussion followed.

A wine and cheese is planned for June 2 at the Institute of Ocean Sciences, along with a tour of the NOAA ship 'Ranier'.

As preparations are underway for this years start of field season a notable change on the roster is evident, the addition of multi-disciplinary hydrographers. This homogenous group of skilled plastic scratchers have come to the end of their in-house training and are ready to face the rigours of the real world. As stated by one of the more illustrious senior coxwains, "fresh meat".

If you had shown up at the Glen Meadows Golf and Country Club on Sunday March 22 expecting to see the likes of Sparks, Armstrong and Suton demonstrate a certain degree of curling prowess, it would have become instantly obvious that you were at the wrong rink - because this was the 5th annual H_2O Bonspiel.

Thirty-five members and their friends participated in the bonspiel. Notable curling techniques; the James Wilcox dive into the ice, followed by the best impression of a Zamboni - Dave Thornhill and the furious sweeping by Doug Cartwright, Judy Vosburgh, Geof Methuen, Lois Woolley and Gloria Halcro. All were taking place at ice level under the watchful eyes of Mike Bolton. First place went to Willie Rapatz and his team of Marg Rapatz and Dave Thornhill.



Pacific Branch H_2O Bonspiel: Winning Rink
Marg Rapatz, Dave Thornhill, Willie Rapatz

Special thanks to the sponsors, without whom there would be no bonspiel:

Blue Peter Pub
CISM
CHA National
Dunsmuir Lodge
Glen Meadows
Hotel Sidney
OS Staff Association
Island Blue Print
Peden R.V.
PSAC Local 20076
Quester Tangent
Shoppers Drug Mart
Slegg Lumber
Squid Roe Pub
Stonehouse
Terra Surveys
Thrifty Foods, Sidney

On behalf of the participants, thanks to Art Lyon and Bill Hinds for a great spiel.

Just in off the wire, CHA member Dave Jackson has once again proven that any one can drive a Boston Whaler, but it takes a real multi-disciplinary hydrographer to find those rocks - other than dampened spirits, no one was injured.

CHA Pacific Branch is pleased to announce the addition of five new members; Doug Cartwright, Patti Dew, Dave Gartley, Ron Wilcox and James Wilcox.

Section du Québec

À la suite de notre assemblée générale annuelle, tenue le 7 décembre 1991, mesdames Lynn Cleary, directeur du programme Écotoxicologie et écosystèmes et Isabelle Goulet du ministère de l'Environnement Canada, nous ont entretenus du Plan d'action Saint-Laurent, le titre de leur conférence était "Le Plan d'action Saint-Laurent: la science au service de l'action". Cette conférence a permis aux membres présents de la Section de mieux connaître ce programme et les réalisations déjà accomplies. Nous avons pu constater l'importance de l'hydrographie sur un modèle de propagation des courants dans le lac Saint-Pierre qui est issu du Plan d'action Saint-Laurent.

La Section du Québec a profité de la présence de monsieur Gérard Lachapelle à Rimouski pour organiser une soirée-conférence. Ce dernier était professeur invité au cours Positionnement dynamique du programme Hydrographie Fondamentale. Le public et les membres présents ont eu droit, le 5 mars, à un exposé de qualité au niveau du contenu et de la présentation vivante de monsieur Lachapelle. Le titre de la conférence était "Le GPS - Un sextant spatial à la portée de tout navigant".

Sur l'invitation de la Section du Québec, la compagnie SOCOMAR a fait, le 9 avril, une démonstration du marémètre TMS-1000 sous le thème "Une nouvelle technologie pour les marées". Nous avons pu constater que le TMS-1000 est non seulement un enregistreur de niveau d'eau mais aussi un enregistreur de paramètres environnementaux (salinité, température de l'eau et pression atmosphérique). Il est d'utilisation simple et plusieurs modes de communication sont disponibles (lien direct, téléphonique et radio-fréquence). À la suite de cette démonstration, nous avons assisté à une présentation de différents récepteurs GPS que vend SOCOMAR. La Section a voulu ainsi permettre au public et à ses membres présents d'avoir une occasion privilégiée de se renseigner sur les caractéristiques des récepteurs en montre.

Tout au cours de l'hiver, la Section a travaillé sur son projet de Carnet de bord. Deux employées ont été embauchées spécifiquement pour sa réalisation. Hélène Aubut a remplacé le graphiste Sylvain Gagné en début novembre. Hélène a une touche personnelle qui rend la présentation de l'information visuellement agréable à lire. Kina St-Laurent, agente de marketing, s'est occupée de la promotion du Carnet de bord. Pierre-Paul Beaupré aidait Hélène et Kina au besoin, en plus d'être responsable du fonctionnement du magasin de cartes. Le conseil d'administration a veillé à la réalisation en participant à toutes les étapes de sa production. Nous pouvons dire que la réalisation du Carnet de bord n'a été rendue possible que grâce à un travail d'équipe.

Le lancement officiel du Carnet de bord se fera pendant l'Expo-Nature de Rimouski qui se tiendra cette année du 23 au 26 avril.

International Members

Membership in the Canadian Hydrographic Association is open to anyone interested in maintaining a link with hydrography in Canada. People who live or work in other countries or who are not conveniently located to existing CHA Branches can become International Members with the same rights and privileges as other members.

As authorized under the CHA by-laws, the National President has arranged for Central Branch to continue administering the International section of the CHA membership. Under this arrangement we endeavour to ensure that all International Members receive the same level of service. International Members may also join the Branch of their choice.

International Membership is $30.00 (Canadian) per year, or the equivalent in Sterling or US currency. This includes a personal Membership Certificate suitable for framing along with annual update seals, as well as copies of our journal Lighthouse each spring and fall.

Each International Member also receives the Central Branch *NewsLetter*. This helps our far-flung members keep in touch between issues of our journal and also offers a forum for members to share views and concerns.

Commander Larry Robbins of the Royal New Zealand Navy is our International correspondent for the *NewsLetter* and writes a regular column with items of interest to International Members. Drop snippets of news to him at: 1 Varlene Terrace, Forrest Hill, Auckland 1310, New Zealand, Tel/FAX (+64) 9 410 2626. All scraps are very welcome! And if you have special news or views you are most welcome to write something longer for the newsletter or Lighthouse. Letters to the Editors are also welcome.

A recent major accomplishment was our first ever social event for International Members, hosted by Larry Robbins in December 1991 during the Second Australasian Hydrographic Symposium at the University of New South Wales in Sydney, Australia. Several CHA Members were at the Symposium and able to take advantage of this opportunity, sponsored by the CHA National, CHA Central Branch, and Sustaining Member Racal Positioning Systems Ltd. Thanks to the sparkling hosting of Larry Robbins and a talk on the history of the CHA by George Goldsteen, we signed up six new International Members at that function. Welcome aboard!

Incidentally, our congratulations to Commander Robbins on being elected as a Fellow of the Nautical Institute in December. This is an honour indeed for one of our own, and well-earned recognition of the accomplishments of a busy and committed professional. Larry joins fellow CHA Member Keith Millen in this distinguished company, Keith being similarly honoured a year ago. Our congratulations, also, to Matthew Smith on being initiated to the Royal Institute of Chartered Surveyors earlier this year.

<u>Membership</u>

We welcome several new International Members to the CHA:

- Sahari Abdul Aziz, of the Malaysian Hydrographic Dept.;
- Kenneth G. Burrows, of Royal Australian Navy Hydrographic Office;
- Lt. Cdr Allan Dennison RAN, C.O. of HMAS Shepparton;

- Ronald Furness of Royal Australian Navy Hydrographic Office;
- Dennis A. Knox of Ocean Surveys & Sciences, New Zealand;
- Don Kydd, of Marinus Cartographic, Nova Scotia;
- William S. Lawton, of Seabeam Instruments, USA;
- Roland O'Neill, Sales Co-ordinator for Racal Survey, West Australia;
- Jeremy K. Tate, student at Polytech, Southwest, UK;
- Donald F. Wallace with Dept of Marine and Harbours, West Australia; and
- Head of Hydrographic Section, Saudi Arabia.

We take this opportunity to extend a warm welcome to these new members, and to remind all our members that you have a full voice and vote in our Association. You are also most welcome to attend meetings and other events of any Branch of the CHA if you happen to be within reach, so let us know in good time if you are planning a trip to Canada. Hope you can all make it to some of our meetings soon!

Here in Burlington, Ontario we had visits recently from Paul Day, a UK member en route home after working on HADLAPS in NZ; and Rod Reilly, now working on the GIS data base to be used by the land registry offices in Ontario. It is good to be able to meet International Members from time to time. A warm welcome awaits you.

Incidentally, if you are currently a subscriber to Lighthouse but are interested in becoming a full member of the CHA, you would be most welcome. If you have already paid this year's subscription, just sent us a Membership Application form with some information on yourself along with a cheque for the extra $10.00 or $5.00 (depending on whether you are now a Canadian or a foreign subscriber) and we'll be happy to transfer you to our membership rolls. You would become a Member of a nearby Branch (we have eight across Canada) or registered as an International Member.

Ottawa Branch

The Ottawa Branch closed out 1991 with our annual Christmas luncheon which was attended by 103 'Friends of Hydrography'. Once again the Branch is indebted to those generous sponsors who donated door prizes:

Bytown Marine Ltd.
terra surveys ltd.
SURNAV
Gentian Electronics Ltd
IDON Corporation
Versatec
LAS BRISAS Café
Bev Aubin
J.M. Ellis Ltd.

The 1992 executive for the Ottawa Branch is :

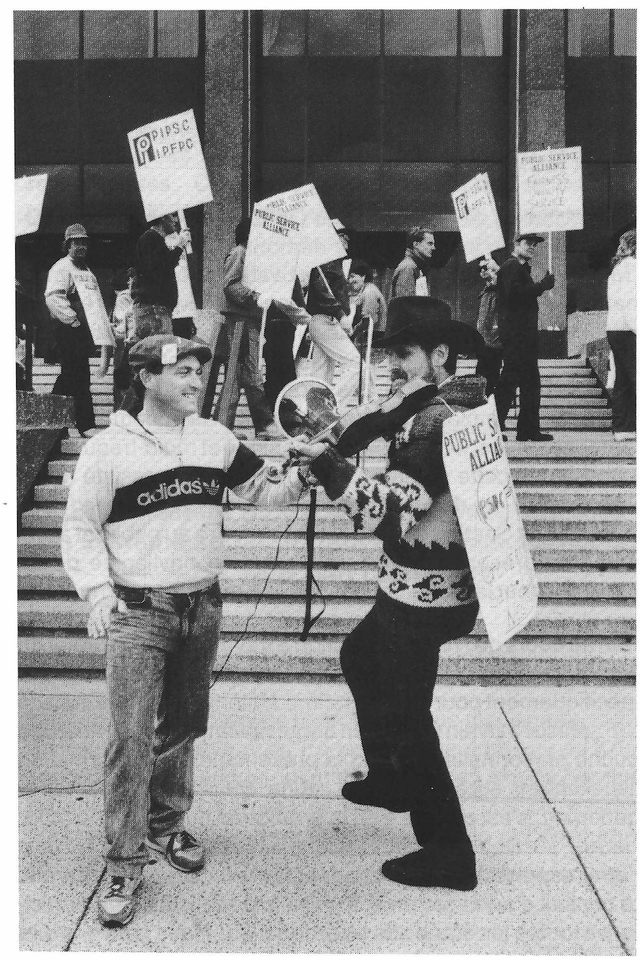
Vice-President:	Rick Mehlman
Sec. Treasurer:	Gunther Schuetzenmeier
Directors:	Ilona Hilbert-Mullen
	Richard Horrigan
	Bill Gould
	Tom Cassidy
	Ralph A. Renaud
Past Vice-President:	Sheila Acheson

We hope that any CHA members who will be in Ottawa on June 30 can join us for our annual picnic at Mooney's Bay.

Ottawa Branch members have, as usual, been busy attending and presenting papers at conferences at home and abroad.

Mr. Tim Evangelatos is the recipient of the **Prince Albert I Medal**, which is awarded by the International Hydrographic Organization for the best original article published in the International Hydrographic Review during the 5-year period between International Hydrographic Conferences. Tim's award winning article, "The Technology of Interactive Compilation", appeared in the July, 1989 edition of the International Hydrographic Review. The Prince Albert I Medal was presented to Tim at the International Hydrographic Conference in Monaco (May, 1992). Ottawa Branch was honoured to host a reception for Tim Evangelatos in recognition of this prestigious achievement.

Mike Casey presented a paper, "GPS and the Use of Multi-Monitor Stations" at the PLANS 92 Conference in Monteray, April 1992, where he also chaired the Conference's session on GPS and Surveying and Mapping. Mike is now the Chairman of the Canadian Navigation Society and a Member of the Council on Canadian Astronautics and Space Institute.



Ray Chapeskie (right)
CHA, Ottawa Branch member and National Treasurer entertaining fellow Public Service Alliance of Canada members during the Sept. '91 strike. Ray reports no calls yet from Nashville.
(photo courtesy of the Ottawa Citizen)

Printemps 1992

Lighthouse

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

Originalement à l'hiver 1969, **LIGHTHOUSE** était le journal de l'Association canadienne des hydrographes (ACH). Il représentait un moyen pour stimuler les discussions entre les Sections de l'ACH. De par les années, **LIGHTHOUSE** est devenue la revue hydrographique nationale du Canada. Elle reste fidèle à son but original de fournir une source d'information technique, historique et sociale à ceux qui s'intéressent à l'hydrographie au Canada. Son tirage a augmenté pour inclure au-delà de 1000 membres, compagnies et organisations hydrographiques au Canada et dans le monde entier.

Tarifs publicitaires 1992

EMPLACEMENTS

L'approbation et l'emplacement de l'annonce sont à la discrétion de l'éditeur. Cependant, toute demande d'emplacement spécifique sera considérée si une prime de 25 $ est ajoutée à la demande de parution.

EXIGENCES MÉCANIQUES

L'annonce publicitaire doit être un prêt à photographier ou sur film négatif (les couleurs supplémentaires doivent être sur film négatif) et être fournie aux dates de tombée. La préparation de copie couleur, à fond perdu et de photos sera chargée au tarif de l'imprimeur plus 10 %. 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.

DIMENSIONS DE LA PUBLICITÉ

	(Hauteur)		(Largeur)
Dimension de la revue:	8.5"	x	11.0"
Encart libre:	7.0"	x	10.0"
Publicité à fond perdu:	8.75"	x	11.25"
Insertion d'une page:	8.25"	x	10.75"

Grandeurs standards des suppléments:			
Pleine page:	7.0"	x	10.0"
Demie-page:	6.875"	x	4.75"
ou:	3.375"	x	9.75"

DATE DE TOMBÉE

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

IMPRESSION

Internégatif tramé à 133 lignes au pouce.

TARIFS

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

	N & B	Couleur	
		Une*	Quatre
Couverture arrière	SO	SO	1025
Couverture intérieure	300	400	825
Pleine page	275	375	675
Demie-page	200	300	675
Insertion d'une page	275	375	675
Carte d'affaire	125	225	SO

*Une couleur (Orange, rouge ou bleu)

Les tarifs sont assurés aux termes des contrats publicitaires jusqu'à concurrence d'un an. Les annulations ne sont pas acceptées après la date de tombée.

Tout le matériel publicitaire doit être acheminé à:

Monsieur K. Weaver ,Directeur de la publicité
LIGHTHOUSE
P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario
CANADA L7R 4A6
Téléphone: (416) 336-4538
Télécopieur: (416) 336-8916

Spring 1992

Lighthouse

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

LIGHTHOUSE originally began as an internal newsletter of the Canadian Hydrographers' Association (CHA) in the winter of 1969. It was conceived as a means of stimulating discussion between the branches of CHA. Over the years, **LIGHTHOUSE** has become Canada's national hydrographic journal. It still remains faithful to the original goal of providing a mix of technical, historical and social information of interest to those associated with hydrography in Canada. But its circulation has expanded to include over 1,000 individuals, companies and hydrographic organizations in Canada and around the world!

1992 Advertising Rates

POSITIONING

The acceptance and positioning of advertising material is under the sole jurisdiction of the publisher. However, requests for a specified position will be considered if the position premium of $25 has been included in the insertion order.

MECHANICAL REQUIREMENTS

Advertising material must be supplied by the closing dates as camera-ready copy or film negatives (Colour ads must be film negatives). Copy preparation, including colour, bleed and photos will be charged at the printer's cost plus 10%. 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).

PUBLICATION SIZE

	(Width	x	Length)
Publication Trim Size:	8.5"	x	11.0"
Live Copy Area:	7"	x	10"
Bleed Size:	8.75"	x	11.25"
Single Page Insert Trim Size:	8.25"	x	10.75"

Standard Ad Sizes:			
Full Page:	7"	x	10"
1/2 Page:	6.875"	x	4.75"
or:	3.375"	x	9.75"

CLOSING DATES

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

PRINTING

Offset screened at 133 lines per inch.

RATES

All rates are quoted in Canadian Funds. Sustaining members receive a 10% discount.

	B &W	Colour	
		Spot*	Four
Outside Back Cover	NA	NA	$1025
Inside Cover	$300	$400	$825
Body, Full Page	$275	$375	$675
Half Page	$200	$300	$675
Single-page Insert	$275	$375	$675
Professional Card	$125	$225	NA

*Spot Colour (Orange, Red or Blue)

RATE PROTECTION

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

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P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario
CANADA L7R 4A6

Telephone: (416) 336-4538
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Canadian Hydrographic Association - Central Branch

Heritage Launch Project