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Lighthouse

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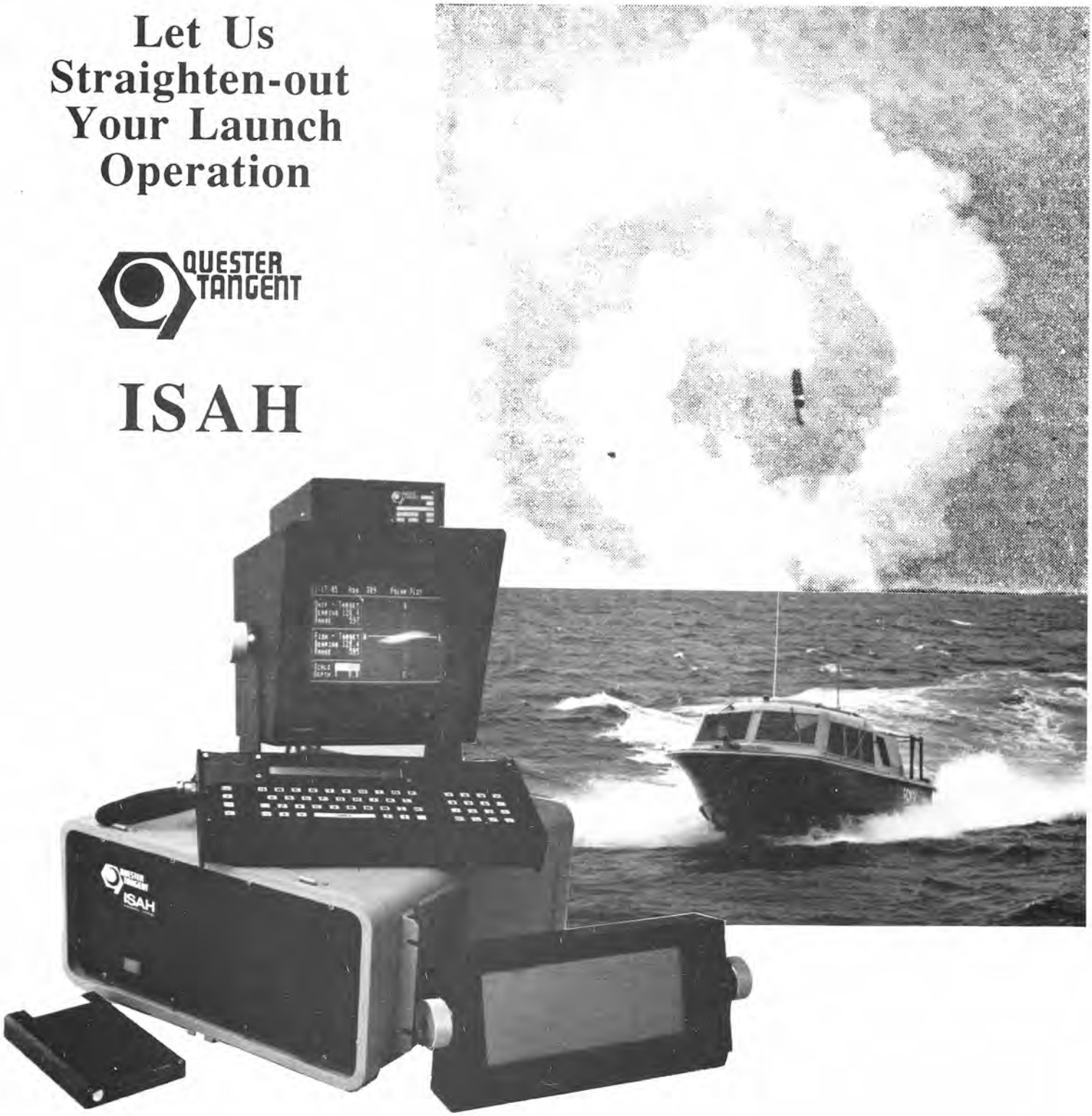

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Edition 42 **LIGHTHOUSE** Fall 1990

JOURNAL OF THE CANADIAN HYDROGRAPHIC ASSOCIATION

Lighthouse Staff

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 30** of this issue. Yearly subscription rates for non-members, effective 1990, 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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Closing dates for articles are:

Spring issue	**March 1**
Fall issue	**October 1**

Editor's Notes

Last edition I introduced myself to Lighthouse subscribers and now would like to introduce the rest of the ***volunteer*** *Lighthouse team and thank them for another completed edition.*

J.H. (Sam) Weller is the Associate Editor, responsible for the CHA News, Lighthouse distribution, and many other duties such as "proofing", researching and compiling features. With the remainder of his spare time he is the Editor of the CHA Central Branch Newsletter, the CHA National Secretary and very involved with United Church activities. Sam is the Hydrographic Publications Officer for Central and Arctic Region (C&AR) of the Canadian Hydrographic Service (CHS), in Burlington.

Dave Monahan is one of the Assistant Editors for Lighthouse. Dave directs a steady stream of excellent articles to Lighthouse as well as providing a good source of advice. Dave is the Director of Marine Cartography with the CHS, in Ottawa.

George Macdonald is the other Assistant Editor (and former Editor). He is also an excellent source of advice and helps with obtaining and "proofing" the Lighthouse articles. George is the Assistant Director for Hydrography in C&AR of the CHS, in Burlington.

The Advertising Manager of Lighthouse is Keith Weaver, who is responsible for obtaining Lighthouse advertising which keeps us financially afloat. He also assists greatly with "proofing" of the papers. Keith is currently Acting EDP Manager for CHS, C&AR.

The Lighthouse Financial Manager is Rick Sandilands. Rick looks after the books, and is looking forward to the introduction of the Goods and Services Tax. Rick is the Manager of Tides, Currents and Water Levels for C&AR of the CHS.

Steve Bockmaster is Lighthouse Reprographics Manager and is responsible for all of the artwork, photo reductions, half-tones and other reprographic work necessary for printing. Steve is a Marine Cartographer with C&AR of the CHS.

Printing of Lighthouse is looked after by Boyd Thorson, who deals directly with the local commercial printers. Boyd has just been named Chief of Chart Maintenance and Distribution for CHS Headquarters in Ottawa.

Denis Pigeon is responsible for translation of Lighthouse abstracts, and proofing of some articles. Denis is a Marine Cartographer, and currently acting Chart Production Supervisor, for C&AR of the CHS.

Word Processing of the many articles received, not already on disk, is handled very efficiently by Linda Smith. Linda is the Secretary for the Director of Hydrography in C&AR of the CHS.

I would also like to welcome aboard Terese Herron as Lighthouse Feature Editor. Terese is responsible for the compilation of the News from Industry, and Sustaining Members sections. She is a Hydrographic Surveyor with C&AR of the CHS.

There are also many others who assist in the production of Lighthouse when called upon and deserve a round of thanks as well. Of course a major source of assistance is the membership who continue to support Lighthouse with their articles and letters.

Bruce Richards

Message from the National President

Welcome back!

Nearly a year has past since I assumed the duties of the National President. The activities which your executive and myself have attended to during these months have maintained not only the mundane tasks of an association, but have also spotlighted the CHA.

The annual Director's meeting and subsequent annual General meeting were held during May at the Canadian Institute of Surveying and Mapping conference in Ottawa. Minutes from both these meetings are being prepared for circulation.

Our national logo (see below) is now receiving wide distribution and lapel pins featuring the new logo will be distributed to your Branch executive for sale to members.

The "offical" CHA logo will be prominent on a portable display being assembled for use at conferences etc., promoting the CHA, exposing our journal Lighthouse and providing membership application forms. The excellent display which was produced by the Quebec Branch has been used in the past, however a more easily handled display is required. This new display is being constructed at minimal cost and we are grateful for the loan of the display media and graphic materials which were provided by interested parties.

Our Bylaws will soon be distributed in a bilingual format. The effort put into the translation of our Bylaws by the Quebec Branch staff is sincerely appreciated.

The CIDA/CHA Jamaica project is proceeding at a much quicker pace. This is partially due to the funding commitment being met by the Jamaican government after Mr. McCulloch's continued efforts to stress the importance of hydrography to the local government officials. However, in order to fulfill the initial goals of the project an extension until October '91 has been required.

In addition the CHA hosted two international visits to Canada, funded by CIDA: Lieutenant-Commander Zainal Abidin bin Soot of the Royal Malaysian Navy Hydrographic Unit attended the Maritime Boundary Delimitation course at the Erindale Campus, University of Toronto; and Lt. Cdr. Mohamed Fairoz, also from Malaysia, visited the CHS in Ottawa and Sidney, B.C. He spent the majority of his time at the Marine Environmental Data Service offices in Ottawa. Both were appreciative of the support and hospitality afforded them by CHA members.

During August, Bruce Richards, Sheila Acheson and myself attended a seminar hosted by CISM on the affects of the proposed Goods and Services Tax (GST) to associations. This informative seminar was conducted by Revenue Canada personnel and we will implement as appropriate the accounting techniques which may be applicable. A guideline will be supplied to the Branchs as the GST legislation is enacted.

The fall cavalcade of activities will soon commence for the Branches, please remember it's your association which needs your support.

Regards
Dave

The New Logo of the
Canadian Hydrographic Association

Lighthouse Abstracts

Résumés pour Lighthouse

Page 7

Le balayage par machine comme alternatif à la numérisation manuelle

par

Paul N. Holroyd

Le balayage par machine peu éliminé l'embouteillage de la cartographie digitale contemporaine en fournissant une méthode à frais modique pour réduire le temps nécessaire de la transformation analogue-numérique des données en cartes bathymétriques, cartes nautiques et les minutes hydrographiques.

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Numéro 8

par

Bill Covey

Ce document nous rappel des gens, événements et techniques de la section de production du Service hydrographique du Canada durant les années quarantes et cinquantes, quand le Service ce logeait dans une édifice temporaire de la guerre, une monstruosité architecturale de la ville d'Ottawa.

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Le programme hydrographique de la marine des États-Unis d'Amérique

par

Contre-amiral James E. Koehr

La marine des États-Unis effectue des levées hydrographiques dans les régions désignées par le 'Defence Mapping Agency'. Pour rencontrer les responsabilités hydrographiques de la marine durant une éle de budgets qui diminues et des demandes qui augmentes, le commandant du 'Naval Oceanography Command' considère de nouveau et de plus compétents navires qui opèrent à des prix réduits, la hausse d'un programme international coopératif de levé et l'application de nouvelles technologies.

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Le système différentiel de positionnement global à temps-vrai - Le système de positionnement définitif pour les levés hydrographiques

par

Peter Kielland et Dave Neufeldt

Le Service hydrographique du Canada a dirigé pour plus de huit années un programme de recherches et développement du système de positionnement global. Le résultat de ces séries d'études continuelles, l'exécution du logiciel et les épreuves sur le champ est le logiciel d'ordinateur 'Hydrostar'. L'Hydrostar est un système différentiel à temps-vrai qui utilise des ordinateurs portatifs au site de réception autant qu'à bord du bateau de levé. Il s'agit d'un ensemble de logiciels générique qui accepte des données brutes provenant de plusieurs différent récepteurs et qui emploi des algorithmes avancés. Le système est jumelé à un lien de communications différentielle de données à très hautes fréquences et un senseur de roulis et de tangage. Les données de roulis et de tangage sont utilisées de concert avec les données de phase du système de positionnement pour évaluer la soulèvement d'un navire de levée. Cet article discute l'évolution et les capacités d'Hydrostar et nous présente la méthodologie pour une épreuve comparative des récepteurs 'Trimble', 'Ashtech' and 'Northstar', à l'université de Calgary en novembre, 1990.

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L'évaluation de l'erreur humaine pour une sonde d'echogramme graduer à la main

par

Geof Thompson

Ce document discute les résultats d'une épreuve préparée pour examiner les erreurs fait au hasard, trouvées pour une sonde graduée dû à la graduation manuelle. L'épreuve examine l'erreur trouvée dans une unique sonde graduée par un groupe d'essai composé de cinq hydrographes expérimentés du Service hydrographique du Canada.

La raison pour cette épreuve est pour établir un niveau de repère de précision qui pourrait être utilisé pour qualifier et vérifier les données historiques et modernes. L'épreuve est le premier stage pour établir le niveau de bruit pour une sonde après que toutes les erreurs systématiques sont enlevés.

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Machine Scanning as an Alternative to Manual Digitizing

by
Paul N. Holroyd

Introduction
The Ocean Mapping Division of the Canadian Hydrographic Service (CHS) in Ottawa has been researching the state-of-the-art in digital scanning technology in an effort to reduce or eliminate the serious bottleneck in contemporary map and chart production which has been created by analogue-to-digital data conversion.

This bottleneck is primarily due to the fact that in digital cartography it is difficult to integrate analogue and digital data. Manual digitizing, the most popular method for analogue-to-digital data conversion, is error-prone, labour intensive, slow and therefore expensive. As computing power and storage have become faster and less expensive, the popular methods for converting data to digital form have remained largely unchanged.

Recent tests have proven that the digitizing bottleneck can be virtually eliminated by scanning technology. This paper examines the opportunities that can now be realized.

Background
There are two ways of storing graphical information in digital form: raster and vector. Raster storage is comprised of a matrix of dots called "picture elements" which are commonly referred to as "pixels". This type of image has no intelligence except to the observer, who mentally compiles a series of pixels so they appear as a recognizable object, such as a contour or a wharf. By contrast, vector storage is a method by which points, lines and areas can be described through geometric coordinates. Features and attributes exist at the graphics level and can be manipulated as objects. Traditionally, vector has been the most common form for representing digital graphical data.

Scanning, as discussed in this paper, refers first to creating a raster image of a document, such as a map, chart or field sheet, and then converting the raster image to vector form for subsequent manipulation on a Geographic Information System (GIS).

The Ocean Mapping Division has applied scanning technology to two types of digitizing problems: line digitizing and field sheet digitizing. Line digitizing required line scanning which refers to the raster scanning and vectorization of linework. Field sheet digitizing required optical character recognition (OCR) which refers to the raster scanning of digits, such as those appearing as soundings on a field sheet, followed by a vectorization process which is based on pattern recognition techniques.

The research conducted to date has been undertaken within the framework of a series of activities with Dataspan Technology Incorporated, of Calgary, Alberta. Results thus far show that, using scanning technology, the potential exists to convert the vast numbers of analogue bathymetric maps, charts and field sheets held by the CHS to digital form, in a cost-effective and timely fashion.

Line Scanning
Natural Resource Maps (NRM), noted for their detailed and complex depiction of the seafloor, require an average of two months per map to manually digitize. In 1989 the Ocean Mapping Division had the bathymetric contours, coastline, hydrology,and topographic features from three NRM's (Pacific coast maps 15787, 15798, 19308) scanned and vectorized. Using scanning technology, the total digitizing time for all three maps was reduced to less than two weeks. The quality of each digital file was equal to that of the original graphic.

The digital files were delivered in SIF (Standard Interchange Format) and were converted to the NTX (Interchange) format using CARIS. The data format conversion and integration into the CARIS border file took approximately 30 minutes per map. Using digital cartographic techniques, the maps were subsequently completed and printed on a colour Versatec electrostatic plotter.

Utilizing line scanning is justifiable on the basis of time savings alone, which creates "opportunity gained" as in-house expertise is relieved of the monotony of digitizing and is able to concentrate on other aspects of map production. Scanning is more effective than doing the work in-house when one considers in-house cost components of salary, education, materials, support, hardware, software, and most importantly, time. The cost of scanning these NRM's ranged from $1000.00 to $1300.00 per map. Salary costs alone to manually digitize these maps would be five to six times higher than the cost of scanning.

Line scanning has been proven to be extremely valuable to Ocean Mapping in the construction of a digital bathymetric database and this technology will be used as much as possible in the future.

Optical Character Recognition
The solution offered by line scanning provides an attractive option for converting existing analogue maps to digital form, but this is only part of the puzzle. If the CHS wishes to make major gains in digital cartography it must seek ways to convert to digital form, the usable portion of the vast inventory of analogue field sheets, and then apply expertise in digital techniques to improving product creation and maintenance.

Optical character recognition (OCR) refers to the technology

of raster scanning numbers, such as soundings, and storing component digits as raster images or shapes, then identifying and vectorizing numbers using specialized pattern recognition software. The software does this by comparing the raster shapes to entries in a library of known shapes representing the digits 0 to 9. A high success rate in character recognition is achieved using interactive and automatic quality control procedures to verify the scanned file.

OCR performed on CHS field sheets in the mid-1980's resulted in a recognition rate of between 60 and 90 per cent [1]. Preliminary results with more recent software, operating on field sheets which included hand drawn soundings, have shown this rate to be in excess of 93 per cent before operator intervention, and better than 99 per cent on the final file.

Additionally, the soundings in the output file can be organized into their original ship tracks to retain the linearity (or non-randomness) of the survey data. This is important because CHS survey data, collected along profiles, tells much about what lies along these profiles but virtually nothing about what lies between the survey lines. By retaining the original ship-tracks within the data, this information can be applied when the file is automatically contoured using such tools as the Warren-Boone contour package, a package customized for hydrographic contouring applications [2].

For map and chart production applications, the availability of this newly digitized data assists the cartographer in employing the many powerful tools of digital cartography.

The Ocean Mapping Division favours this type of scanning of field sheets over manual digitizing because it reduces analogue-to-digital conversion time and eliminates monotony for the cartographer. Manual contouring is also virtually eliminated since that task can be handled by the computer. This results in a further reduction in overall production time and an increase in the consistency of contours since they are machine-generated.

The Data Mining Alternative

'Data mining' has been suggested as a method for digitizing only the data necessary for building a specific map or chart. In this approach the graphic is scanned and a raster image created. The raster image, used simply as an "underlay" or "guide", is displayed on a graphics terminal and the cartographer digitizes the vector data required for a particular product. Operations such as contouring and sounding selection are also performed manually on the display screen.

If only a few soundings are required then data mining is an attractive option, but as the volume of required data grows time constraints soon become obvious and the cartographer ends up doing nothing more than manually digitizing from a screen rather than from a hardcopy. Equipment and human resources are again tied up in the manual digitizing process and since only the data for a specific project is digitized, the resultant digital data set is not very versatile.

Contemporary computer CPU power is increasing, peripheral storage is growing and costs are decreasing. More information can be handled in a shorter production cycle. While technologies such as scanning provide high density data sets that can be automatically analyzed and processed, computer assisted processing will result in more consistent and less subjective decisions.

The Contract Digitizing Alternative

Paying someone else to manually digitize data is another option. It is an attractive option because someone else can be paid to perform a laborious task. However humans still digitize the data, and all the same human weaknesses and inconsistencies remain a factor. The people performing the digitizing may not operate to CHS standards, and quality control may be weak. There is certainly no saving in time, so that digitizing mass quantities of data is still time consuming, and the cost is higher than that of scanning. There is also a significant requirement for in-house quality control, with mainly visual comparison.

Future Plans

The Ocean Mapping Division is planning to scan all the field sheets comprising NRM 19422, which covers the western part of Dixon Entrance on the Pacific coast. The project will further evaluate the scanning of field sheets whose ages and quality vary significantly. The digital field sheets will be machine contoured and the final bathymetric map product created using interactive cartographic processes.

Summary

Historically, digital cartography in the CHS has not been particularly efficient. When using digital techniques it normally takes longer to produce a map or a chart. The major reasons include the lack of digital data, which creates a requirement to digitize data before compilation, and that early computer-assisted cartographic techniques, which attempted to simply mimic traditional methods, were not particularly efficient.

Digital cartography has, however, been proven to be effective when it is applied wisely. Once a map, chart, or field sheet is digital, and when digital data is managed properly within a database environment, it can be used again for other products. It is essential that the bottlenecks in digital cartography be eliminated if the potential benefits are to be realized. By using scanning technologies to reduce or eliminate manual digitizing, the Ocean Mapping Division has been able to match and, in many cases, decrease manual map production time.

As scanning technology matures it will offer the CHS a genuinely viable method for converting analogue maps, charts, and field sheets into digital form, perhaps 'en masse', for inclusion in digital databases.

Scanning entire maps, charts, and field sheets to reduce or eliminate manual digitizing results in "opportunity gained". This "credit" can then be "spent" on other issues, including future-oriented activities such as building systems to manage and update digital databases, new map and chart production, and supplying new forms of information, such as raster images and electronic chart data.

Providing cartographers with digital data at the start of the production cycle is the first step in realizing the potential of digital cartography. Scanning provides a cost-effective solution to achieve this objective.

References

1. Vachon, Don H., "Plotter Evaluation Report", CHS internal report, April 1985.

2. Warren, J.S., L.G. Boone, and P. Guibord, "A Digital Depth Model and Automated Contours", Lighthouse, Edition No. 41, Spring 1990.

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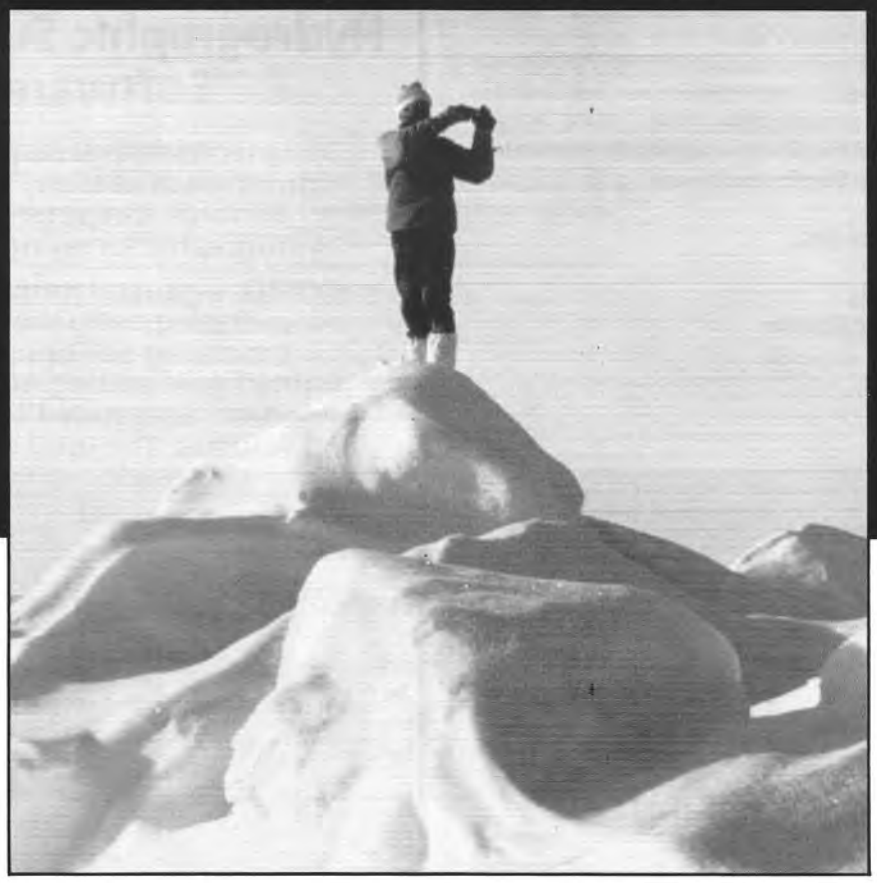

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Photo courtesy of Richard Weber

Number 8

by
Bill Covey

After working as a Draftsman with the Geological Survey of Canada for nine years [1], I realized that advancement in the ranks was dependent on that uncertain opportunity we all know as "Dead Man's Shoes". There was a cadre of seven draftsmen who were one grade senior and ten years older than I and the future as far as promotion was concerned was, to put it mildly, somewhat bleak. I was a Draftsman Grade 2 and the best I could hope for was a Grade 3 position becoming vacant sometime in the nebulous future.

There was also an enormous expansion taking place in 1946 and 1947 throughout the Civil Service to make jobs for the large number of war veterans who were coming onto the job market, many thousands for the first time. The Drafting Section at Geological Survey quickly acquired about fifteen new draftsmen, some experienced with mapping work overseas in the Corps of Engineers and others who were veterans looking for a job. There had been no time for formal examinations and the establishment of "Eligibility Lists". A visit to the Civil Service Commission was often all that was necessary. The large drafting room at the Victoria Memorial Museum was soon bursting at the seams.

In mid-summer of 1948, the Canadian Hydrographic Service (CHS) announced a competition for a Grade 3 Draftsman. I entered it, won, and on September 15 reported for work at the CHS Chart Construction Section at Number 8 Temporary Building on Carling Avenue. History was repeating itself. I knew nothing about marine navigation charts, although my experience as a long-range navigator in Transport Command of the Royal Canadian Air Force during the war had undoubtedly helped my cause when I appeared before the Selection Board. I certainly was familiar with the properties of a Mercator projection and how to use it as a navigator. Nobody at CHS took me to task for my lack of knowledge about the product as Alexander Dickison had at GSC nine years earlier [1]. Orm Hodgins had preceded me from GSC and had become a marine chart draftsman of considerable skill. His hand-drawn rendition of a coastal chart in the vicinity of Yarmouth, Nova Scotia was a classic, probably the finest of its kind ever produced.

The training I had received in pen-and-ink drafting was immediately put to good use at CHS. The engraving of marine charts on copper plates had ceased about the same time it had at GSC and CHS was hand-drawing the "fair copy" of each chart on heavily-backed paper similar to that used by GSC. The only parts of the chart that were "patched" or stuck on the finished drawing were the titles, tidal and border notes. A morbid fear existed that a patched sounding, light characteristic, buoy identification or place name would fall off undetected after the final check and the printed chart would be in error. Also, both the British Admiralty and United States Hydrographic Office charts had just evolved from the days of copperplate engraving and we three were still trying to make the new hand-drawn charts look as much like the engraved product as we possibly could. I had to familiarize myself with the art of hand-lettering soundings and place names and then I was off and running. I enjoyed the work. It was an entirely new form of cartography and an interesting challenge.

So was working in Number 8 Temporary Building. Gone was the spacious drafting room with the high ceilings and high windows at the old castle-like Museum. I was now working in a building which had been built about 1940 entirely of wood in a mill-design mode. It and another seven Temporary Buildings had been erected as wartime office accommodation throughout Ottawa. Except for the cement stairwells, the buildings were made of wood with wooden columns, a plethora of beams, miles of sprinkler systems, and offices enclosed by a mixture of Gyproc and Tentest walls. Number 8 had four floors, the limit imposed on this type of construction and CHS had the use of about a fifth of the third floor at the back of the building. The office walls on two sections of hallway had been removed to form two large open rooms for the Drafting, Compilation and Chart Correction Units. Chart Distribution occupied part of the Ground Floor until they moved downtown to the Bolodrome in the mid-Fifties. Except for the folk in Victoria on the West Coast, the entire CHS, including the field staff and Administration was housed at Number 8. Each survey party was based in Ottawa and returned there in the fall where they spent the winter finishing their field sheets and getting ready for the next season. Off they would go in the spring, usually to Pictou where the ships wintered. The rest of the building was occupied by the Topographical Survey on the floor above us, and units of the Department of National Defence. There may have been other departments in the building but it was such a sprawling mass that one never was quite sure who was where.

The place was huge. One walked to the office through a myriad of narrow corridors that were closed off by numerous fire doors. You could arrive just on time at the front door but find the sign-in sheets gone before you reached the office. Ottawa's sweltering summer heat hit the temporary buildings and their inhabitants hard, particularly after a hot weekend. Walking through the corridors on Monday morning with the weekend heat bottled up by the closed fire doors was a test of one's fortitude. By Wednesday the corridors might be walkable even though the heat wave had ended days before.

The insect and small creature life at Number 8 was interesting. In the fall field mice moved into the building and did their best to survive the winter. Most of them tried living in the spacious drawers of the drafting tables in the Chart Construction Section, tearing paper to make nests and rearing litter

after litter. Leaving one's lunch in a bag in a drawer was asking to have it shared by mice before noon. About once a week a draftsman would head for the washroom with a drawer from his desk containing a litter of new-born mice to flush the drawer contents down the toilet. Occasionally a mouse would die in a drawer and that caused a Dickison-like cleanup to take place. One never really conquered the little critters, but philosophically realized that about the time the field parties packed up and left in the spring, the field mice packed up and left for the field as well.

Not so the cockroaches. We had the misfortune to be situated two floors above the cafeteria. When the cockroach population reached an unacceptable limit in the cafeteria, the fumigators would come in over the weekend and go after them. They probably killed the majority, but the survivors just moved up three or four floors through the walls for about a week until they were hungry enough to go back to the cafeteria. During one particularly bad invasion, the draftsmen pinned each cockroach they killed to the wall beside their desks. We soon had to call a halt to the trophy-gathering as the walls were becoming festooned with long lines of the mounted varmints.

The windows were wooden double-hung, single pane and had no storm windows in winter. The building was steam-heated, but the system was barely adequate to cope with the drafts and window desks normally coveted by a draftsman were no bargain at all. In summer, glass deflectors in each window kept the breeze from cleaning our work off the desks. Just before I arrived on the scene, CHS had moved from the stately Confederation Building next to the West Block on Wellington Street and I guess I wasn't the only member of the staff undergoing a bit of a culture shock. The Confederation Building now houses the offices of Members of Parliament.

In 1948, R.J. Fraser was the Dominion Hydrographer and F.C.G. Smith was the Superintendent of Charts. Bob Lee was in charge of Tidal and John Bell was the Chief of Chart Production. Bell's assistant was Charles Weese, a very talented man who, a few months after I arrived, was wooed to the private sector with the offer of a fine job with America's top commercial cartographic firm, H.M. Gousha in California, where he enjoyed a profitable career.

Bell's staff was increasing dramatically with the acquisition of war veterans. He also had new Grade Three Drafting positions created and Ellsworth Walsh, Norman Veitch and Warren Buckley, three Grade Two draftsmen from Geological Survey soon followed me to CHS. In February 1949 Frank Strachan arrived from Scotland, the first of a group of experienced draftsmen who had been recruited by a Canadian overseas team. Frank, a former Royal Air Force Spitfire pilot, walked into the Drafting Room one cold afternoon wearing his RAF greatcoat and spent his first few weeks in Ottawa living at the YMCA. John Cookson, Bob Bottriell, George Gough and Jack Renshaw emigrated to Canada over the next few years. Frank came from John Bartholomew's prestigious mapping works in Edinburgh and the others were products of the British Army's Survey Establishment. A good Scot never loses his accent and Frank, now retired in Ottawa, will long be remembered for his classic suggestion to a junior draftsman to "move yon name doon a wee ba' hair, laddie".

George Gough, although interviewed and accepted at the same time as Frank Strachan, was two years late arriving in Canada. George lived in Southampton in a badly bombed-damaged area. When the postman dropped George's acceptance letter through the mail box in late 1948, it fell through an unrepaired split in the floor. Two years later when George was renovating the house, he took up the floor, found the letter and quickly wrote to the Civil Service Commission in Ottawa to see if the offer was still good, which it was.

In the mid-Sixties Jack Renshaw saw the light, started up his own commercial cartography firm in Toronto and is still at it. Rumour has it that he owns a villa in Spain! While we were at Number 8 we recruited some of the stalwarts of CHS cartography. They all started as rank beginners on a drafting table. It was during this period that the Civil Service Commission, at the request of the various cartographic establishments, established a drafting school in Ottawa. Candidates for cartographic jobs were brought to Ottawa from across Canada and were given formal training to qualify them for positions in hydrographic, topographic and agricultural cartography. Each office provided a staff member to act as an instructor, Norman Veitch was sent from CHS. The school was a success and CHS acquired Ozzie Ross among others.

We also recruited another Englishman, the late Cyril Champ, from the British Army Survey Establishment. Cyril didn't last long in the cartography side. His capacity to do everything well and his phenomenal memory endeared him to top management and he soon became a staff assistant to Norman Gray, the Dominion Hydrographer who followed F.C.G. Smith. When I became the CHS Information Officer in later years, I shared an office with Cyril and saw his awesome recall capabilities in action. He could quote passages from files that he hadn't opened in years.

In the late Forties the production of the hand-drawn chart was a long, laborious process. Pantograph reductions of all the field sheets used in the chart were made on tracing paper which were then "keiled down" to the drafting copy. "Keiling" was a thin blue-chalked paper used as a transfer medium. Later we copied the latest U.S. Hydrographic Office technique of using photographic transparencies of the field sheets reduced to chart scale, making a mosaic of them and developing a blue-line copy on a sheet of fine drawing paper that had been mounted on an aluminum plate to withstand the wet developing process. This was a quantum leap in technique. However, there was no commercial supply of good drawing paper mounted on aluminum, so we had to prepare our own. We obtained the paper, aluminum plates and a waterproof plastic adhesive and tried assembling them in the drafting room. The first time was also the last as the plastic adhesive had a noxious suffocating smell that just about cleared out CHS and all of its neighbours on the third floor.

Fortunately we had recently rented a small warehouse on Beech Street about two blocks from the office to accommodate our growing stocks of printing paper (which consisted of thousands of sheets in six popular sizes) since the Departmental Map Printing Establishment at the Labelle Building downtown had run out of space. The paper, wrapped in bundles of 100 sheets, had to be carefully stored as it was a monstrously expensive 100% rag stock paper, which was supposed to be reasonably dimensionally stable and impervious to dampness when used at sea. Happily, we replaced

it later with a superior paper of only 50% rag content at a fraction of the cost.

About that time we had to deal with another problem at Number 8. We had 200 copper plates left from the engraving days which we were keeping in case they had to be used again. In reality they never were, but what does one do with 200 chart-size copper plates weighing about sixty pounds each? The easiest decision was to keep them, so six tons of plates were leaned against the walls of the chart document storage area which was already crammed with heavy plan-file cabinets. The tenants in the offices below became alarmed when their ceilings began sagging around the edges as the building certainly hadn't been designed to carry that kind of floor load. We had to move the copper plates at once, so into the Beech Street warehouse they went. It is interesting to note that not quite all 200 went to the warehouse as some of the more enterprising senior staff members squirrelled them off home where they were made into magnificent mahogany-framed coffee tables. When polished they were a joy to behold, even if they were the heaviest coffee tables ever produced by man.

As a Supervising Draftsman, one of my responsibilities was the Beech Street warehouse and its contents. It was a great place in which to mount the drawing paper on the new aluminum plates. We prepared our stock for the year during the summer months where the junior staff did the job by the open door wearing industrial vapour masks. A good time was had by all as they were off on their own away from the office and nobody really noticed if they knocked off work early on a nice day. One day they opened the warehouse to mount another batch and discovered that an enterprising thief had lifted the lot of old copper plates, all six tons. There were no windows broken or jimmied and the door locks were intact. Copper was worth about fifty cents a pound on the scrap market at that time, so someone made a cool $600. The RCMP investigated the theft, caught nobody and that was the last we saw or heard of the copper plates. In retrospect the thieves had done us a favour as we would have disposed of them eventually through Crown Assets. I doubt that one of the staff would have made two hundred coffee tables.

One of the great advantages to working at Number 8 was its proximity to the Central Experimental Farm. During lunch hour, one could enjoy a quiet walk through the beautifully landscaped grounds at any season of the year. In the spring, we wouldn't miss the lambing, spending noon-hours hanging over the pens watching proceedings. Some of us even wandered into the bull barn one day into the midst of a semen-gathering exercise for artificial insemination. The fall Chrysanthemum Show was not to be missed. In the spring, one of the staff would fold his paper lunch bag, walk to the Farm and surreptitiously steal an iris root each day. He had a fine iris bed at home, every bit as good as the one at the Experimental Farm, although not quite as large. Another member, whose wife grew African violets, would wander through the greenhouses pinching off leaves which he would take home for her to root. The rest of us just wandered through the flower beds, barns and greenhouses enjoying the sights and smells.

During the winter months, the Farm's most popular attraction for the young male members of the staff had to be the Experimental Farm Recreational Association's (EFRA) broomball rink. The paved tennis courts of summer became a board-enclosed broomball rink in winter at a time when the game was in its infancy. The EFRA members used it in the evenings but not at noon and it wasn't long before a dozen or so of the young bucks were spending each noon hour on the rink. The DPW cleaning staff's brooms at Number 8 rapidly disappeared. By 1 p.m. each day the players returned to work and the Drafting Room took on the flavour of an unaired gymnasium, much to the disgust of the other ladies and gentlemen of the staff. The harmony in the office during the afternoon depended to a large extent on who had whacked whom during the game.

The changing technology caused another interesting stride in the cartography side in the early Fifties. When I was the Supervisor of a group in the Compilation Section, the most onerous task was the calculation of a chart projection and the control coordinates, which had to be laboriously calculated by the use of logarithms, a long, boring, tedious task. Equally as long, boring and tedious was the checking of the calculations which had to be done the same way. We owned a Millionaire Calculator, in fact it had been in CHS since about the turn of the century, and it resembled a small trunk on wheels bearing an imposing array of slides, dials and cranks. When properly manipulated it would noisily clatter away at the job, but it actually was as quick and certainly a lot quieter to sit patiently and work with the logarithm tables and a pad of paper. One day I discovered that Topographic Survey on the fourth floor had the loan, from a dealer, of the first model of Friden Calculator to come on the market. I borrowed it, read the manual, and in a trice calculated and checked a projection. We and Nautical Geodesy soon had these marvelous new machines and a new era had dawned!

In the early Fifties, F.C.G. Smith was Superintendent of Charts, a position next in seniority to the Dominion Hydrographer. He was responsible for all Chart Production. As a hydrographer of considerable experience and merit, he considered himself to be the only person qualified to make sounding selections during the production of a chart and he did so, often holding up the works while he fitted them into his busy schedule. He was an indefatigable worker, serious and dedicated to his job and, like Alexander Dickison, minutely examined every item of work turned out by the Chart Production Unit. However, with the heavier work load imposed on him by the increases in staff, he finally had to admit that there was a possibility that the senior members of the Chart Production staff could make their own sounding selections. In fact, he delegated many of his former tasks, as he was getting ready to step into the Dominion Hydrographer's job.

In 1952 R.J. Fraser reached the age of 65 and retired as Dominion Hydrographer. R.J. had been a hard-drinking hydrographer in his early days until he had been reformed by the Oxford Group, a crusading evangelical organization that was active in the 30's and 40's and which aimed its endeavours mainly at professional folk. Undoubtedly the Oxford Group did good work as they had certainly straightened out R.J. He led an exemplary life and even though he spent most of his days in his office, seldom visiting our part of the world at the other end of the long corridor, we all knew of his views on morality, clean living and the Demon Rum.

The Christmas Eve before he retired, an unwitting salesman

from one of the major instrument supply companies left a quart of the best rum with R.J.'s secretary while R.J. was at lunch. The same chap also left a quart on John Bell's desk. John was a staunch Baptist and a man who held the same views concerning drink as R.J. When they both returned after lunch absolute hell broke loose. John had Leslie Wooff, one of the junior draftsmen who was also a member of John's church, take the offending bottle and pour it down one of the washroom sinks, watched in horror by most of the Chart Production staff. R.J. was equally incensed. He gave his bottle to the office boy along with a vitriolic letter about the evils of drink and instructed him to return them posthaste downtown to the company's office. The lad never got past the front door of Number 8. He was intercepted by George Lowe and Ralph Hanson, two of the senior hydrographers who were well known for not sharing R.J.'s views about liquor. They assured the lad that they would take care of the offending bottle and letter.

When R.J. retired he was feted at a party in the Drafting Room, the only space capable of holding all the staff. After the presentations and speeches, we awaited the usual short farewell by the retiree. However, R.J. arose with his Bible in his hand, announced the text he thought suited the occasion and preached a thirty-minute sermon on the evils of drink. It was and probably still is the longest and driest half-hour ever experienced by the staff in the history of the Canadian Hydrographic Service.

In 1953, a momentous occasion was observed when the Civil Service adopted the five-day work week on September 14. For those readers who have spent their careers working five days a week, it may seem to be nothing to get excited about, but at that time it was an event worth recording for posterity.

F.C.G. really came into his own as the Dominion Hydrographer for five years until he retired in 1957. He was a strict martinet but he was fair and the Chart Construction Section was able to fly with its own wings without him hovering over their every move. He was a natty dresser, always attired in a suit or sport jacket. One day he called me down the hall to his office and he was not in a good mood. Ball point pens had just become Government issue and he had been carrying one uncapped and point down in his Harris Tweed jacket pocket. The pen had emptied in the pocket and he had a magnificent blue stain on his impeccable jacket. We had an assortment of solvents and liquids in the Drafting Room, and I tried valiantly to move it, but there isn't anything that I know of to this day that will remove ball-point ink, without a trace, from Harris Tweed except a pair of sharp scissors.

During F.C.G. Smith's reign as Dominion Hydrographer, the Canadian Hydrographic Service crest was designed. Gordon Croll, a fine artist and calligrapher as well as a draftsman, was given the job of creating a distinctive crest for the Service. He worked for some considerable time at it in close touch with F.C.G. and eventually all and sundry, particularly F.C.G., were pleased with the result.

Gordon prepared a full colour drawing of the crest about eight inches wide, and someone somehow got it into the hands of the Canadian High Commissioner in London, who managed to have it set before Queen Elizabeth for her approval. Her Majesty must have liked it, as she signed it, which, as far as F.C.G. was concerned, made it official. The last time I saw it sixteen years ago, the framed original was hanging on the Dominion Hydrographer's office wall. I hope it still is. *[Editor's Note: The original crest is still mounted on the wall of the current Dominion Hydrographer, Ross Douglas, at 615 Booth Street in Ottawa.]*

However, I understand Britain's Royal College of Heralds were most upset when they discovered that the Queen had signed an "armorial bearing" which they had never had the chance to examine. Bypassing the College was a breach of protocol which they didn't like almost as much as they said they didn't like the crest, which they said they never would have approved as it was. That didn't bother F.C.G. He is reported to have smugly stated, "If it is good enough for the Queen, it is good enough for us". The crest has been widely used throughout the Service and recognized throughout the world, except perhaps by the Royal College of Heralds.

F.C.G. - nobody ever referred to him as anything else - and his wife lived in a fine home in Rockliffe Park and in his garage kept a 1936 Packard sedan which he maintained in mint condition. He drove it sparingly only at weekends, never to work or on a long vacation and put it up on blocks each winter. After he retired in 1957, he moved to Annapolis Royal in Nova Scotia after selling both the Rockliffe Park home and the Packard for outstanding prices. He lived comfortably in retirement on his pension and the proceeds until he died at the age of 90. Adam Kerr, Leeman Hunter and I went to his funeral service in the local Baptist church and had a fine time singing "Uncle Cliff's" favourite hymns. During his 25 years of retirement he acquired new CHS charts and would go over them with a fine tooth comb, often sending in his comments and questions. Every time I cross the MacKay Bridge on my way into Halifax, the sight of the "F.C.G. Smith" moored at the Institute dock brings back interesting memories of a good, honest, hard-working man.

At Number 8 we finally managed to overcome the phobia about sticking down all those things that might fall off the chart during the production process. I was given the responsibility of setting up our own typesetting facility, and we ordered fonts of lead type, banks of job-cases and the necessary printing equipment to produce the names and notes. We had no trouble purchasing everything except a small flat-bed proofing press and that is where we ran smack up against the Queen's Printer (QP) and miles of red tape. The QP controlled all printing in the Federal Government and weren't about to allow a drafting office to have a press on the premises which would be used to print something over which they had no control. The obfuscator at the QP who was holding things up finally admitted that a flat-bed proofing press was admirably suited to the production of counterfeit bank notes! We gave up trying to acquire the press the proper way and, with the connivance of the supplier, managed to slip an order to the firm for the press worded so that the QP didn't recognize it as a press but which turned out to be exactly what we wanted. When we upgraded the press a few years later, the unfortunate gentleman at the QP must have retired, as we had no problem.

To do our typesetting and printing, we hired two inexperienced lads, one of whom was Ed Lischenski, and trained them on the job. The other lad didn't stay long and was

replaced by Guy Tremblay. Ed and Guy are still with the firm although I understand Ed hasn't set much type lately. The typesetters worked very hard as the demand for their output was heavy. We no longer had to rely on the skill of a draftsman to hand-letter the names on the chart. Production increased and the chart began to take on the modern appearance that it has today. The typesetters didn't mind hand-composing the lead type, but hated the boring job of breaking it down into the job cases. One day I happened to look out the window into the courtyard below their work area and saw a glittering mound of lead type on the ground! In the early Sixties we switched to our own photo-typesetting, commercial photo-typesetting services then became available and a lot of strain was taken off the two typesetters, who for the first time had clean hands like the rest of the staff in the Section.

In the late 1950's, the development of scribing began. It was slow as there were many technical and photomechanical problems that had to be overcome and commercial equipment and materials were still being developed. One problem was the development of a tool to produce a simple circular dot used almost exclusively in marine cartography for border graduations, depth contours and drying banks of mud and sand. At that time suitable equipment was not available commercially so Ells Walsh adapted a mechanical pencil that had a scribing point on the end of a spiral rod which, to quote his Suggestion Award submission, "converts downward pressure into circular motion thus creating a round dot which leaves no residue on the working surface". He received a substantial cash award for its development.

About 1958 we entered the Boat Show business. The management of the big Toronto Show, which was in either its first or second year at that time, asked us to participate and Norman Gray, the new Dominion Hydrographer, thought it was a great idea. Ells Walsh and I were given the job of producing the exhibit. We appropriated two handy draftsmen, one being Jean-Paul Racette, lumber, sheets of fir and mahogany plywood, put them all into a spare room at Number 8 where they eventually created a creditable exhibit consisting of a sideboard to display folios of charts and panels to display mounted charts along with some homemade lighting. We set the exhibit up for a preview, invited the Deputy Minister who appeared to be quite impressed and then packed it in a van and took it to Toronto. Thus was born the first of many Boat Shows exhibits that eventually took CHS charts and publications to not only Toronto but to Vancouver, Victoria, Seattle, New York City, Boston, Cleveland, Lunenburg, Halifax, Montreal, Rimouski and Ottawa.

The first Toronto Show had two major impacts on the CHS. The first was an awareness of the need of the boater for charts of Ontario's vast recreational waters. We were literally swamped with visitors and were by far the most popular booth at the show. The recreational charting program took off as a result of the public clamor for charts that we encountered. Before leaving Ottawa we had the foresight to prepare a one-page index of the charts of the area and where they could be obtained. The staff of Ells Walsh, myself, Mike Bolton, Austin Quirk and Derek Cooper spent a hectic ten days handing out these sheets and going through folios of charts with boaters. Thus, the second impact of the show was the birth of the Information Bulletin which soon supplanted the formal catalogue in book form that we had been using up to then.

Miss Boat Show, a most nubile young lady who had been suitably charmed and coerced by Mike, Austin and Derek, spent most of her time in our booth handing out the information sheets while suitably clad in what had to be the shortest of short shorts. Possibly her presence helped to bring the crowd into the booth, but I still like to think that the charts were an attraction as well.

We soon began using the services of the Canadian Government Exhibition Commission (CGEC) to professionally produce the exhibits. We no longer had to pack an exhibit and erect and dismantle it on site. CGEC did it all for us, and well, too. CHS staff soon built up an interesting rapport with recreational boaters at the shows from coast to coast in Canada and the USA. It was an annual chance to meet the users of about half the charts we distributed. When I retired in 1974, annual exhibits at Boat Shows were a way of life. Sadly, though, we never used Miss Boat Show again to entice visitors, probably because Mike, Austin and Derek didn't come back to staff the exhibit and none of us had nearly their charm.

Toward the close of the Fifties, the planning and building of the huge map production complex on Booth Street was in progress and we were just champing at the bit to get into our new home. So was Topographic Survey who occupied the top floor above us at Number 8 and who must have suffered from the heat worse than we did one floor below. Geological Survey were finally going to vacate the Victoria Memorial Museum and move to Booth Street so that the Museum could get on with the business of being a Museum. The Photomechanical, Printing and Drafting Sections of Topographical Survey who occupied the old factory-like Labelle Building a couple of blocks from the Ottawa Market were also moving to the Booth Street site and the Army Survey Establishment was moving from Cartier Square.

It all took place in the spring of 1961 and the Chart Production folk thought they had died and gone straight to Heaven. During the first heat wave after they moved in, there they sat in temperature and humidity-controlled bliss in the "technical" area on the third floor. The Administration side had to open windows, turn on fans if they had them and suffer. However, when the "discomfort level" was reached about 1 pm, they went home while Chart Production worked out their regular hours. As one would expect, most of the folk working in air-conditioned comfort were upset to see the rest of the staff heading for home but they had to learn that everything in life has its price.

Number 8 and its seven sisters lasted as active office buildings into the early 80's and then fell to the wrecking crew, who sold almost all of the wooden components of the building. The Wartime Temporary Buildings had lasted forty years and were good for at least another forty when they were demolished. The vacant downtown spaces were soon occupied by modern edifices but the site of Number 8 was an environmental asset, a green park, the last time I saw it, with rounded grassy mounds where some of the rubble of the concrete stairwells lies. Perhaps far in the future, an archaeological dig at one of the mounds might turn up traces of decayed wood, lumps of concrete, a very rusty Gillotte 1000 fine-point pen nib, the metal parts of a mousetrap, a treasure trove of lead

printer's type and shards of liquor-stained porcelain from a washroom sink. The entire mound will undoubtedly display abnormally high temperature readings from the final heat wave that hit the building before it was demolished. It will also contain a thriving colony of cockroaches, a sturdy insect that has long survived man's futile efforts to do it in for thousands of years.

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About the Author

Born in Moose Jaw, raised and educated in Toronto and a resident of Ottawa for 43 years, Bill Covey now lives in retirement in Middleton, Nova Scotia. He worked for the Federal Government for 35 years, 26 of those as pleasurable years with the CHS, first as a cartographer and then as Technical Information Officer. He retired in 1974, one of the first to go at 55 with 35 years' service, a move he has never regretted.

"Number 8" was nostalgically written with memory jogging by Frank Strachan, Clay Fulford and Roy Petticrew for the purpose of acquainting the present CHS generation with life in the Service almost a half-century ago. Memory can be a capricious thing that can easily drop one squarely on the hot seat when committed to print. If Bill has offended anyone or unintentionally misstated a fact, please feel free to drop the Editor a line. Or even better, talk it over with Bill next summer over a cold one on his deck overlooking the meadow in lovely old Middleton, the Heart of the Annapolis Valley.

CHS Chart Construction Staff, Christmas, 1955

Front row, from left to right: Frank Strachan, Joan Hamilton, Ernie Leslie, John Bell, Mrs. Keogan, Maurice Isabelle, Bill Covey.
Second row: Bernie Wilson, Sev Crowther, Rolly Gervais, Harry Kelson, Don Bayne, Eddie Banks, ???, Barry Hanson, Jean Remi Charreyron, Norman Veitch, Lloyd McDonald, Earl Cowell's forehead, Fred Pittman, Bob Mathie, Stan Swettenham, Gordon Spencer, John Maddox, Wayne Connors, Barry Brouse, Ernie Hagar, Roy Petticrew, Yves Pinard, Leslie Wooff.
Third row: Rolly Hamilton, Gordon Croil, Ells Walsh, Dick Cashen, Harold Berg.
Fourth row: Arnie Stanzel, Jean-Paul Racette, Clay Fulford, Jack Wilson

The U.S. Navy's Hydrographic Program

by
Rear Admiral James E. Koehr, USN

Introduction

The responsibility for hydrography in the United States has been divided among several departments and agencies. Although some overlaps in responsibilities occur, in general the Department of Commerce, through the National Oceanic and Atmospheric Administration and the National Ocean Service, is responsible for surveying and charting the jurisdictional waters of the United States; the Department of Defense through the Army Corps of Engineers is responsible for surveys of the inland waterways, navigable rivers, and canals of the United States; and the Department of Defense, through the Defense Mapping Agency (DMA) and the Navy, is responsible for surveying and charting in areas outside the jurisdictional waters of the United States.

Within the DMA / Navy partnership, DMA compiles, produces, prints and distributes the charts and the Navy conducts the hydrographic surveys. If DMA determines that the data for a given chart is deficient for some reason, they task the Navy to conduct the required survey.

The Navy's involvement in hydrography has its roots in the earliest days of the United States. Captain Thomas Truxton, one of the first U.S. Navy captains appointed by President George Washington in 1794, published in that same year his own manual of navigation. The first documented hydrographic survey by any agency of the federal government was conducted by the U.S. Navy in 1811. Commodore John Rodgers used the frigate CONSTITUTION ("OLD IRONSIDES") to conduct a survey of New London Harbor in that year.

The Navy's Depot of Charts and Instruments was established in 1830. Over the years the Depot became the U.S. Navy Hydrographic Office and, in 1962, the Naval Oceanographic Office (NAVOCEANO). In 1976, the modern Naval Oceanographic Office was relocated from the Washington, DC area to a NASA facility, now named the John C. Stennis Space Center, in southern Mississippi.

In 1978, the Chief of Naval Operations established the Naval Oceanography Command at the Stennis Space Center. The Naval Oceanography Command centralized responsibility for several aspects of the Naval Oceanography Program including oceanography and meteorology as well as mapping, charting and geodesy. The Command consists of some three thousand officers, enlisted personnel and civilians at two major production centers, three regional centers and two area oceanography centers. There are also a number of other facilities, detachments and units ashore and at sea, aboard 12 survey ships and 3 survey aircraft. The Naval Oceanographic Office is the largest single element of the command.

USNS CHAUVENET / USNS HARKNESS

Since 1971, the Naval Oceanographic Office has operated two coastal hydrographic survey ships; the USNS CHAUVENET and USNS HARKNESS. Since becoming operational in 1972, the ships have operated overseas almost continuously. CHAUVENET has performed hydrographic surveys in the Republic of Korea, the Philippines, the Bashi Channel, the Caroline Islands, Panama, Indonesia, Somalia and Kenya. The CHAUVENET is now surveying in Djibouti, at the entrance to the Red Sea. The HARKNESS has surveyed in Greece, the Mona Passage, the Dominican Republic, Haiti, Egypt, the Yucatan Channel, Somalia, Oman and is now in Indonesia.

At 393 feet, CHAUVENET and HARKNESS are bigger than most modern hydrographic survey ships. The ships have a beam of 54 feet and a draft of 18 feet. They displace some 4800 tons. Each ship carries about 150 people; 70 in the contractor crew and 80 in the hydrographic detachment (the Oceanographic Unit) including officers, enlisted personnel and civilians. The ships operate at a speed of 13 knots; have a range of about 12,000 nautical miles; and carry four 36-foot hydrographic survey launches. Both ships are equipped with 12 kHz wide-beam echo sounders and both the ships and launches are equipped with dual frequency shallow water depth sounders, medium-range and short-range positioning systems, side scan sonar systems, Global Positioning System (GPS) receivers and automated data collection and processing systems. The two ships are also capable of producing nautical charts on board for immediate use by an operational commander.

36-foot Hydrographic Survey Launches

USNS HARKNESS

CHAUVENET and HARKNESS carry with them the capability to deploy and resupply a shore based radio positioning network and to complete the geodesy necessary to support the shore sites. In order to efficiently establish and resupply up to three sites with enough food, fuel, water and other provisions to permit the three to five people manning them to be self-sufficient over a period of a month or more, the ships carry two 36-foot landing craft and, until this year, a helicopter and its associated ground and air crews.

CHAUVENET and HARKNESS represent a lot of ship, a lot of people and a lot of operating dollars. For the nineties, there is a better way for the Navy to do the job.

USNS MCDONNELL / USNS LITTLEHALES

In 1989, the Navy signed a contract with Halter-Marine Shipyard of Moss Point, Mississippi for the construction of two new coastal survey ships. USNS MCDONNELL is named for Capt. John R. McDonnell, the first Commander, Naval Oceanography Command, and USNS LITTLEHALES is named for George W. Littlehales, the first civilian chief scientist at NAVOCEANO. The two ships, at 208 feet, are about half the length of the CHAUVENET-class ships.

Because they will be operating almost exclusively with GPS receivers, these two ships will be able to do away with the tremendous logistics problems caused by shore sites. The ships will have a beam of 45 feet and a draft of only 14 feet. Survey speed and endurance will be about the same as for CHAUVENET and HARKNESS. MCDONNELL and LITTLEHALES will carry only two 34-foot survey launches. Because they are designed to take advantage of the GPS, the ships will have no capability to deploy and support the medium-range systems; however, both ships will continue to use microwave positioning systems for surveys supporting the larger scale port and harbor approach charts. Both ships will still carry a capability to deploy tide gauges from the sea, but the big landing craft will be gone. The ships will carry about 34 people consisting of a contracted crew of 24 plus a hydrographic detachment of about 10 NAVOCEANO military and civilian hydrographers and electronics personnel.

Although smaller than the CHAUVENET and HARKNESS, LITTLEHALES and MCDONNELL will actually be more capable than the two older ships. One of the main reasons for this increased capability is the use of the GPS. GPS is expected to be the only positioning system used for surveys at scales of 1:25,000 and smaller. Such surveys comprise over 90 percent of all of the surveys conducted from Navy ships. The increased ship time which will result from not having to establish and maintain shore sites is expected to significantly increase the time spent on the actual survey.

Another example of increased capability is a modern multibeam shallow water sonar system, the SIMRAD EM100. The EM100, complete with on-board post-processing hardware and software, is designed for seabed mapping in coastal areas and on the continental shelf in water depths down to about 600 meters.

Except when in port, LITTLEHALES and MCDONNELL will be operating 24 hours a day, seven days a week. With the EM100, they will be collecting many more soundings per mile than ever collected with CHAUVENET and HARKNESS. At the same time, the Navy's hydrographic detachment will shrink by a factor of six or seven. The expected flood of hydrographic data will be handled through a massive use of automation. LITTLEHALES and MCDONNELL will therefore be equipped with leading-edge computer hardware and software for ship and launch conning, data logging, processing, editing and display.

LITTLEHALES and MCDONNELL will also carry better side scan sonar systems and side scan sonar fish handling systems, better sound velocity profilers, and better boom sampling equipment than the two older ships.

To keep up with the data coming in from its hydrographic ships, the Navy is working with the Defense Mapping Agency and the National Ocean Service to improve the interchange of hydrographic data. New hardware, software and procedures are being developed to cut down the large amount of manpower-intensive processing which must now be done. The Navy's goal is to saddle machines with those dull, repetitive jobs that they are particularly well suited for.

Hydrographic Cooperation Program

The Navy is also deeply committed to cooperative surveys with other nations. Prior to 1964, NAVOCEANO provided hydrographic assistance to other nations upon specific request. In 1964, the Harbor Survey Assistance Program (HARSAP) was established. The goal of that program was to assist various South and Central American countries in surveying their ports and harbors to modern standards. Sometime later, the name was changed to the Hydrographic Survey Assistance Program (HYSAP) to reflect a broadening of the program to include offshore areas as well as port and harbors. In 1985, the name was changed again to the Hydrographic Cooperation Program to reflect the growing realization that the Navy was no longer providing assistance to our partner nations but had grown beyond that to a true cooperative venture where each country contributed what they could to the survey effort and each country then shared the products. The Navy's share in the cooperative efforts may include the loan of equipment and survey boats, expert advice from our hydrographers, personnel to help man the host nations' survey platforms, and, very occasionally, the use of a survey ship.

This Hydrographic Cooperation or HYCOOP Program has grown significantly in the past few years. Since 1984, the number of countries with whom the Navy have cooperative survey agreements has grown from 11 to 16 and the intention is to expand this program to a total of 24 nations in the next few years. In 1984, there was only one Hydrographic Cooperation Program regional office. It served the Latin America region. Now there are three more covering the Caribbean states; the Middle East (Europe and Africa region); and the Far East.

HYCOOP agreements may be initiated either by the United States or the other nation. They may be consummated in two ways: either as specific stand-alone country-to-country HYCOOP arrangements, or as annexes to existing contracts such as science and technology exchanges or mapping, charting and geodesy agreements. Projects are tailored to satisfy the mutual needs of the United States and the participating nation, so each cooperative venture is unique. Most agreements address such common provisions as conformance to standards and procedures recognized by the International Hydrographic Organization; provision of personnel, equipment, and services; required geodetic work and equipment; nautical cartography; chart publication schedules and exchange of reproduction materials; data disposition; long-range (five years or more) charting and surveying plans; and immigrations and customs statutes as they apply to the personnel and equipment to be used in the surveys.

Hydrographic Training Program

Hydrographic training has always played a major role at NAVOCEANO and within the Navy. One of the services the HYCOOP Program provides is a six-month intensive course in practical hydrography. Open to officers and civilians of most interested nations, the course is offered annually from April to October at NAVOCEANO in Mississippi. The curriculum consists of modules in mathematics, geodesy, hydrography, oceanography, nautical science, cartography, and law of the sea. A number of payment options including Foreign Military Sales, International Military Education and Training Program, and United Nations Development Program funding and the like are available for participants.

The course currently offered is a shortened version of a one-year course taught by NAVOCEANO from 1952 through 1981. It was instituted in 1986 and received a Category "B" certification from the International Hydrographic Organization and the International Federation of Surveyors, in 1989. Since 1952, over 400 students from 45 different countries have graduated. Many of the graduates have achieved prominent positions in their own nation's hydrographic or mapping services.

Geomagnetics

Another aspect of the Navy's support to navigation and charting is the geomagnetic program. The compass roses on nautical charts come from a world magnetic chart model developed by the Naval Oceanographic Office in cooperation with the British Geological Service.

The earth's magnetic field, being neither stationary nor constant in physical configuration, requires measurements on a continuing basis. NAVOCEANO is the only organization in the world performing full-time worldwide airborne magnetic data collection directed at complete definition of the geomagnetic field. Since its beginning in the early 1950's a number of airplanes have served as the platform for this data collection effort. The current Project MAGNET airplane is a specially-configured RP-3D.

On April 11, the United States launched our Polar Orbiting Geomagnetic Survey satellite (POGS) from Vandenburg Air Force Base. Control of the satellite will be at the Navy's Mississippi ground station. Two remote tracking stations, one in Fairbanks, Alaska, and another to be installed in Edinburgh, Scotland will complete the ground segment of the POGS experiment. It is expected that the data collected from

the POGS will significantly reduce the Navy's use of the Project MAGNET airplane for the World Magnetic Chart Model.

POGS is not the Navy's first use of satellites for hydrography and will not be the last. In addition to the Navy Navigation Satellite System which has been used for positioning since the sixties, the use of the Global Positioning System should allow the Navy to streamline hydrographic survey operations.

Advanced Survey Technology

The Navy is also involved with hydrographic research and development. The leading lab for mapping, charting and geodesy is the Naval Oceanographic and Atmospheric Research Laboratory (NOARL), formerly the Naval Ocean Research and Development Activity (NORDA), co-located with us at the Stennis Space Center in Mississippi. Over the past several years, this lab has been very active in applying remote sensing technology to hydrographic applications and in the use of digital data to support Navy requirements.

In 1972, the Navy determined the feasibility of using lasers to measure water depths from the air. NOARL has continued working with lasers for hydrography. Using the NOARL-developed prototype Hydrographic Airborne Laser Sounder to collect test data sets, NOARL has developed processing algorithms and techniques to handle the tremendous amount of data which would result from an airplane surveying to international standards.

NOARL has also developed algorithms for the extraction of bathymetric data from multispectral scanner data. The Navy has been pursuing multispectral scanner technology as the airborne analogy to a side scanning sonar, filling in the gaps between laser sounder pulses. Again, a NOARL-developed instrument, the "NORDA" Scanner," has been used to collect data sets for this work. NOARL has also participated in the development of algorithms to process data from a solid state version of their scanner. This airborne multispectral 'pushbroom' scanner will be installed in one of the oceanographic airplanes for collection of a variety of ocean parameters until a laser sounder capable of performing to Navy specifications and in NAVOCEANO's operating environment becomes available.

Another sensor being developed by NOARL permits the determination of water depth by monitoring the secondary field generated in the water by an airplane towing an electromagnetic-field-producing primary coil. Still in the early stages of development, the sensor shows a lot of promise as a means of hazard detection and may eventually be able to actually determine water depths to international standards. The airborne electromagnetic bathymetry system may have some oceanographic applications as well including measuring salinity, ice thickness, and bottom conductivity.

NOARL, with other Navy labs, has continued to be active in developing tidal models. An ultimate goal of NOARL's work in this area is to reduce the number of tide gauges necessary to correct the bathymetry collected in hydrographic surveys. Because Navy ships usually operate in remote areas of the world, it is rare that a tide gauge network is already in place. The setting up of a tide gauge network is another of those time-consuming jobs that must be done from ships. If it could be determined just where to position each of the gauges to get the most out of the effort, the time saved could be spent on the actual survey.

The Navy is beginning to use electronic charts on a number of its platforms, most notably the Helicopter Amphibious Assault Ships and Air Cushion Landing Craft. Much more could be done and much more will be done with electronic charts. However, while electronic charts are clearly the future of charting, paper chart products are not going to go away soon.

Conclusion

In conclusion, the United States Navy continues to put an appropriate emphasis on its hydrographic responsibilities. International trade and commerce as well as national defense depend on good, up-to-date, modern charts. As more ships begin to operate with global positioning satellite system receivers, it is essential that the positional accuracy of our charts keeps pace. The maritime infrastructure in many coastal waters has grown in complexity with large increases in the numbers of fixed and floating aids to navigation, new port facilities and highly regulated coastal traffic procedures. The electronic chart and requirements for digital data will clearly put new demands on producers of hydrographic products.

In an environment of shrinking budgets and varying national priorities, however, Navy hydrography is holding its own. New ships with improved capability, continued growth in cooperative ventures with other nations, increased automation, the use of satellites and remote sensing from aircraft are examples of what "Navigating the Nineties" will involve. With fewer dollars available, it will be incumbent on the Navy to use those dollars which are available, smarter than ever before.

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Real-Time Differential GPS: The Ultimate Positioning System for Hydrographic Surveys

by
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Introduction

Quantum leaps in positioning technology rarely occur. The last one was during World War II with the invention of the first electronic positioning systems. The one prior to that occurred in the late 1700s when the chronometer was invented thus allowing longitude to be measured. The Global Positioning System (GPS) promises to provide the next quantum leap in positioning. Its capabilities and availability are not just an incremental improvement over what went before but a revolutionary development with far reaching implications for people in all walks of life.

Hydrographic surveyors will be affected as much as anyone else. Anticipating this, the Canadian Hydrographic Service (CHS) has, over the last 8 years, studied all aspects of GPS in preparation for when the system becomes fully operational. These studies have covered many of the technical aspects of how to achieve maximum performance from GPS and have resulted in the receiver testing described later in this paper. The studies have also examined some of the non-technical aspects of GPS that qualify it as a quantum leap forward. For hydrographers the effects are felt on two fronts:

1) the effect GPS will have on how we collect bathymetric data;
2) the effect GPS will have on how bathymetric data will be used by navigators.

1) The Effect of GPS on Hydrographers

Hydrographers in the CHS are being caught in the same cost squeeze as most other sectors of government. They are required to perform more and more detailed surveys at the same time as budgets are being trimmed. In this situation GPS promises to deliver the gains in productivity needed to carry out our mandate.

Hydrographers have a great range of positioning requirements depending on the scale of each survey. In critical harbour areas, the positioning requirement is about +/- 1 metre. For offshore surveys 100 metre accuracy might be sufficient. No matter where data are collected data there is a need to have a good estimate of what the accuracy of each position fix is.

A wide variety of specialized survey positioning systems presently exist which can fill all present positioning needs. Each of these systems however, must make a trade-off between wide coverage and high accuracy; wide coverage implies less accuracy and vice versa. The cost of acquiring installing and maintaining these systems during a survey constitutes a large portion of the effort involved in carrying out a survey.

Differential GPS (DGPS) promises to provide a single positioning system that will meet the most stringent present and foreseeable future needs. It will eliminate the need for establishing traditional geodetic control points and shore transmitters. It will be able to provide both high accuracy and wide coverage while at the same time reducing equipment and operating costs.

To quantify this anticipated cost benefit, the CHS carried out a cost/benefit analysis based on 18 typical surveys already completed using conventional terrestrial systems [3]. Work statistics from these surveys determined that had GPS been used on these surveys, an average gain in productivity of 42% would have been experienced. This conclusion was based on the assumption that the time and money spent on establishing, calibrating and maintaining shore transmitters could be converted into acquiring depth soundings. If these figures are borne out in practice, the productivity gains alone will make a large difference in the level of service that hydrographers can provide.

2) The Effect of GPS on Chart Users

While the cost/benefit of GPS for hydrographic surveying is important, there is a larger GPS impact that must also be anticipated: GPS will be a major enabling technology for the widespread use of Electronic Charts (EC). Once implemented, the EC will greatly improve the ease and safety of all types of navigation.

In essence, an EC displays to a navigator a digital version of chart data on a computer screen. An electronic positioning system constantly inputs a position to this computer which then precisely animates an icon of the ships position across the underlying chart graphics. This provides a continuously updated view to the mariner of where he is with respect to underwater hazards. While other positioning systems could provide the continuous positioning needed to run an EC, only differential GPS provides the coverage, accuracy and integrity needed to exploit the EC concept to the fullest.

There is far more to the EC than simply the automatic plotting of the vessels position. The computerized environment permits a number of other EC capabilities that can greatly improve convenience and safety. Some of these possibilities are [1]:

- zooming into the data to show complex areas at a larger scale than the paper chart;
- automatically plotting radar targets onto the EC thus making collision avoidance manoeuvres much safer;
- facilitating route planning by composing the waypoints of a voyage interactively on the EC screen and storing them for future use;

- reducing tides in realtime; and
- automatically warning of potential groundings or collisions

The potential danger associated with these new capabilities is that they tend to lull the mariner into a false confidence in the accuracy of the old bathymetric data underlying the modern EC format. The result could be more dangerous voyages since the mariner will feel confident in his ability to sail close to dangers. This tendency to push the safety limits of the chart data itself will become a major concern of all hydrographic offices.

To maintain a margin of safety, hydrographers have traditionally used a positioning system that is much more accurate than that available to the marine community. When differential GPS is fully implemented, this margin of safety will no longer exist. A mariner using differential GPS will be able to navigate with an accuracy of a few metres whereas the hydrographic survey used to collect the original chart data might well have been positioned with much poorer accuracy. To maintain a safety factor hydrographers must strive to achieve two things:

1) to ensure that the navigators new confidence in the chart data displayed on his EC is well founded either by resurveying areas or warning the navigator of questionable source data; and
2) to develop and employ the most accurate and reliable methods of using GPS for data collection.

This second objective has been the driving force behind the GPS R&D work carried out by the CHS.

C.H.S. Research and Development Activities in GPS

In an effort to attain this goal, the following experiments have been carried out:

1981 - A STI-5010 receiver was deployed aboard the oceanographic vessel Hudson [8]. The STI 5010 was the first available receiver and as such it was very large, expensive and slow. Despite these drawbacks, the experiment convinced the CHS of the potential of GPS for marine positioning.

1983 - Two TI-4100s in differential mode were used in an aircraft during testing of a laser airborne bathymeter. A Trisponder microwave positioning system provided the primary navigation and served as a reference for evaluating the GPS positions. Ten-metre accuracy was observed.

1985 - An experiment was conducted using TI-4100s in a moving truck to eliminate the uncertainty of the reference positions. Optical triggers positioned along the road provided very accurate point positions with which the GPS positions were evaluated. The ten-metre accuracies observed in the airborne tests were duplicated using CHS post-processing differential software [6].

1986 - The CHS incorporated a phase-smoothing algorithm into their software to make use of all of the GPS observations. Various algorithms were also tried out for both cycle-slip detection and L1/L2 ionospheric corrections. Both a ship and sounding launch were used with reference positions provided by a highly redundant mix of microwave and laser lines of position. The observed kinematic accuracy of GPS was 2-3 metres.

1987 - Tests were carried out to determine the effect of multipath on both static and kinematic GPS. A motorized oscillating mast was constructed to move the antenna and provide reference positions accurate to within a few centimetres. Controlled multipath errors were induced in both static and kinematic modes to determine the effect of antenna movement on this error source. The effect of using a radio frequency absorbent groundplane was also studied [5].

An airborne test was also carried out in 1987 using the software developed by the CHS. Aero-triangulation was used to provide reference positions. The agreement between the GPS positions and the photogrammetric positions during the flight was better than 1 metre [2].

1988 - Differential data links were tested using an HF radio link and various data modems. A simulated GPS message was transmitted and checked for error rates over a variety of ranges and terrain conditions [7].

A number of interesting findings have resulted from these experiments which are documented in the references.

HYDROSTAR Development

The CHS had control over all the processing software during these experiments, and thus could better understand what was happening with the data. During the 8 year period of experimentation, a lot of software was written to perform the different tests, try out different processing algorithms and to support data logging and navigating during the field trials. This R&D software was developed for the CHS under contract by Nortech Surveys of Calgary.

This software developed to the point where instead of just a R&D testbed, it had all the ingredients of a package that could be used for production surveys. The CHS decided to upgrade this software into a field ready package called "HYDROSTAR". The upgrade has addressed a number of problems that were in the original version:

Modern computing platform

The experimental software was written in Pascal on a Hewlett Packard series 200 computer. While the HP is a rugged machine it has become outdated. To address this problem, all of the Pascal code was translated into the C language and ported into MS-DOS. The present CHS HYDROSTAR package uses Toshiba 386 laptop computers for processing, both at the differential monitor and on board the survey launch.

Multiple data sources

The old software could only decode raw data from the TI-4100. The new Hydrostar will read data from the Ashtech, Trimble 4000 and Norstar 1000 receivers. This flexibility in

observing raw data is one of the advantages in using a PC-based processing package instead of relying on any given manufacturer's firmware. It has allowed the CHS to test the different receivers as described later in this paper.

ISAH Compatibility

The CHS has standardized on the Integrated System for Automated Hydrography (ISAH) for all on-board data logging and navigational display functions. HYDROSTAR has now been interfaced with ISAH, therefore the logging and navigation display functions that were in the prototype software have been eliminated.

Data Link

CHS tests concluded that low band VHF (50 MHz) would be ideal for the range and data rates that are required. The PC laptops were interfaced to a DataRadio MDLC data modem and Kenwood VHF transceivers to provide the differential link. The link will operate at up to 4800 baud and accommodates store and forward repeater operation. The full RTCM differential data format has been implemented. This move was primarily to allow HYDROSTAR to broadcast standard differential data to the public in the future.

Heave Correction

The PC is now interfaced to a low-cost pitch and roll sensor. HYDROSTAR employs a heave-filtering algorithm developed at the University of New Brunswick, which uses attitude information to reduce the short-term vertical movement of the GPS antenna into the heave induced vertical movement of another sensor located on the same vessel. If testing proves these heave estimates to be accurate enough, the CHS will be able to use these heave estimates to correct measured depths.

Calgary Test

The mandate of the CHS R&D program was not necessarily to develop production GPS software but to fully understand the problems associated with GPS and identify optimal solutions. If a PC-based processing package such as HYDROSTAR is the required solution then it will be adopted for production surveys. If firmware within commercial receivers such as the Ashtech or Trimble can provide the same level of performance and flexibility then it will be simpler and cheaper to opt for an all-in-one solution.

In order to make this decision the CHS is collaborating with Nortech Surveys and the University of Calgary, Department of Survey Engineering to perform a comparative test that will involve using the HYDROSTAR software together with Ashtech, Trimble and Norstar receivers.

Raw data from the different test receivers will be collected simultaneously in a simulated survey launch environment. This will be accomplished using the same oscillating mast apparatus constructed 2 years ago for the multipath testing. The mast is being modified to provide vertical as well as horizontal movement in order to test the heave compensation algorithm in HYDROSTAR. The mast, which is set up on the roof of the engineering building at the University of Calgary,is instrumented to provide absolute reference positions for the test antennas that are accurate to +/- 1 cm. The monitor station for each of the receivers being tested will be located at the same site within 25 metres of the simulated launch. The monitor antenna will be protected against multipath contamination by a special r.f. absorbing groundplane.

There are four goals for the Calgary test which, if met, will allow CHS to proceed with procuring GPS hardware for its production surveys. These are:

1) to evaluate current receiver hardware;
2) to evaluate current receiver software (both internal receiver firmware and external PC packages);
3) to evaluate the "Integrity Monitoring" ability of each software solution; and
4) to evaluate the performance of heave estimates obtain able from GPS observations.

The results of these tests will be reported on in a future edition of Lighthouse.

Conclusion

The C.H.S., through its work with Nortech Surveys of Calgary, has invested considerable resources to studying the use of GPS for hydrographic surveying and also to develop a GPS processing package for hydrographers. Further tests are required to consummate this R&D work and to allow the CHS involvement with GPS to proceed to the production stage in an informed manner.

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An Estimation of the Human Error in a Manually Scaled Echo Sounding

by
Geof Thompson

Introduction
Scaling, in hydrographic terms, is the manual reading of depths from an echo sounder graphic record; the sounding roll. Acoustic echo sounders are standard equipment on all but the most advanced hydrographic survey systems and even with advancing data collection technology, echo sounders will still be an integral part of hydrographic surveying for many years to come.

In most cases the echo sounder is coupled to a graphic chart recorder. The chart from this recorder is used extensively in both automated and manual data collection and processing. The sounding roll provides:

- the only record of the bottom, in a manual survey;
- a pseudo-profile of the bottom;
- a hard copy, for verification of the digital file; and
- a hard copy back up, in case of corrupt digital data or a failed data logger.

Hydrographic surveys are tending to become more and more automated. However, there is still a need to examine and use sounding rolls because hydrographers want to compare the roll to the digitizer and may want to use the roll to interpolate the morphology of the sea bottom.

The purpose of this article is to present and discuss the results of a test designed to estimate the random errors in a single sounding due to human errors in scaling. The article examines the error in a single sounding as scaled by a group of C.H.S. hydrographers.

The reason for this test is to establish a benchmark level of precision to be used in qualifying and verifying historical and modern data. The test is the first step in establishing a realistic noise level for a sounding given that all other systematic errors are removed.

The project was started in the spring of 1986 and completed in the spring of 1987. The test subjects were all hydrographers employed by The Canadian Hydrographic Service (CHS), Central and Arctic Region, who had many years of field experience. The test material was an actual sounding roll with three distinct types of bottom terrain: smooth and flat; smooth and rolling; and rough and rolling. The sounding roll was taken from a Ross Fineline model 801 sounder and used at a scale of 0 to 25 metres.

The test consisted of six parts:

1) the selection of a sample sounding roll and test subjects;
2) the repeated scaling of the sounding roll by the test hydrographers;
3) the selection and correlation of test points;
4) the testing of the data against the 'F' statistic;
5) the estimation of an appropriate standard error; and
6) conclusions and recommendations.

Selection of a Sample Sounding Roll and Test Subjects
The selection of a test sounding roll was the first element in the design and execution of the test. Great care was taken in the selection because if the test was to have any validity the test sample must be as close to reality as possible.

Sounding rolls from several different types of echo sounders and several different locations were examined. The goal was to find a typical sounding roll. After careful consideration, a sounding roll from a Ross 801 Fineline was selected. The Ross 801 produces a paper graph on which the depth graduations are already printed. The Ross 801 produces a clean, clear graph. More importantly, it produces a graph which is similar to most of the graphs produced by the sounders used in C.H.S. hydrographic surveys over the last 10 years. The Ross sounder is used widely throughout the North American hydrographic community.

The chart paper used in the Ross sounder has printed lines on it to aid in scaling. Occasionally the graduated lines shift in relation to the top of the paper sounding roll due to a less than perfect printing process. The test subjects were told to ignore these shifts.

The trace on any sounding graph is not a continuous line. It is rather a series of closely spaced vertical tick marks. These tick marks seldom, if ever, line up exactly and as a result sounding graphs tend to become "fuzzy". The Ross 801 has some of this "fuzz" on its graph, but when compared to other sounders it is not excessive. The "fuzziness" of the trace is important because when a sounding is scaled it is from top of the trace, which is not a distinct line due to the fuzz. This report will examine the extent to which individuals differ when reading the top of the trace.

After selecting a "typical" sounder, the next element in the test was to find a sounding roll with several bottom terrains. Portions of a sounding roll from the Frenchman's Bay area of Lake Ontario were selected. On this roll, three distinct bottom terrains were identified. The first terrain was a smooth flat bottom ranging in depth from 15 to 20 metres (Figure 1). The graph for this area is clear and easily scaled. It is a typical graph of a hard clay bottom. The second terrain was flat with spikes (Figure 2). It ranged in depth from 0 to 20 metres and was difficult to scale because of its spiked nature. The terrain on this graph is typical of a boulder-covered bottom. The final terrain was smooth and rolling with several steep slopes (Figure 3). The depths ranged from 0 to 4 metres. This terrain

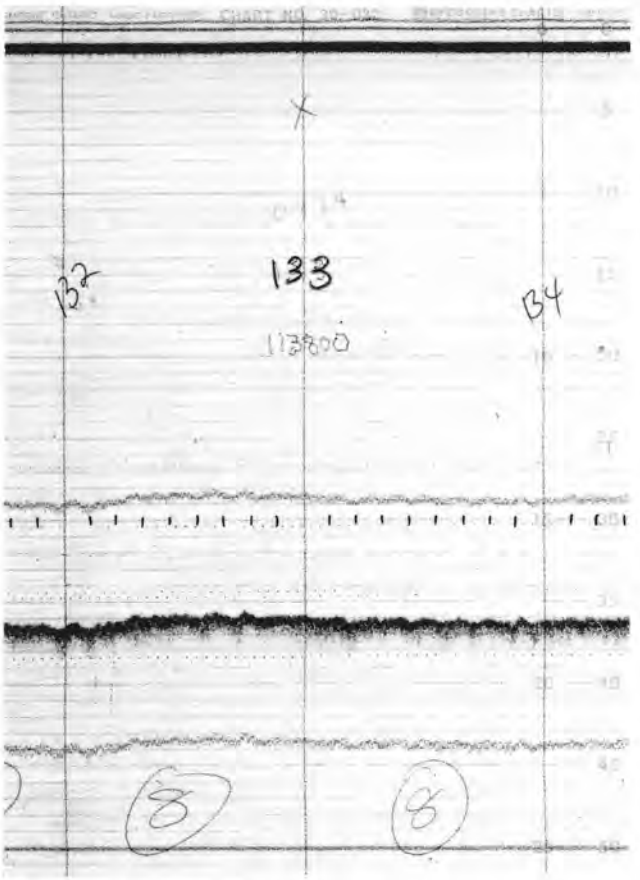

Figure 1: Terrain #1 - smooth and flat bottom

Figure 3: Terrain #3 - smooth and rolling bottom

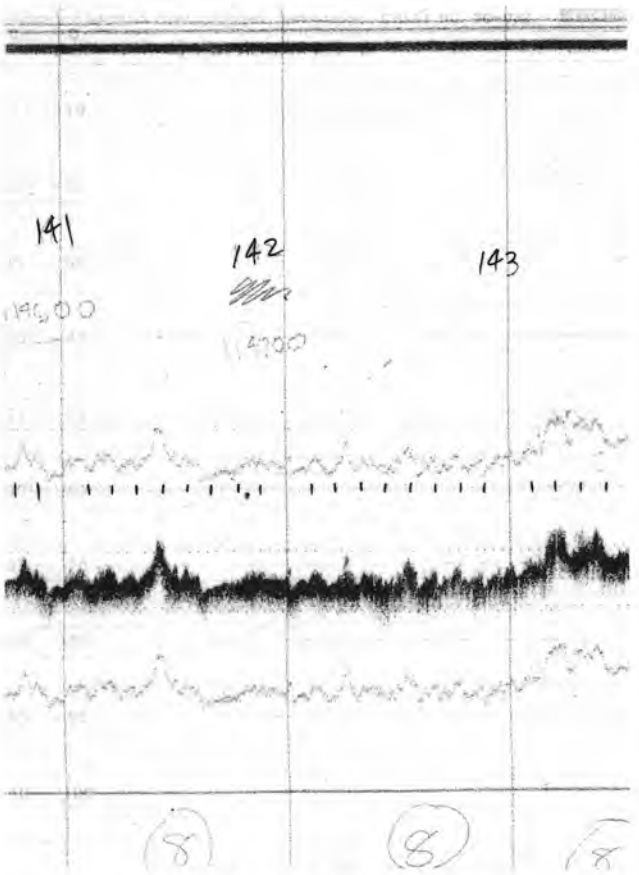

Figure 2: Terrain #2 - spiked bottom

is typical of a hard sand bottom and relatively easy to scale.

The last element in this stage of the test was to find volunteer test subjects. Five field hydrographers came forward. Their experience ranged from 10 to 15 years. All five were active in field hydrography at the time of the test. The volunteers were all hydrographers with the Canadian Hydrographic Service, Central and Arctic Region. There are 27 field hydrographers in the Central and Arctic Region thus the volunteers represented 18.6 percent of the population. They represent a good cross section of the population and may be considered "typical".

Repeated Scaling of the Sounding Roll

The test subjects were instructed to scale the test roll with no more or no less care than they would use if they were scaling a roll of actual field data under field conditions. Each hydrographer scaled the sample roll ten times. They were also instructed to scale the roll no more than twice a day with at least three hours between scalings. The repeated scalings were conducted so that a statistical analysis could be performed on the data. The timing was set to try to eliminate any bias in scaling caused by the hydrographer's memory.

The test hydrographers were also instructed to scale the roll as if all the conditions affecting a sounding roll were perfect. They were told to assume that:

- there was no transmission line slip;
- there were no printing errors in the paper; and
- that the calibration line remained constant.

By assuming the above to be constant any difference between two or more repeated scalings of the same point would be the random error introduced by the hydrographer scaling the roll.

The data were recorded on C.H.S. Hydro Form 22 (Figure 4) and the roll was scaled at the 0 to 25 metre scale on the first phase of the Ross sounder. The test subjects scaled all the divisions and were not told which data points were to be used in the statistical testing. This was to try and make the conditions under which the roll was scaled as close to reality as possible. The points selected as sample points were chosen after the scaling, but before looking at the recorded data. This point selection was performed to ensure that this was a blind test.

Selection and Correlation of Test Points

There were far too many points on the sounding roll to test all of the scaled soundings, therefore to reduce the size of the data set and make the analysis more realistic a selection of the data was made,and divided by terrain. By grouping the data by terrain and pooling it, the number of degrees of freedom remained small enough to allow testing with the possibility of rejection. If all the group data had been used the number of degrees of freedom would be so large that virtually all values for an individual reading would have been accepted.

The third division after the fix mark was selected as a sample point, for the following reasons:

1) A division was selected rather than a fix because the fix is marked by a solid line. Soundings at these marks can be scaled with substantially more precision than the soundings scaled between the fixes. By using a division there is an error in both the vertical (depth) and the horizontal (along line). Both the vertical and horizontal errors contribute to the scaling error being examined in this report.

   The soundings between the fixes are also more representative of the data set since there are usually more soundings between fixes than at the fixes.

2) The third division was chosen because there were at least three divisions between each fix, thus ensuring that a test point existed between each fix mark.

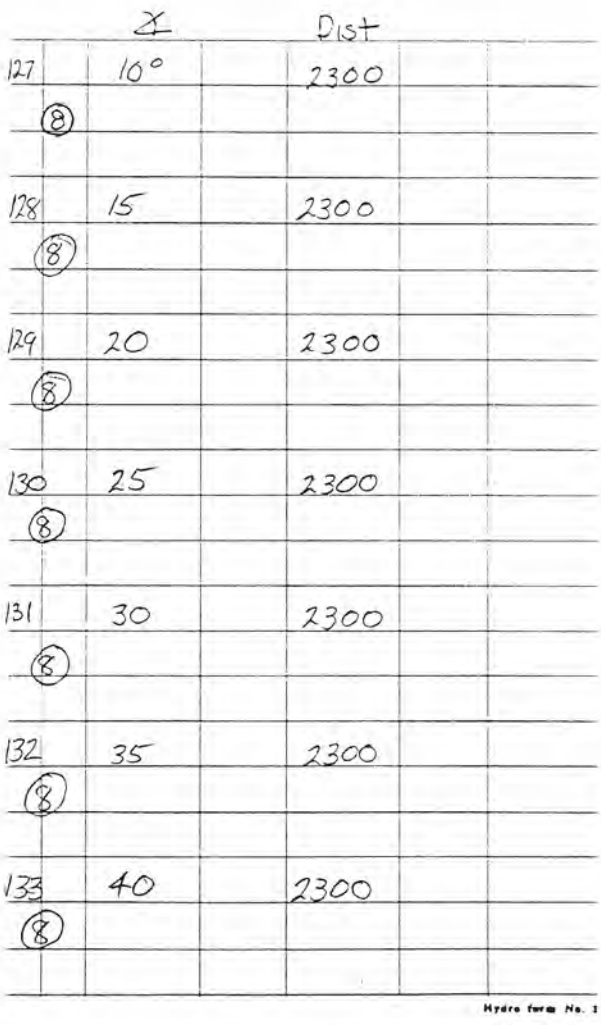

Figure 4: Typical sounding notes on Hydro form 22

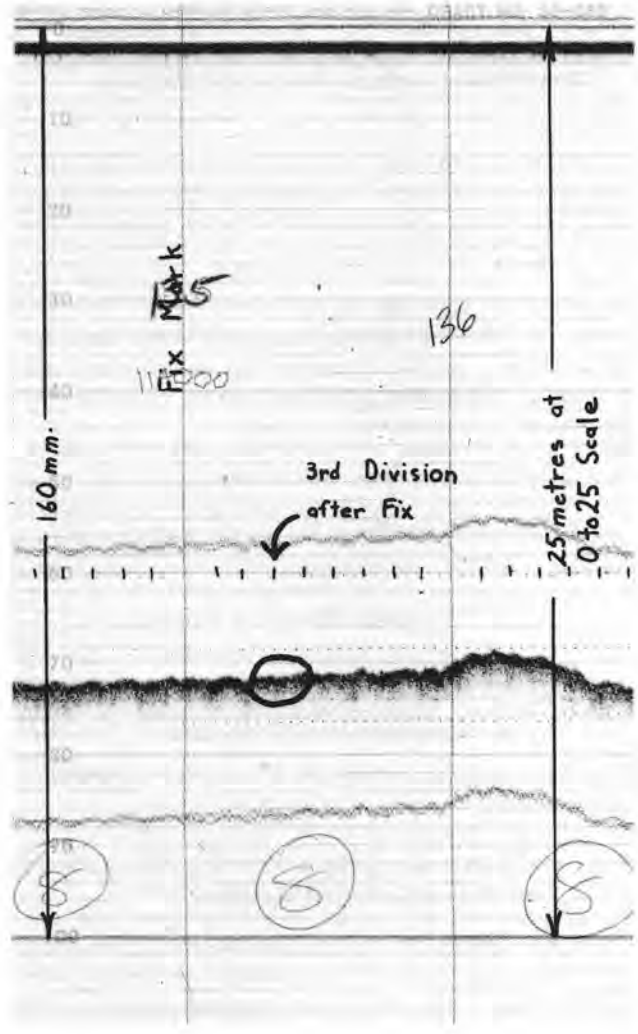

Figure 5: Typical data point on sounding roll

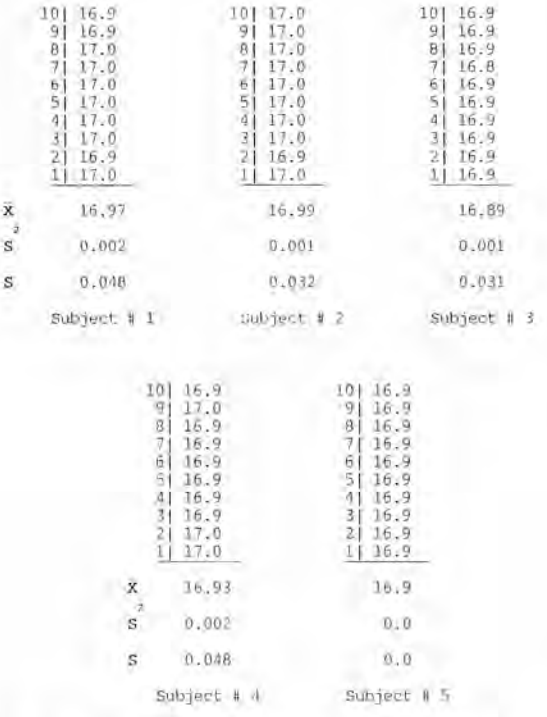

Figure 6: Tabulation of a single scaled sounding at data point and the mean, variance and standard deviation

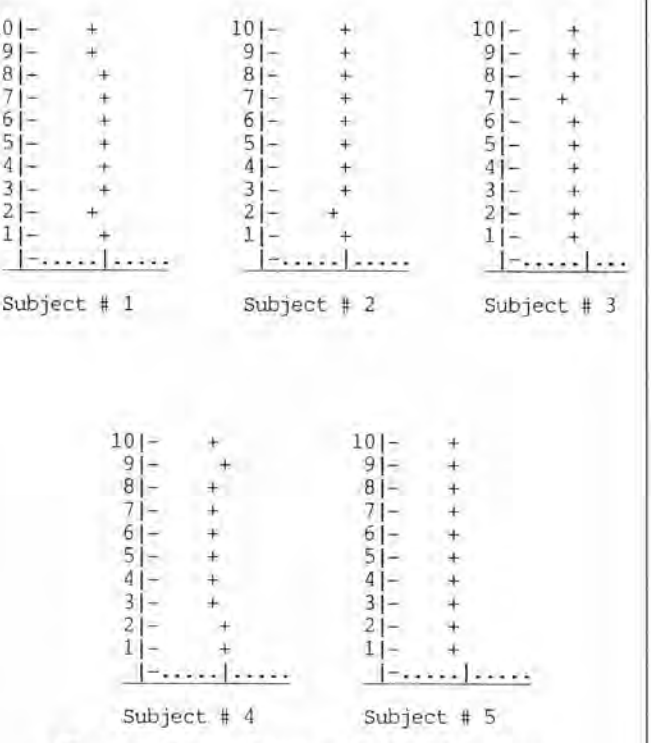

Figure 7: Scatter diagrams of data point values

The selected scaled soundings (data points) from each hydrographer were tabulated (Figure 6), scatter diagrams for each point drawn (Figure 7) and the mean, variance, and standard deviation were calculated.

Test for the "F" Statistic

The readings from the sounding rolls were in fact observed measurements. Survey measurements were normal and independent. To state this another way the model for any measurement can be written:

$$y_{ijk} = m_i + \alpha_{ij} + E_{ijk}$$

where: i is the number of the sample point (1 to N);
j is the hydrographer number (1 to 5);
k is the number of the repetition (1 to 10);
y_{ijk} is the scaled value of the sounding;
m_i is the true value of the sounding;
α_{ij} is the effect for hydrographer j at point i; and
E_{ijk} is the random error of the mean.

For the purpose of this analysis we will assume that there was no personal bias.

The hypothesis that was tested is that the variance of each sounding read is equal to the null condition, or:

To test this, five 'F' statistics were calculated and compared to the 'F' tables.

The 'F' Statistic was formed and is the residual sum of the squares for each terrain. The above statistic has 9(N) degrees of freedom and estimates a normal distribution. The results are tabulated in Table 1.

From the tabulated results it can be statistically shown that on a clear smooth bottom the Null Hypothesis holds. That is to say all five hydrographers were scaling the roll at the same point. However, what is more important to note is that the Null Hypothesis was rejected strongly for terrains #2 and #3, the more complex bottom topographies.

To summarize this calculation; when the group of hydrographers scaled a smooth and flat portion of the sounding roll the statistical test implied that there was very strong agreement between hydrographers and they were likely scaling the same point. However, as the bottom became more complex, each hydrographer's perception of the bottom was different and it would seem that there is a strong personal effect on a single reading of a sounding for the same point. Simply stated each hydrographer reads the "fuzz" slightly different.

Estimation of an Appropriate Standard Error

The major objective of this report was to calculate an appropriate standard error in a sounding caused by human reading errors. The value of this error can be estimated by the following formula:

$$\sigma 2 = \frac{1}{49N} \sum_{i=1}^{N} \sum_{j=1}^{5} \sum_{k=1}^{10} (y_{ijk} - \bar{y}_{i...})^2$$

where;

$$\bar{y}_{i...} = \frac{1}{50} \sum_{j=1}^{5} \sum_{k=1}^{10} y_{ijk}$$

Terrain #1	Terrain #2	Terrain #3
$F_1 = \frac{0.243/9\ (10)}{(0.972-0.243)/36\ (10)} = 1.328$	$F_1 = \frac{0.177/9\ (5)}{(1.801-0.177)/36\ (5)} = 1.744$	$F_1 = \frac{0.450/9\ (20)}{(7.099-0.450)/36\ (20)} = 1.020$
$F_2 = \frac{0.117/9\ (10)}{(0.972-.117)/36\ (10)} = 0.544$	$F_2 = \frac{0.423/9\ (5)}{(1.801-0.423)/36\ (5)} = 5.049$	$F_2 = \frac{1.035/9\ (20)}{(7.099-1.035)/36\ (20)} = 2.731$
$F_3 = \frac{0.081/9\ (10)}{(0.972-0.081)/36\ (10)} = 0.368$	$F_3 = \frac{0.252/9\ (5)}{(1.801-0.252)/36\ (5)} = 2.603$	$F_3 = \frac{0.594/9\ (20)}{(7.099-0.594)/36\ (20)} = 1.461$
$F_4 = \frac{0.099/9\ (10)}{(0.972-0.099)/36\ (10)} = 0.448$	$F_4 = \frac{0.513/9\ (5)}{(1.801-0.513)/36\ (5)} = 6.376$	$F_4 = \frac{2.427/9\ (20)}{(7.099-2.427)/36\ (20)} = 8.312$
$F_5 = \frac{0.432/9\ (10)}{(0.972-0.432)/36\ (10)} = 0.320$	$F_5 = \frac{0.427/9\ (5)}{(1.801-0.427)/36\ (5)} = 4.972$	$F_5 = \frac{2.593/9\ (20)}{(7.099-2.593)/36\ (20)} = 9.207$
from the 'F' Statistic Tables:	from the 'F' Statistic Tables:	fromthe 'F' Statistic Tables:
$F_{0.01} = 1.29$ $F_{0.05} = 1.18$	$F_{0.01} = 1.66$ $F_{0.05} = 1.43$	$F_{0.01} = 1.29$ $F_{0.05} = 1.18$
The values of the five 'F' statistics are less than the two 'F' statistics from the tables. Therefore, the measurements would appear to be largely independent.	The values of the five 'F' statistics are greater than the two 'F' statistics from the tables. Therefore, the measurements would appear to be non-independent. However, Terrain #1, a smooth, flat terrain showed independence. Thus it would appear that the errors are related to bottom type and not the hydrographer.	The values of the five 'F' statistics are greater than the two 'F' statistics from the tables. Therefore, the measurements would appear to be non-independent. However, Terrain #1, a smooth, flat terrain showed independence. Again it would appear that the errors are related to bottom type and not the hydrographer.

Table 1: Test for the 'F' Statistic

The results are as follows:

Terrain # 1	$\sigma^2 = 0.002$
	$\sigma = 0.004$
Terrain # 2	$\sigma^2 = 0.004$
	$\sigma = 0.060$
Terrain # 3	$\sigma^2 = 0.013$
	$\sigma = 0.120$

Conclusions and Recommendations

The above standard errors indicate several things. First, in the overall worst case, terrain # 3, the standard error is about 1 decimeter (0.120 m.). CHS hydrographers usually state that a sounder graph, like that of a Ross 801 on the 0 to 25 scale, soundings can be scaled to the decimetre. The test seems to indicate that the hydrographers are correct.

Secondly, there is a very strong relationship between bottom topography and the precision to which the depth is scaled. The rougher the bottom the worse the repeatability.

Finally, when all the above standard errors are looked at together the test shows that the manual methods used by the CHS for scaling are well within the accuracy required by hydrographers. It should be noted however, that it would be dangerous to use hydrographic data where greater accuracy is required. It is also important to note that this is only an examination of one of several sources of error in a sounding.

The test results indicate that manually scaled soundings from a Ross 801 sounder at the 0 to 25m. scale have a standard error of about 0.120 metres. They also strongly indicate that the smoother the bottom the smaller the standard error, or better the precision. The test also shows that the precision of the sounding is more dependent on the bottom topography than the hydrographer scaling the roll.

The Ross 801 sounder has a 160 millimetre vertical graph which for this test repesented 25 metres. If we convert by direct ratio the standard error of 0.120 metres to the true distance on the graph it becomes 0.8 millimetres.

Therefore: 0.120 m. = 0.765 mm. (or 0.8 mm.)

The simple calculation above allows the application of the test results to any sounder at any scale. For example, the following table shows a method of comparing soundings from different sounders and could be useful when comparing different sources for charting.

Sounder	Scale	Graph ht.	Factor	Error
Ross 801	0-25	160 mm.	0.8	0.120 m.
Ross 801	0-50	160 mm.	0.8	0.240 m.
Typical	0-50	200 mm.	0.8	0.191 m.

It is important to note that this represents an examination of only one of several sources of error found in a recorded sounding. Other non-systematic errors could be present such as errors in estimating the velocity of sound in the water column. There are also numerous other systematic errors in a sounding which all add to the error in any given depth. Testing of these systematic errors in soundings is needed. Some areas to be looked at are: sounder repeatability; the effect of varying power on a recorded depth; and the effect of varying beam width on a recorded depth.

The field person can for the most part remove systematic

errors by proper field procedures. Thus, as in all surveying, only the random errors are left.

Over the years hydrographers have developed rules of thumb for daily hydrographic work. In Central and Arctic Region of the Canadian Hydrographic Service, it was generally held that our rolls were scaled to a decimetre. But it was felt that because of effects such as topography and bottom quality that accuracy was worse than the 1 decimetre level. After several months of work by volunteers and pages of simple statistical calculations, the hydrographer's "gut feelings" seem to be correct. Manually scaled sounding rolls can be read to about 0.8 mm. or, as it turns out, 1 decimetre at the scales normally used in Central and Arctic Region.

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1. Dillon, William R., and Matthew Goldstein, "Multivariate Analysis Methods and Applications", John Wiley & Sons, Toronto, 1984.

2. Middlebrooks, E. Joe "Statistical Calculations: How to Solve Statistical Problems", Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, 1980.

About the Author

Geof Thompson is a hydrographer presently assigned to the Development Division in Central and Arctic Region of the CHS, and is an active member of the C.H.A. He joined the C.H.S. in 1974 after graduating from Seneca College in Toronto. In 1980 he enrolled in the Survey Science program at the University of Toronto and graduated with a BSc. in 1984. This article is based on research originally completed for the technical report requirement of his Canada Lands Surveyor (CLS) commission which he received in 1986.

Geof lives in Grimsby, Ontario, Canada with his wife Muriel and their cockatiel "Aussie".

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Poet's Corner

THE SINKING OF THE J.H. JONES

The steamer Jones of Wiarton lay in Owen Sound's sheltered "swatch"
Whilst Captain Crawford paced the deck a-fumbling with his watch.
Foreboding skies revealed so well a "blow" from north and west,
Which meant the little cargo ships would face a gruelling test --

The winds blew strong and reached a gale way out on Georgian Bay
But Captain Jim, so tall and prim, just itched to get away;
Dominion Fish's Caribou, the flagship of her fleet,
Came sailing in with decks awash through angry winds and sleet.

She docked astern the steamer Jones as Captain Batten cried --
"Don't try it, Jim, stay right in here, it's might rough outside."
The Captain quipped, "My faithful ship has never failed me yet,
Though we've been through a blow or two that we shall ne'er forget."

Her whistle screamed to call the crew - each man to take his post,
Twelve boys Jim could ever trust and drink a Captain's toast.
His passengers were also paged to board the vessel too.
What odds a storm when Captain Jim would see them safely through.

Ah, faith and trust rode high that day for gallant men and ships
As from her berth she steamed away to leave the sheltered slip.
Protected well from howling wind by Owen Sound's western shore,
She pointed north to breast the gale around Cape Commodore.

Then on she pushed toward Griffith's Isle where lighthouse keeper Boyd
Could view the graceful little ship that soon would be destroyed.
And as he watched, his heart would tune to say a fervent prayer
For Captain Jim and those with him so rudely battered there.

Owen R. Moore (Cape Croker Island, November 1906)

The J.H. Jones, pictured above in Tobermory Harbour, which served as a passenger ship and freighter in Georgian Bay and the North Channel of Lake Huron in the early 1900's sank off Cape Croker with no survivors in November 1906. It was just one of many shipwrecks in these treacherous waters during this period. (photo courtesy of Norman Smith)

[This poem and photo were made available by "The Manitoulin Expositor" and were part of a series of articles researched and written by Mr. Sandy McGillivary for the town of Little Current's centennial celebration in 1990. This particular article was found in the August 1, 1990 edition.]

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The CHA is a non-profit, scientific and technical group of about 500 members with the objectives of:

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- 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

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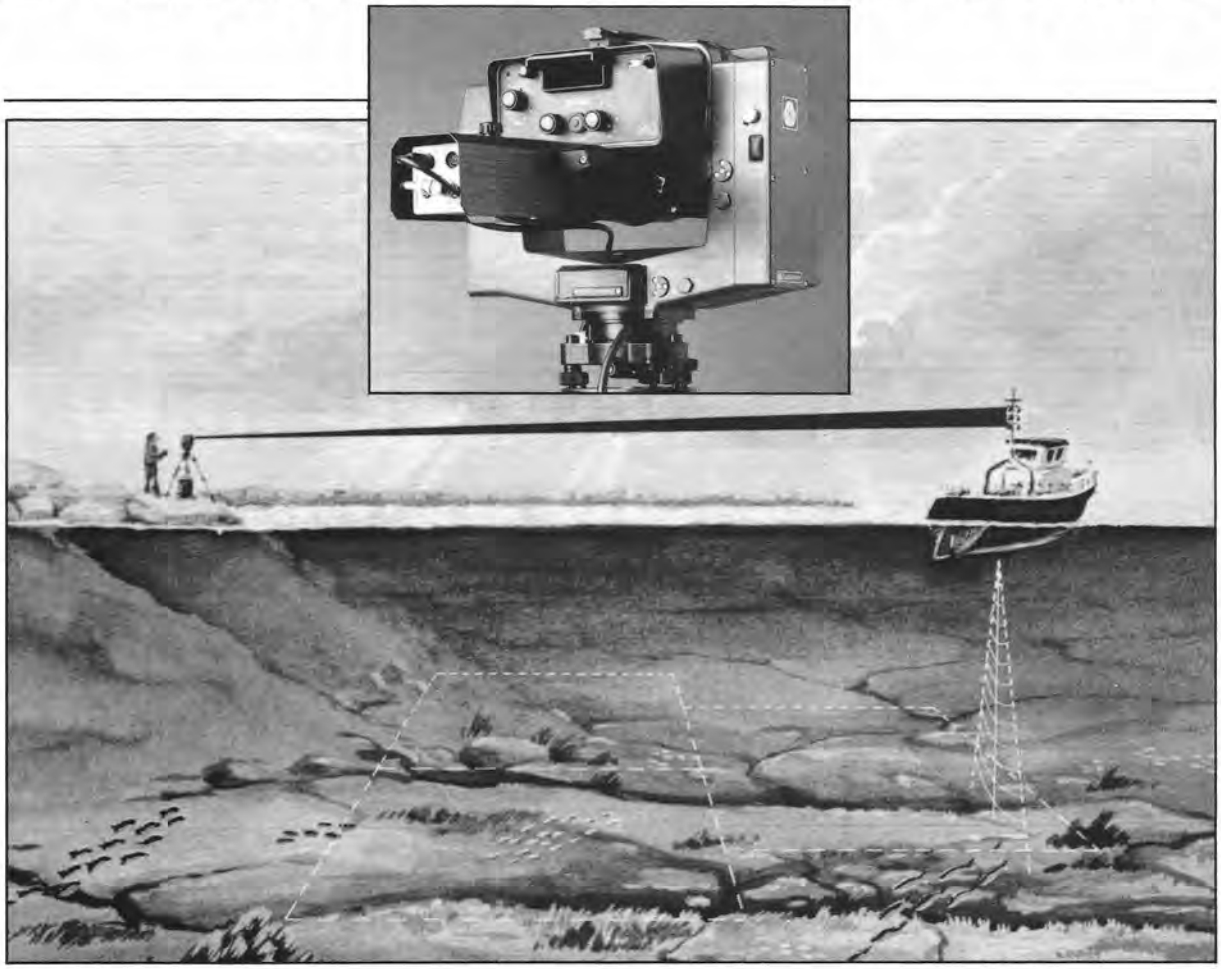

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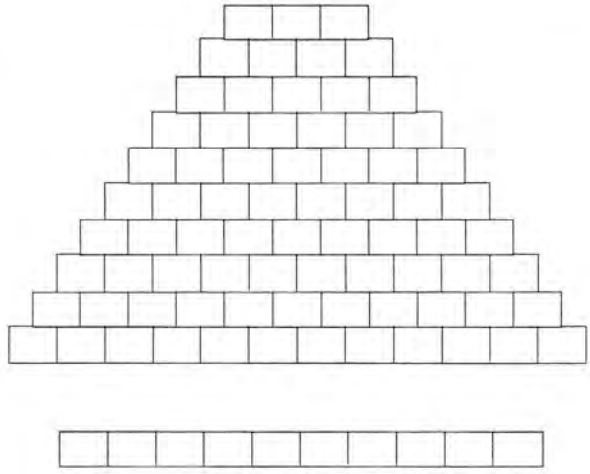
Lighthouse Puzzler

by
B. Weller

One night a hydrographer was using his baby's blocks to teach the baby some work-related words. He built a pyramid of ten words. Imagine his amazement when the baby re-arranged each word into alphabetical order but took one letter from each word and made another ten-letter word.

Can you rebuild the pyramid and deduce the baby's word?

				F	X	?			
				E	I	N	?		
			A	N	R	S	?		
		E	R	S	V	Y	?		
	A	E	N	T	T	X	?		
	E	E	I	M	O	R	V	?	
A	E	N	O	R	S	T	T	?	
C	D	I	I	N	O	R	S	T	?
C	E	E	I	L	N	R	S	T	T	?
A	D	E	H	H	O	P	R	R	R	Y	?



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Letters to the Editor

Dear Bruce,
Thank you sincerely for publishing my cartographic tale and for sending me a copy of "Lighthouse". I have another one about the CHS Cartographic Section during the fifties almost ready and you should receive it in September.

My reason for writing is to supply Francis Emmorey with information regarding his Waltham pocket watch (Lighthouse Edition #41, Spring '90). Norman Phinney of Middleton is a renowned collector of timepieces who recently endowed the MacDonald Museum in Middleton with what is probably Canada's best clock collection of more than 100 items. When he isn't up to his ears in clocks, Phinney restores old cars, his pride and joy being a 1922 Rolls Royce Touring Sedan.

I visited Norman yesterday morning to see if he knew anything about the Waltham pocket watch. After looking at the picture in "Lighthouse" he went to a drawer and took out an identical watch in an identical case. He acquired 6 Waltham chronometers and 6 deck watches from an antique dealer named William Meister in Aylesford, Nova Scotia about a month ago. They were part of a consignment of forty of each that Meister purchased from Colin Peel of Berwick, Nova Scotia, who buys consignments from Crown Assets. Among one of his lot were the Walthams. Meister in turn unloaded them to Phinney and another antique dealer. Phinney has only a chronometer and a watch left as he soon sold the other 5 sets.

Norman Phinney claims that the chronometers and watches were manufactured for the Royal Canadian Navy about 1940 for use at sea during World War 2 and probably subsequent to that until more precise time-measuring devices such as the Time Signal came into use. The Captain kept the chronometer and the Watch Officers used a deck watch. All the sets Phinney saw have "CHS 3" stamped on the back and he doubts that it has anything to do with the Canadian Hydrographic Service. The plastic window that Francis Emmorey replaced was the original window in the case.

Norman Phinney would like to assure Mr. Emmorey that he has purchased a superb timepiece that, properly taken care of, should last him his lifetime and that of his descendants as well. Phinney's deck watch keeps excellent time. The chronometer in its case would sell for about $400 and the watch should fetch about $250.

Yours Sincerely
Bill Covey

Editor's note: I also received a phone call from Lieutenant-Commander Jim Bradford with the Cartography Directorate of the Canadian Navy. He indicated that the watch was issued along with the nautical charts by the Chart and Chronometer Depot of the Royal Canadian Navy to all of their ships. The "CHS 3" stamp on the back probably referred to the Chronometer Service, with the "3" indicating a deck watch as opposed to a chronometer ("1") or chronometer watch ("2").

NOTICE

IMPORTANT INDUSTRY STUDIES TO PROCEED IN EARLY 1991

A Task Force on the Status of the Geomatics Industry in Canada has recently been formed by the Geomatics Industry Association of Canada (GIAC). The Task Force will be conducting a Study to assess the key issues facing the industry in the 1990s, and to update the statistics on industry employment, sales and market prospects. GIAC's partners in this initiative are Industry, Science and Technology Canada, which is providing funding support, the Canadian Institute of Surveying and Mapping (CISM), the Canadian Council of Land Surveyors (CCLS), the Canadian Remote Sensing Society (CRSS), and the Canadian Hydrographic Association (CHA).

In a related initiative, CISM and GIAC have signed a joint agreement with Employment and Immigration Canada to conduct a Geomatics Human Resource Planning Study. The primary objectives of this Study are to identify short and medium term personnel requirements, to assess the ability of Canada's education/training programs to meet the industry's needs, and to evaluate the impact of technological change on skill requirements.

There will be an integrated data gathering process for these two studies, and questionnaires will be distributed to all known geomatics organizations in Canada in early 1991. Readers are encouraged to participate in the surveys, so that study conclusions are based on a strong, realistic response. These important studies will produce documentation necessary to ensure that the Geomatics industry has equitable access to government programs for training and industry development. They will also produce valuable information required to address the growing concern that long term geomatics market growth will be constrained by shortages of qualified personnel.

PLEASE WATCH FOR THE QUESTIONNAIRE AND RESPOND PROMPTLY

AVIS

IMPORTANTES ÉTUDES SECTORIELLES POUR LE DÉBUT DE 1991

L'Association canadienne des entreprises de géomatique (ACEG) a récemment constitué un groupe de travail sur la situation du secteur canadien de la géomatique. On entend étudier les questions clés auxquelles fera face ce secteur pendant les années 1990, ainsi qu'actualiser nos données sur l'emploi, les ventes et les perspectives du marché. L'ACEG s'associera dans cette entreprise à Industrie, Sciences et Technologie Canada, qui apporte une aide financière, à l'Association canadienne des sciences géodésiques et cartographiques (ACSGC), au Conseil canadien des arpenteurs-géomètres (CCAG), à la Société canadienne de télédétection (SCT) et à l'Association canadienne d'hydrographie (ACH).

L'ACSGC et l'ACEG se sont aussi entendues avec Emploi et Immigration Canada pour réaliser une étude de planification de ressources humaines en géomatique, qui vise principalement à dégager les besoins de personnel à court terme et à moyen terme, à juger de la capacité des programmes d'éducation et de formation au Canada de répondre à ses exigences et à évaluer l'incidence de l'évolution technologique sur les besoins de compétences.

Les activités de collecte de données seront communes à ces deux études et des questionnaires parviendront à toutes les entreprises canadiennes de géomatique connues au début de 1991. Nous vous encourageons à participer à ces enquêtes dont les conclusions devraient reposer sur un large éventail de réponses réalistes. Grâce à ces importantes études, nous aurons l'information nécessaire pour nous assurer que le secteur de la géomatique a un accès équitable aux programmes publics de formation et d'expansion industrielle. Nous devrions en outre obtenir de précieuses données qui nous aideront à garantir que la croissance à long terme de la géomatique ne sera pas gênée, comme on le craint de plus en plus, par des pénuries de personnel qualifié.

SURVEILLEZ CES QUESTIONNAIRES ET VEUILLEZ Y RÉPONDRE RAPIDEMENT

Coming Events

Hydro 90, the 7th Biennial International Symposium of The Hydrographic Society, will be held at the University of Southampton, England, from December 18 to 20, 1990. This is co-sponsored by the International Hydrographic Bureau, The Nautical Institute, the Canadian Hydrographic Association, the British Marine Equipment Council, the International Federation of Surveyors and the World Organisation of Dredging Associations. Themes cover wide areas of charting and navigating concerns including the electronic chart, remote sensing, GPS and the environment.

GIS -'91-SIG: "The Canadian Conference on GIS" will be held in Ottawa, Canada from March 18 to 22, 1991. This conference is sponsored by the Canadian Institute of Surveying and Mapping. *(Please see the advertisement on pages 54 and 55.)*

Canadian Hydrographic Conference will be held in Rimouski, Quebec, Canada from April 16 to 18, 1991. This biennial conference is sponsored by the Canadian Hydrographic Service, and is part of an agreement established by the Canada / U.S. International Hydrographic Commission.

The main theme for this conference is *"Hydrography INFOSTRUCTURE of the Future"* corresponding to the new technological era of management of digital geo-referenced data. Topics to be presented include the electronic chart, legal aspects of hydrography, environment, navigation, international development of hydrographic data acquisition and management. *(See advertisement on pages 4 and 5)*

There will be an ICOIN (Inland Waters, Coastal and Ocean Information Network) workshop held before the conference on April 15, 1991. There will also be an Oceanic Industry Forum held after the conference, on April 19, 1991, which will be addressed to the users and suppliers of goods and services in the hydrographic industry.

15th International Cartographic Conference, will take place from September 23 to October 1, 1991, at the Bournemouth International Centre in Bournemouth, England. The theme of this conference, *"Mapping the Nations"*, has been chosen to reflect the many national mapping organizations now in existence. Sub-themes include Marine Cartography, the impact of ECDIS, GIS technology, Cartographic Expert Systems, national mapping organizations in the 1990's, the development of global digital cartographic databases, and the use of maps and spatial data.

For further information please contact the Conference Organisers at:
Conference Services ICA,
Congress House,
55 New Cavendish Street,
London W1M 7RE

Second Australian Hydrographic Symposium, will be held at the University of New South Wales in Sydney, Australia, from December 9 to 12, 1991. The Symposium is jointly organized by the East Australia Region of the Australasian Branch of the Hydrographic Society and the school of Surveying at the University of NSW.

The theme for the Symposium is *"Our Maritime Environment: A Fragile Resource"*. This theme was chosen to highlight the need for proper management of our ocean environment and the fundamental need for underlying data upon which environmentally sound decisions can be made.

Authors are asked to submit detailed abstracts of intended papers by May 31, 1991, and to indicate their required presentation time.

More information may be obtained by contacting:
Ron Furness, Program Director
c/-RAN Hydrographic Service,
PO Box 1332,
North Sydney, NSW, 2059,
Australia

Seventh International Symposium on Vessel Traffic Services "VTS '92" will be held at the Hyatt Regency Hotel in Vancouver, B.C. Canada, from June 8 to12, 1992. The Canadian Coast Guard is organizing the symposium under the direction of an International Organizing Committee representing major maritime organizations.

The theme for the symposium is *"Vessel Traffic Services in the Global Environment"*. The goal is to further the understanding and development of VTS by exchanging ideas and sharing experiences. The program should appeal to anyone with an interest in VTS operations, training, development or equipment.

Further information may be obtained by contacting:
Richards S. Bryant, Secretary,
7th International Symposium on Vessel Traffic Services,
Canadian Coast Guard,
Box 220 - 800 Burrard Street,
Vancouver, B.C.,
Canada V6Z 2J8

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Sustaining Members

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;
- 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 has been set at $150.00 (Canadian)

The names of each of the Sustaining Members are listed below:

Aanderaa Instruments Ltd.
560 Alpha Street,
Victoria, British Columbia,
V8Z 1B2
contact: Gail Gabel

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

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

Krupp Atlas Elektronic
1075 Central Avenue,
Clark, New Jersey,
USA 07066
contact: Karl Wm. Kieninger

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

SURNAV Corporation
1000-38 Antares Dr.,
Nepean, Ontario,
K2E 7V2
Contact: Rick Quinn

Terra Surveys Ltd.
1962 Mills Road,
Sidney, British Columbia,
V8L 3S1
contact: Rick Quinn

Each issue of Lighthouse contains information about some of our Sustaining Members. This time we can tell you about "L'Institut Maritime du Québec Inc.":

La fondation de l'Institut Maritime du Québec Inc.
L'Institut Maritime du Québec est unique au Québec et a pour mission la formation de techniciens et de techniciennes et d'officiers pour l'industrie maritime canadienne. Depuis quelques années, l'Institut étend sa mission de formation dans tous les secteurs d'activité reliés au domaine maritime. Par ses centres de formation aux adultes situés à Rimouski, Québec, Montréal et Saint-Romuald, l'Institut répond également aux besoins de perfectionnement du personnel de l'industrie maritime. La qualité de la formation offerte à l'Institut est reconnue par nombre d'organismes nationaux et internationaux. Pour maintenir cette qualité, l'Institut doit continuellement investir tant dans ses ressources humaines que matérielles.

La fondation est un nouvel outil que s'est donné l'Institut pour favoriser le maintien de cette qualité.

The Quebec Maritime Institute is unique in the province and has a mandate to train technicians and officers for the Canadian maritime industry. For a few years now, the Institute has been increasing it's mandate, to training in all sectors related to the maritime field. With its adult training centres at Rimouski, Quebec, Montreal and Saint-Romuald, the Institute also responds to the needs of personnel training within the maritime industry. The quality of training offered by the Institute is renowned by many national and international organizations. To maintain this quality, the institut must continually invest in its manpower as well as its equipment.

The Foundation is a new tool developed for the preservation of quality as provided by the Institute.

Fall 1990

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!

1991 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

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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
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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.

All advertising material should be directed to:

Mr. K. Weaver
Advertising Manager, LIGHTHOUSE
867 Lakeshore Road
Burlington, Ontario
CANADA L7R 4A6

Telephone: (416) 336-4538
Fax: (416) 336-4819

News from Industry

Canadian Hydrographic Service

CHS - Alantic

Colour and Symbol Standards for ECDIS

When the Canadian Hydrographic Service and Universal Systems Limited (USL) began developing the Electronic Chart Testbed in 1984, the design of the electronic chart display was of prime interest. The finest information in the world is useless unless it is presented clearly and unambiguously. Good display design was preached by Mike Eaton of CHS, Atlantic, at international meetings and tests, using the results developed by Steve Glavin (currently of CHS, Headquarters), starting with his work at USL. So it was natural that when the chairmanship of an IHO Working group on colours and symbols standards became available, M. Eaton became chairman and S. Glavin did the demonstrating. This work was strengthened by contributions from perception specialists in the Netherlands, Germany and Canada, and by simulator tests made by the Hamburg Sea School, and has now resulted in a 1st edition of **"Provisional Presentation Standards for ECDIS".** These standards are intended for use in the initial versions of ECDIS, and for further testing.

CHS Point Database Developments

There has been considerable activity in development of the Hydrographic Hyperspatial Code (HH Code) in Atlantic Region during the past year. The HH Code is a technique for encoding multi-dimensional data (i.e. time, space, etc.) in such a way that it can be entered into, manipulated and extracted from a Relational Database Management System quickly and efficiently. Orders of magnitude improvements over traditional approaches have been observed in the prototype system developed in the region.

Negotiations are presently underway between the CHS and ORACLE Canada Limited to develop this prototype system into a marketable product. ORACLE has already invested in a market study that has confirmed significant potential for a product based on this technology, not only in Canada, but around the world.

CHS, Atlantic, has also had discussions with a number of other agencies about the potential benefits of this development such as: the federal Department of Fisheries and Oceans; Physical & Chemical Sciences and Marine Environment Data Services Branches; the University of New Brunswick; and most recently the Norwegian Hydrographic Service.

Further development of the CHS point database management system is on hold pending the outcome of CHS/ORACLE negotiations.

Ocean Mapping

The Department of Fisheries and Oceans (DFO), in cooperation with the private sector, is developing a unique ocean mapping system by integrating the SIMRAD EM100 multibeam sonar system with DOLPHIN. This joint cooperative program is referred to as the Canadian Ocean Mapping System (COMS), Phase I.

COMS consists of four projects:
1. DOLPHIN/EM100 Integration;
2. DOLPHIN Handling System;
3. Operational Sea Trials; and
4. Data Processing of Large Data Sets.

It is a three year program, scheduled to be completed in March 1992. The objective is to have a prototype ocean mapping system consisting of:

- one DOLPHIN with an EM100 sonar system operational;
- a DOLPHIN handling system for a ship of opportunity; and
- an improved processing system for large bathymetric data sets.

Work is underway on all four projects and progress is currently about two months behind the planned schedule.

The DOLPHIN/EM100 Integration work is being completed by ISE Research Limited and SIMRAD Mesotech Systems Limited of Vancouver, British Columbia. The design of the transducer installation, electronics repackaging and radio modifications is complete.

The DOLPHIN Handling System is being developed by Brooke Ocean Technology Limited of Halifax, Nova Scotia. Conceptual design and model testing is nearing completion. The model tests have demonstrated the feasibility of a single point pick-up using a motion compensated crane.

The Operational Sea Trials are being completed by Geo-Resources Incorporated of St. John's Newfoundland. Training in EM100 and DOLPHIN hydrographic operations is completed and a DOLPHIN shore-base has been established. Sea-trails of the EM100/DOLPHIN will continue upon completion of the integration work.

The large data set processing issue is being addressed by the Ocean Mapping Group at the University of New Brunswick and USL of Fredericton, New Brunswick. The approach involves developing a set of automatic and interactive data cleaning tools based on new algorithms combined with visualization. A requirements analysis and conceptual design of the processing package is underway and will be completed in November 1990.

Région du Québec (avril à novembre 1990)

Conférence hydrographique Canadienne 1991

La région du Québec a obtenu la responsabilité de présenter la Conférence hydrographique Canadienne 1991 qui doit être tenue à Rimouski (QC). *[see adv. on pages 4 and 5]*

Modèle de priorité

Un modèle de priorité et un logiciel basé sur le Apple-

Macintosh en utilisant un chiffrier électronique Excel a été développé. Ce modèle permet à l'usager d'évaluer les priorités de levé et de cartographie en utilisant une vingtaine de critères ou couches et couvrant l'ensemble de la région du Québec avec une dimension de maille de 1 ou 5 km de coté. Des sorties couleur sur l'écran et sur papier permettent à l'usager de faire varier les poids relatifs des couches disponibles et ainsi juger, de visu, les résultats.

Projet pilote des Instructions nautiques
La région a été désignée pour être l'hôte d'un projet pilote de refonte du contenu et du contenant des Instructions nautiques. Le projet mis de l'avant met l'accent sur un format plus petit (8.5" x 11"), un concept de fascicule et une mise en pages radicalement différente. La technologie de la publication assistée par ordinateur (PAO) sur Apple-Macintosh est utilisée. L'échéancier prévu de l'édition du volume couvrant le Golfe et le fleuve St. Laurent est pour début 1992.

Communications
Plusieurs initiatives ont été mises de l'avant quant à la mise en réseau des divers environnements informatiques de la région du Québec (HP, DEC-VAX et Apple-Macintosh). Les transferts de données inter-résaux, les serveurs et le courrier électronique permettent maintenant d'optimiser le travail des usagers et de tirer le maximum de profit du parc informatique existant.

HIN
La région du Québec a reçu le mandat de concevoir un plan stratégique de développement du réseau d'infromation hydrographique (HIN). Pour ce faire, la situation globale actuelle, la situation cible et le plan de migration sont développés. Le travail s'effectue à contrat par la firms SOMAPRO de Québec. Ce plan servira de base aux initiatives futures de développement des modules et du réseau lui-même du système de gestion des données numériques du SHC.

Modélisation des MCNE
Une entente multiparties entre le Ministère de P & O (SHC et DSPC) et entre l'INRS-Eau (Rimouski) et le Plan d'Action St. Laurent (PASL) du Ministère de l'Environnement et été paraphée récemment afin de développer un modèle tridimensionnel et multicouches devant servir a prédire les courants et les marées dans l'estuaire du St. Laurent entre Québec et Pointe-des-Monts. Le SHC joue un role actif dans ce dossier en tant que client principal, vérificateur et fournisseur de données de base.

TMS
Le marémètre numérique TMS-50 en configuration temporaire et en configuration permanente a complété la série de test et a commencé à être déployé sur les levés hydrographiques et en parallèle avec les instruments analogiques du réseau permanent.

SATRADHY
Le Système de Traitement des Données Hydrographiques pour les données d'écho-sounder à faisceau unique de la région a fait l'objet d'une nouvelle version (3.0) qui corrige certaines lacunes et ajoute de nouvelles fonctionnalités.

ISAH
Le systéme standard de navigation et d'enregistrement des données du SHC-national a continué d'être testé et d'être intégré dans les divers systèmes et opérations-terrain de la région.

SIMRAD
Le système de balayage acoustique multi-faisceaux SIMRAD EM-100 qui a été installé à bord du NSC Louis-M. Lauzier a complété sa phase d'implantation et a débuté en phase production par un levé sur la Moyenne-Cote-Nord.

C.H.S. Headquarters - Marine Cartography
Cartographic Development
During the past year there have been numerous research and development projects undertaken by the Cartographic Development Section.

There is a study being conducted into the next generation cartographic work station and Graphical User Interfaces.

The CARIS version 4.1 has been released to Regional Offices this year. The CARIS Working Group met at Headquarters in September, 1990.

Phase 1 of the Notices to Mariners (NTM) system is now operational and being tested at Headquarters.

The Chart Distribution system is presently being installed and Phase 1 should be completely functional in the new year. There are plans to send members of the cartographic development group to the regions this fall to conduct demonstrations of the existing prototypes. These prototypes include the Digital Chart Maintenance System (DCMS) and NTM client.

The automated contouring package developed by Lewis Boone and John Warren *[see Lighthouse Edition #41, Spring '90]* has been included in the release of CARIS version 4.1. It is now being tested in various applications.

Ocean Mapping Division
The Ocean Mapping Division designs and produces maps for users whose prime interest is not navigation, but the nature of the seafloor and the material beneath it. Ocean Mapping is responsible for several bathymetric map series at various scales.

At present, the primary objective of the Ocean Mapping Division is to construct a database of bathymetric maps, built around the Natural Resource Map (NRM) series, at a scale of 1:250,000. This is being accomplished using a variety of evolving techniques in digital data capture and digital cartography, including raster scanning and vectorization of existing analogue maps (both published maps and hand drawn open file compilations), optical scanning and automatic number recognition of field sheet data, automatic contouring software, and interactive map compilation. Phase 1 of the database is scheduled for completion early in 1991 and will result in continuous coverage of Canada's west coast.

This initiative will ensure complete, continuous, and detailed coverage of the Canadian coastal and offshore zone at a relatively large scale (1:250,000). The database will be used to support all other smaller scale Ocean Mapping products, and will be an offshore extension of the National Topographic Series (NTS) base maps that can serve as base maps for

such initiatives as ICOIN (Inland Coastal Oceans Information Network). It will be an important element in furthering the understanding and improving the management of the vast Canadian offshore region.

The Marine Cartographers in Ocean Mapping have recently been reclassified as Marine Cartographic Technologists.

Sailing Directions
Desk-top publishing is now established in Sailing Directions at Headquarters. Sailing Directions are now produced using Interleaf and Microsoft Word software with a Macintosh computer. Two publications have been completed to date.

Quality Control
Competitions for the Chief of Quality Control and a Quality Control Officer are presently underway and will be staffed in the near future.

Chart Maintenance and Distribution
Mr. Boyd Thorson is the new Chief of Chart Maintenance and Distribution.

Nautical Information Section
The Nautical Information Section is responsible for processing Notices to Mariners that affect charts. Draft Notices received from CHS regions are edited and drafts from Coast Guard are reviewed for possible chart action before publication. The Section also processes all releases of CHS products and checks the navigational aids on all products.

The Section is presently testing Phase 1 of the Notices to Mariners data base before extending it to regional testing.

Reprints Section
This section is responsible for reprints for 3 CHS Regions and its main task is ensuring that there is always a stock of charts available to the public. When the stock is about to be depleted or the hand correction load becomes unbearable, the Ottawa Reprints Section applies advertised changes to the reprographic material of 50 to 70 charts per year and sends them to press. The section also supplies customers, on request, with copies of all Notices to Mariners affecting small craft charts.

Sales and Distribution Section
The sales office of the Ottawa Chart Distribution Centre generates over $1.2 million of revenue annually. Phase 1 of a new computerized accounting/inventory system that was built to the specifications of Jacques Dupras and his staff is being tested and should be operational early in 1991.

Warehouse Section
The Ottawa Chart Distribution Centre warehouse, at 1675 Russell Road ships out over 250,000 charts and 75,000 publications annually. Keith McCooeye has been refining the stock depletion prediction routines with the help of a Macintosh computer.

Chart Corrections Section
This section applies all changes advertised in Notices to Mariners which affect standard nautical charts to each copy of these charts before they are shipped to customers or CHS dealers. This amounts to over 4 million corrections per year or approximately 2800 corrections per person per day.

Hydrographic Data Centre
The Hydrographic Data Centre is busy preparing data for conversion from the old "S2K" data base to the new Source Directory System (SDS). The SDS is an index for all CHS source data and a gateway to future information networks.

CHS, Central and Arctic Region
Field Surveys Division
Five hydrographic surveys have been deployed in 1990 at various field locations. All of their processed data are presented in digital and graphical format.

Arctic Survey
The Arctic Survey based at Rowley Island involved a 6 km grid gravity/spot-sounding survey of Foxe Basin in February and March. This was earlier than usual to take advantage of better ice conditions. The survey used four helicopters.

Hudson Bay Survey
The 1990 Hudson Bay survey continued a program to ensure safe navigation of supply vessels and others on the east coast of Hudson Bay. Two east-west shipping corridors were surveyed: one from the south end of the Belcher Islands to Kuujjuarapik; and one from the north end of the Belcher Islands to the east coast of Hudson Bay. The survey was based on board CSS Baffin, which supported 5 survey launches and 1 helicopter. The survey ran from the beginning of August to October 8.

North Channel Survey (Lake Huron)
This completed the program to update North Channel survey coverage and eventually replace two old existing charts (2294 and 2286). Part of the area was previously unsurveyed or surveyed in the late 1890's. A new larger scale chart scheme will provide better coverage for commercial and recreational boat traffic. The survey commenced in early May and continued until the beginning of October.

St. Lawrence River Survey
This completed the program to resurvey the St. Lawrence River between Kingston and the Beauharnois Canal. New charts will provide common Canadian and U.S. coverage in the river. In 1990 the survey continued east on Lake St. Francis and into the Beauharnois Canal. Work commenced in mid-April and continued until the beginning of October.

Revisory/Sweep Survey
Revisory resolved chart queries on scheduled new editions. Large-scale surveys in Thessalon, Blind River and Prescott were completed. Large-scale surveys of Grimsby, Fifty Mile Point and Port Dalhousie, on Lake Ontario, were also completed.

Other Projects
Field data for the production of a new edition of the Lake Ontario Small Craft Guide were collected in July. 153 chart dealership inspections were carried out in Ontario, Manitoba and the United States to review stock and evaluate dealers. In August, Baker Lake and Chesterfield Inlet navigation ranges were surveyed in co-operation with the Canadian Coast Guard.

Tides, Currents and Water Levels Division
Work included the management of 36 stations in the Perma-

nent Water Level Network in our Region and the maintenance of the 20 data loggers and 11 teleannouncers in the Network. Vertical control information and portable water level gauges were provided to all survey parties. This year one gauge was equipped with a cellular telephone for data transfer. It worked well and was easy to install. Vertical information and adjustments were provided to Chart Production. The Monthly Water Level Bulletin for the Great Lakes and Montreal Harbour was distributed to 1800 subscribers.

Chart Production Division
In addition to the continuing new edition program for existing charts, Central and Arctic Region has produced four new charts recently in the bilingual / metric format:

2228 - Lake Huron - Southern Portion, replacing existing chart 2290;
6259 - Kettle Island to Martin Point (Playgreen Lake, Manitoba);
2017 - Kingston Harbour & Approaches (Lake Ontario), replacing existing chart 1459; and
2018 - Lower Gap to Adolphus Reach (Lake Ontario), replacing existing chart 2005.

Contract charting is continuing on digital New Editions of the six Chesterfield Inlet charts. A digitizing contract has also been initiated on five others.

Development Division
This division develops, tests, evaluates and implements procedures, equipment and systems: to increase the efficiency and effectiveness of the CHS; to operate and maintain the Branch's computer network; and to provide advice and assistance to CHS staff. The focus this year has been on several special projects:

Arctic Sounder Project - to develop a fully digital echo sounder for spot sounding through the ice in Arctic conditions. The project was contracted to Knudsen Engineering Ltd. of Perth, Ontario and a pre-production version of the echo sounder worked well in the Arctic in May, 1990. Five production sounders will be delivered for use on the 1991 Arctic survey.

Through-Ice-Bathymetry-System (TIBS) - to allow hydrographers to collect continuous depth profiles through full or partial ice cover in water depths up to 50 m. using proven electromagnetic technology. In depths greater than 50 m. the system will verify that it is at least deeper than 50 m.

Radar Sounder Project - to investigate the use of radar to collect reliable depth data through thick weed growth in shallow waters. In August 1990 Central and Arctic Region tested an existing impulse radar system in the St. Lawrence River near Cornwall with good results.

ISAH Implementation - to test the ISAH data loggers and integrate them into the field surveys program. Launch tests will be conducted when software problems have been corrected.

Field Processing Program - to maintain and upgrade existing processing software.

Recreational Electronic Chart (REC) Study - a two-year study of issues relating to the use and provision of CHS data.

St. Lawrence River Electronic Navigational Chart (ENC) - to develop quide-lines for the creation of ENC-compatible data from existing digital CHS chart files. The ENC was demonstrated at Cornwall in April, 1990.

Tidal Instrumentation - to transmit water level data in the field involved evaluations of the Suttron Data Logger; of new pressure sensors; and of cellular telephones . The Logger proved suitable for the CHS Permanent Gauging Network particularly because of bilingual voice announcement capability. Several pressure sensors were evaluated against their advertised specifications, and a portable field gauge was interfaced to a cellular telephone and used successfully by the St. Lawrence Survey all season.

Data Management and Support Study - to identify data validation procedures for Central and Arctic Region and how to implement them.

CHS, Pacific Region
The first season for the 'CSS R.B. Young' with Mike Woods as HIC went smoothly. Surveys were completed in several areas between Nanaimo and Prince Rupert. The barge 'Pender' with George Eaton in charge spent the summer in Hakai Passage. Vern Crowley in charge of the 'L. Pacifica' continued work in Nootka Sound.

The Institute of Ocean Sciences held an open house in September, with CHS cartographers contributing mightily by producing much of the graphic display work. 11,000 people visited the 'CSS R.B. Young' which was one of the main features of this popular event. Sev Crowther, Ray Chapeskie, Brian Watt, Mike Ward and Barry Lusk were all active in making this first open house a success.

Andrews Hydrographics Ltd.
Andrews Hydrographics announces the formation of a new survey company to take advantage of increasing satellite coverage. The new company, called Land and Satellite Surveys Ltd., believes that with round-the-clock satellite coverage imminent, the benefits of GPS will prove attractive to a wider range of surveys, from precise geodetic work to simple position fixing. Land and Satellite Surveys Ltd. is based in Newbury.

One of the company's first projects will cover settlement surveys of North Sea platforms, which involves the calibration of the co-ordinates of a central platform as a benchmark from a fixed shorebase some 300 km away.

Communications & Measurement Technologies Ltd. UK
CMT has introduced a device which enables up to four channels of offshore navigational data to be transmitted over a single radio channel. The MSI is a microprocessor-based asynchronous interface which enables up to four serial devices to be multiplexed into a single channel.

Designed for use with the MTS 458 telemetry system, the device firmware supports a number of commonly available sensors such as MicroFix, Syledis and Robertson Gyro as

well as RTCM 104 (differential GPS), which enables it to provide high integrity communications of DGPS applications.

The new device enhances CMT'S MTS 458 Marine Telemetry System already in use in the North Sea, to aid the positioning of pipelaying and construction barge spreads. With the MTS 458 on the anchor handling tugs and a central controller on the barge the tugs are precisely positioned without the need for each to have a dedicated onboard survey package and operator. Each tug transmits raw navigational data back to the barge, which is processed, transmitted back to the tugs and displayed. With the new MSI 140 device, data from four sensors may be telemetered, compared to one previously.

Del Norte Technology Inc.

Del Norte was recently awarded a joint contract with Computing Applications Software Technology (CAST) for an advanced integrated navigation system by Simrad Albatross of Norway. The System is to be used by the Royal Norwegian Navy on mine warfare vessels.

Known as the Global Positioning System (GPS)/Trisponder (TM) the system will utilize various configurations of the Flexible Integrated Navigation System (FINS). FINS combines GPS Satellite measurements, either P code or C/A code, stand alone or differential, with Trisponder (TM) ranges to provide a continuous precision position solution.

Geotronics

Geodimeter has introduced a new surveying system for setting out (staking out) and collecting detail (tacheometry) that by their estimates will reduce surveying costs by 50%. The new system, called Geodimeter System 4000 (Patent pending), utilizes a completely new surveying technique, which makes it possible for one person to carry out surveying tasks that until now have occupied two people.

Geodimeter System 4000 consists of two parts: the measuring unit which is a servo-controlled, auto-tracking total station; and a prism station fitted with a computer/receiver unit (Remote Positioning Unit/RPU). With this new revolutionary system, the whole measurement procedure can be carried out by one man from the prism (RPU) station. The RPU has its own "intelligence", a built-in computer, with all the controls conventionally found in the survey instrument. The instrument station is unmanned, the surveyor himself takes the prism station with full control over the measurement.

Laser Plot Inc.

Laser Plot reports that the ChartNav system is being recognized for it's safety. Two of ChartNav's safety features are: an automatic alarm system which sounds when the boat deviates from the original course; and the use of Government-produced charts, providing accurate depths, currents, markers and other chart information. All chart information is instantly available to the user giving real-time positioning and enabling orientation at any time.

Mobil Oil Corp. has tested the system on one of it's tug and barge units. Captain Kinney reported ChartNav is a "very good aid to get around things you can't see on a radar", during heavy weather and sea conditions. ChartNav also makes navigating easier when aids are out of position or missing due to ice or other weather conditions, "It is immediately apparent where the aid should be". Vessels without ChartNav and operating in the same area as the Mobil Oil Vessel suffered groundings due to the fact they mistook one aid for another.

McQuest Marine Sciences Ltd.

McQuest Marine reports that Datacom Software Research Ltd. have recently developed a new software product called HYDROseismic. Designed specifically for the oil exploration industry, its main emphasis is on seismic positioning for the transition zone between land seismic and the deeper water 3D seismic operations.

Some of the features of HYDROseismic are: runlines defined with predetermined shot point locations; the capability of increasing or decreasing shot point numbers by any defined increment; on-line seven-parameter datum transformations for GPS; differential GPS capability; an additional split screen on the helmsman monitor for running lines; the ability to select the information to be displayed on the navigation and helmsman screens; a user-defined serial output string capability; a preload capability of seismic source; translation of the navigation data to SEG-P1 or UKOOA formats; and extensive user-friendly editing and plotting capabilities.

Navitronic

Navitronic has developed a multichannel system for measuring in rivers and channels. The survey system for the vessel "Herstelle" consists of a multi-channel echo sounder with 36 channels which consists of six echo sounders, each with six transducers and a menu-driven data processing system.

This system has the ability to portray on-line cross section plots of the bottom on the screen and print them out on a graphic printer. In narrow places it is possible to measure accurately with the booms partly folded. Positioning is obtained using the Geodimeter 140T with distances and angles transferred to the ship via telemetry. Individual transducer positions are computed by means of a gyro compass.

Qubit

Qubit reports they have established a breakthrough in marine electronic navigation with the launch of "Master Yeoman", the chart table of tomorrow. This new system provides ship owners and operators, for the first time, with a viable advance from the conventional paper chart towards the electronic chart display system (ECDIS) of the future and promises improved safety and greater efficiency.

"Master Yeoman" is unique in that it brings the power and versatility of electronic data processing directly to the chart table. By linking the navigator to a selected navigation aid, the system enables him to interact with the chart directly to carry out position fixing, course plotting and to identify and input waypoint coordinates quickly and accurately. Quibit has kept the ability of the system to retain the navigator 'in the loop' since his experience and decision-making capability cannot be replaced by a machine. "Master Yeoman" will accept navigational data input from all commonly-used systems includ-

ing Decca Mainchain, Loran C and Omega, as well as the GPS and Transit satellite navigation receivers.

The basic installation comprises three elements: a puck (with backlit LCD display and data entry keypad); a chart table; and a system interface. Each installation can thus be customized to suit any bridge configuration by selecting additional sensor modules from the wide range Quibit has developed over the years.

Surnav Corporation

Surnav Corporation announces the addition of two new Series 4000(TM) Survey Systems, by Trimble Navigation Ltd., to its product line. The Geodetic Surveyor IIP(TM) and the Geodesist p(TM). Both these receivers implement full cycle L2 P-code for excellent tracking and superior performance over long baselines. The existing Series 4000(TM) users can upgrade to benefit from full cycle L2 P-code. The new receivers, like all Trimble survey system receivers, come with TRIMVEC Plus(TM), survey system software.

Trinity House Marine Resources Limited

Formerly Trinity House Pilotage and Marine Services Limited, Trinity House has been involved in hydrographic survey work and has acquired additional technical and professional skills in this field through the acquisition of The Resource Group on the June 1st, 1990. Trinity House also has the capability to develop the existing highly regarded software products.

Marine Services offered worldwide by Trinity House include: procurement and management of specialist vessels; hydrographic, sonar, seismic and pipeline surveying; survey systems supply, installation and training; marine project consultancy including risk analysis, aids to navigation, pilotage and hydrography.

Obituaries

John Hall

We were sad to learn recently of the passing of John Hall a long-time friend to the CHS. Over the last 10 years, John undertook a number of studies of the Canadian hydrographic and ocean surveying industries. His background in journalism and encyclopedic knowledge of oceanographic and hydrographic activities, both national and international, well qualified him for that role.

John developed his keen interest in ocean science and surveys in the late 70's as a private consultant for the Canada Centre for Inland Waters, where he instilled in all the scientific and technical staff a heightened awareness of the public's need to know of the work undertaken at the Centre.

Moving to Ottawa in 1980, John first took up the post of Program Officer, Communication Branch for the Department of Fisheries and Oceans, Ocean Science and Surveys. After a year in Government, he returned to the private sector, revitalizing his communications consulting company, Jayhall Consultants. During this period, John undertook contract work for DFO, co-authored several reports on the Canadian hydrographic and ocean surveying industries, produced a number of ocean industry and remote sensing directories for External Affairs and tried very hard to establish an independent newsletter - "Oceans of Canada".

In 1986, he played an essential role in assisting DFO plan and organize the Oceans Forum in Sidney, B.C. and, as a follow-up, wrote considerable material for DFO's Ocean Task Force. In June 1989, he helped organize a major workshop which John entitled "Managing the Future of Canada's Oceans" and which saw 70 representatives of industry, government and university achieve consensus of the marine science challenges for the next decade.

John was a visionary and saw the critical role that information technology will play in the future economic development of this country. His creation of UPDATA, a database management company dealing primarily with information on the ocean and remote sensing industries capabilities, was a recognition of this vision. The work that John started with UPDATA will be continued by his wife Shireen, who has been very active in the company since its creation, and in this way, John's vision will live on.

Thomas Pullen

Retired Navy Captain Thomas C. Pullen died of cancer on August 3 in Ottawa. He was 72.

He served with the Royal Canadian Navy in World War II, becoming Commander on the destroyer HMCS Saskatchewan in 1944.

He spent much of his career in search of the perfect water route through the Arctic. In 1956-57 he conducted hydrographic and oceanographic surveys in the Arctic as commander of HMCS Labrador, Canada's first Arctic patrol and research vessel. It was the first ship to traverse the treacherous Northwest Passage from east to west in a single year. In 1969, Pullen piloted the Manhattan through the Northwest Passage.

Pullen demonstrated the existence of a deep-draft channel through Bellot Strait, between Somerset Island and the mainland, that became an escape route for ships trapped by ice in the Western Arctic and an alternate route for the Northwest Passage. He also discovered a safer channel to Frobisher Bay.

He was named in 1984 to the Order of Canada for his northern exploits. The Royal Canadian Geographical Society also awarded him its prestigious Massey Medal the same year, "for his contribution to our knowledge of the arctic marine environment and icebreaking operations".

CHA Social News

Newfoundland Branch
The Newfoundland Branch of The Canadian Hydrographic Association has had a fairly quiet summer. Our summer began with a talk given at the Fisheries Centre by Steve Grant. It was fairly well attended and was found to be very informative by everyone. Steve went over the latest development of the Electronic chart as well as up-coming technology.

Our Branch gained five new members last spring. I would like to welcome Capt. Jon Negrijn, Dave Street, Derick Peyton, Alvin Hayes. And a special welcome to Capt. Badrin Kassim who represents the Newfoundland and Labrador Institute of Fisheries & Marine Technology, our first sustaining member.

The MV Maxwell is still out doing survey work and is expected back late October. Also, in the fall and winter we are expecting delivery of the Maxwell's replacement, the new MV Matthew.

Our Branch will be holding a general meeting in the fall when all our members are back from the field. This will include a special "Welcome Back" social event.

As a final note, Graham Rankin, one of our members, has left the Province to attend University. We wish him well in his endeavours.

Atlantic Branch
The branch rounded out its activities in April before the start of the field season with a very interesting talk by Joan Dawson. She spoke about her new book "The Mapmaker's Eye" which gives a history of the first 200 years of mapping in eastern Canada, starting in the mid-1500's. The talk was given under a new format, which was open to the public.

CHA members along with other (non-member) CHS staff were involved this year to one degree or another in putting on a grand display for clients and the general public for the 1990 BIO Open House from October 17 to 20. In many cases, office work (as well as offices!) was displaced as our best face was put on to meet the public.

Andy Power and Dave Lombardi of McElhanny Services Ltd., Dartmouth, report that their company has now completed a telephone cable survey on behalf of MT&T. The project called for detailed route surveys across the Bay of Fundy, the Northumberland Strait, and Cabot Strait for fibre optic cable route selection and assessment. The services included swath bathymetry, subbottom profiling, precise navigation, sidescan, geotechnical sampling, ROV bottom video, diver swim surveys, and topographical layout. Several local subcontractors contributed to the data collection and interpretation. The fibre marine link is scheduled for installation in the summer of 1991.

Cala Carrera went to Ottawa to represent the membership at the AGM. In future, it is hoped that these meetings will be outside of normal field seasons.

Richard Palmer of Newfoundland Branch is welcomed back to BIO to work in Tidal Section for a 9 month term over the winter.

Gerard Costello is back to CHS Atlantic Region from Quebec Branch and he now has a 2 year appointment in the Development section to co-ordinate the COMS program. (See CHS News from Industry-Atlantic Region on page 43.)

International Member Adam Kerr and his family visited Canada this summer and dropped into the Halifax area for a week or so to give his regards to old friends and acquaintances.

Personal Notes
- Kirk and Linda MacDonald are now firmly settled in their new home, with Kirk now very familiar with both ends of a hammer.

- Larry and Collette Norton have now moved into their newly built home so hopefully a conversation can now be had with him that does not involve finances or contractors.

- Galo and Martha Carrera recently moved into a very nice home complete with all that is required for an aerobic workout while mowing the front lawn.

- Congratulations are extended to Doug Frizzle and Gail Kelly who were recently married. It is also reported that subsequent to that event he successfully completed a Hunter Safety Course!

An evening with T.B. Smith is planned for the first half of February to commemorate his upcoming retirement. The exact date is still on a need-to-know basis (Bert is keeping quiet!) but we have decided to have a proper evening with him before the next field season. All regions will be notified when more definite plans are in place.

Section du Québec
Six réunions du conseil d'administration de l'Association canadienne d'hydrographie ont eu lieu depuis avril dernier. Les principaux points soulevés furent l'engagement de personnes permanentes à notre local, la distribution de publications marines et les diverses activités pour l'année en cours.

L'exécutif a procédé à l'engagement de 2 personnes au cours de l'été. Tout d'abord Sylvie Roy a été embauchée à titre d'agent de communication grace au programme Défi 90. Ses principales fonctions furent de coordonner les activités journalières du bureau et de monter un plan de communication. Elle a été à notre service du 18 juin au 3 aout dernier. Puis, Martin Massé a été embauché à titre d'agent administratif grace au programme PDE. En plus de voir au différentes activités du bureau, Martin verra aussi à l'organisation des futurs projets que la Section du Québec veut mettre sur pied au cours des prochains mois. Martin sera avec nous jusqu'au 1er février 1991.

La version francaise de la constitution a été realisée par un des membres de notre éxécutif Yvon Boulanger. Bravo pour son magnifique travail!

Félicitations à notre vice-président Richard Sanfacon et à son épouse Dorothée qui sont depuis quelques semaines les parents d'une petite fille nommée Marie-Christine.

Un membre de notre éxécutif, Sylvain Guimont, s'est rendu derniérement en vacances à Hong-Kong et il en a profité pour aller visiter le bureau de distribution des cartes marines du Service Hydrographique de l'Amirauté Britannique. Son but était d'acheter une carte marine du port de Hong-Kong. Il a pu constater que la méthode de mise à jour des cartes est légerement différente de celle du bureau de distribution du SHC à Ottawa. Le préposé a sorti la carte demandée par Sylvain et sans rien consulter, a "marqué" avec son stylo à une dizaine d'endroits sur la carte. Et voilà! Elle est à jour!

Quatre nouveaux membres se sont joints à nous au cours des derniers mois. Bienvenus parmi nous à Robert Dorais de Rimouski, Chantale Gravel et Stéphane Paquet de Mont-Joli et à Simon Boutin de Hérouxville.

Une première activité pour l'automne a eu lieu, il s'agit d'une visite d'un bateau sondeur à multi-transducteurs (le GC 06) de la Garde cotière canadienne. Cette activité s'est déroulée à Québec à la fin septembre et fut bien appréciée par les membres.

Parmi les autres activités à venir, notons une conférence sur les fonds sablonneux, une visite de l'Institut maritime du Québec à Rimouski, où d'alleurs sont situés nos locaux, et finalement l'assemblèe générale annuelle de notre section.

La Section du Québec participera, avec son kiosque, à quelques expositions et conférences qui se tiendrons au cours des prochains mois à Rimouski:

Octobre 1990	Conseil des loisirs scientifiques au Carrefour
Avril 1991	Conférence Hydrographique du Canada au Centre des congrès
Avril 1991	Expos-Nature au Colisée

Il es très important de noter notre nouvelle adresse postale pour tous ceux qui auraient à communiquer avec nous:
Association canadienne d'hydrographie,
Section du Québec,
53 St-Germain Ouest,
Rimouski, (Québec),
G5L 4B4

Ottawa Branch

Ottawa Branch is happy to welcome Dave Pugh, the National President of CHA, to Ottawa. Dave has accepted a three year assignment to Ottawa as Chairperson of the CHS National Training Committee.

Congratulations to Ottawa Branch member Ross Douglas, Director General of the Canadian Hydrographic Service, on his election as President of the Canadian Institute of Surveying and Mapping. Ross assumed this post in May of this year.

Lt. Cdr Mohd. Fairoz of the Royal Malaysian Navy was in Ottawa for three weeks in September, as part of the CHA/CIDA Malaysian project. Fairoz was here to discuss the national and international policies and procedures involved in establishing an oceanographic data centre. Special thanks are due to the staff of the DFO Marine Environmental Data Service who were responsible for most of Fairoz's itinerary.

Mike Casey and his family blazed through the Netherlands and Belgium on their bikes during their summer vacation. Mike now has a who new European sports wardrobe to wear as he cycles and "skeels" around Ottawa.

The Ottawa Branch Annual Christmas Lunch will be held on Thursday, December 13, 12 noon, at the Continental Dining Lounge, at the Nepean Sportsplex.

Once again Ilona Hilbert Mullen organized the annual CHA picnic. Eighty CHA members and guests attended the picnic on June 28. The company, the weather and food were great! *(see photo below)*

Ralph Renaud at Ottawa Branch annual picnic

The Branch organized the showing of a National Geographic Society video on the sinking of the BISMARCK. Over 40 members and guests attended.

CHA Ottawa Branch was proud to donate prizes to the first annual (hopefully!) golf tournament, Sept. 6.

Central Branch
Membership Committee report 39 In-House and 34 Out-House members now paid up for the year. We welcome new members Ron Dreyer of R. Dreyer & Associates Inc. and Peter Knight who is a student surveyor with Erindale College, Toronto. Peter was a summer student with the CHS team based at Little Current this past summer then later joined the Baffin with the Hudson Bay Survey for part of its voyage.

New Arrivals: Brad & Joanne Tinney proudly announce the advent of Danielle - a third daughter. "The more the merrier", to quote Brad.

Sean & Lynn Hinds also have a new baby girl: Kaitlin. Along with her two (slightly) older brothers it makes for a busy household but everyone is well.

International Member Andrew Leyzack dropped in on the Little Current Survey on his way back home from Sudbury. Now happily married to Cindy Mai he is now available to job offers a little closer to his Toronto home, he says. Central Branch will be glad to have Andrew backs in the ranks for 1991.

Al Koudys has recently joined the ranks of those entitled to have OLS after their name. Congratulations, Al!

Geof Thompson is in the throes of giving hydrography seminars to the survey engineering students at Erindale Campus of University of Toronto.

The CHA Central Branch Summer BBQ was a great success thanks to the hospitality of Bruce and Joanne Richards and the shelter of their spacious garage during the sudden rain... Many thanks from all the members, family and friends in attendance.

Central Branch members Sean Hinds, Earl Brown, Sam Weller, Ryk Karczuga (and, of course, National President Dave Pugh) attended the CHA Director's Meeting and/or AGM held in Ottawa in May. Minutes of these meetings are now being circulated and will be available shortly.

This year Central Branch is taking a big step and is presenting its first formal AGM and Dinner. This will be on November 30 at the new Mimico Cruising Club premises. This special event is motivated by our desire to include the full spectrum of our Out-House and In-House members for this annual event. With members scattered between St. Catharines and Scarborough, we selected Mimico as being near our weighted centre as well as being a fine location. This promises to be a fine occasion.

Capt. Vancouver Branch
The summer passed by without event. This year everyone has been very busy in the field. This is a good sign for our members in Private Industry with the B.C. economy being very strong and no shortage of survey work.

This year our summer meeting was held at the "Surf & Turf" room at the Jericho Sailing Centre. The weather was most cooperative with sun and a warm breeze and a good time was had by all.

Our hosts prepared a fabulous meal - a choice of New York steak, filet of salmon or chicken. All this, along with lots of wine and wind surfing videos made for a very enjoyable meeting. In fact, we "forgot" to discuss any "business". Save that for our fall meeting planned for October 10th, when the monsoons move in.

Pacific Branch
Carpenter Glen Green was personally challenged by CHA Pacific Branch's invitation to construct the "World's Largest Sextant". The results of his labours were on display at the local CHS Open House where visitors admired this large detailed working model of hydrography's oldest positioning instrument. Thanks are extended to the members of Captain Vancouver Branch for their support of this project.

World's Largest Sextant

Cartographer Patti Parkhouse married John Dew on August 18th. After fifty days of drought, it poured rain on that day.

David Prince is expanding his house in anticipation of a third child due at any moment.

And while on that subject, the West Coast continues to participate in the Hydrographic Baby Boom, with the following:

David Jackson and Tracy	a boy - Nick
Ron Woolley and Lois	a boy - Tyler Keith
George Eaton and Nancy	a boy - George Warren
Dennis Sinnott and Alisha	a boy - Keegan
Carol Nowak and Ken	nothing in sight YET

Congratulations to all of the above!

Dave Thornhill, "the fashion hydrographer", has adjusted to the West Coast without any problem. He's probably the only droggie with a fishing rod attached permanently to his arm!

Willie Rapatz, a former National President of the CHA, retired on October 21, 1990, after a very distinguished career with the Canadian Hydrographic Service. Two nights later more than 175 of his friends and colleagues gathered at the Glen Meadow Golf and Country Club in Sidney, BC to celebrate his friendship and to recognize his career.

Willie came to Canada from his native Austria in 1955 and joined CHS Pacific Region as a deckhand. In the following years he served in many capacities, culminating in his appointment as Pacific Region's Regional Tidal Superintendent in 1975. For the past year he has served as A/Director of Hydrography.

Many details of his career were discussed and many stories shared, and gifts and momentos presented. Willie is much admired and respected by many people in hydrography and related fields, and our Best Wishes are extended to him and Margaret as they pursue their interests away from the Civil Service, the CHS, and the daily treks to the office.

Dr. John Davis, Director of I.O.S., makes a presentation. Chairman Fred Stephenson is seated.

Willie Rapatz

Earl Brown presenting on behalf of the C.H.S.

George Eaton, Pacific Branch VP, presents for CHA.

At this writing, all hydrographic field parties have returned from successful seasons. The Branch should soon start seeming more alive.

Our Branch would also take a moment to pass on our sympathies to the family of Bob Noren. Pacific Region's hydrographers mourn his passing. Bob was more than a launch mechanic, he was a personal friend who will be missed by many.

International Membership

Membership in the Canadian Hydrographic Association is not limited to Canadian residents but is available to anyone who is 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 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 and do not accidentally lose touch in any local change of executive responsibilities. Members may, however, request to be International Members of the Branch of their choice.

The cost of International Membership per year is $30.00 (Canadian) or the equivalent in Sterling or U.S. currency. This includes a personal Membership Certificate suitable for framing along with annual update seals, and as well as two editions of Lighthouse annually and other occasional mailings.

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 (RNZN) is foreign correspondent for the NewsLetter and writes to Central Branch with items of particular interest to International Members. Comander Robbins is presently on assignment in Hove, UK, as on-site representative for the RNZN working with Racal Marine Sytems and contributes good in-depth columns with news of our International Members. Drop snippets of news to him at: 12b Bedford Towers, Kings Road, Brighton, BN1 2JG, United Kingdom, or FAX: 0273-773789, c/o Racal Marine Systems. Members are welcome to write articles or reports on points of general or technical interest for the NewsLetter. *(Editor's note: Hydrographic articles or reports are always very welcome for publication in Lighthouse, as well.)*

Our International Membership contiúnues to grow, though one of the occupational hazards of being an association of nomads is that we tend to lose touch with our members too easily. (If you are one of those who have not got around to answering your mail with the requisite cheque for $30.00 Canadian please feel free to do so now.)

Since the last Lighthouse report several new International Members have joined us:

- Sunil Kumar of Fiji

- Andrew Leyzack of the U.S.A. and Canada

- Dr. S. Mertikas of Greece

- Ross Munro of the U.K. and Canada

- Wayne Ross of the U.S.A.

- George G. Sellers of the U.S.A.

Welcome aboard!

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Solutions to Surveying Problems

The Problem: Project Design Evaluation

The Portland District U.S.A.C.E. needed to evaluate the effectiveness of the groin structures it designe
against severe river
maximum thrust as

S/V Norman Bray with dedicated sweep survey barge.

The Solution

The corps put thei
Automated Sweep S
survey (10 lines on 5
500 X 1500 foot area
Just a few hours la
variety of highly det
charts showing the g
even while work wa

**Portable • Singl
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The Problem:

The Savannah C.O.E. required a turnkey survey system to help evaluate the performance capabilities of a radically new SWATH survey vessel within its 150 working day lease schedule.

SWATH vessel Halcyon.

The Solution

ROSS designed, bu
survey system well v
The ROSS system i
a special retractable t
of operating up to sp
range navigation, on
with on-board editin
In addition, the cus
remain flexible enou
survey capabilities fo

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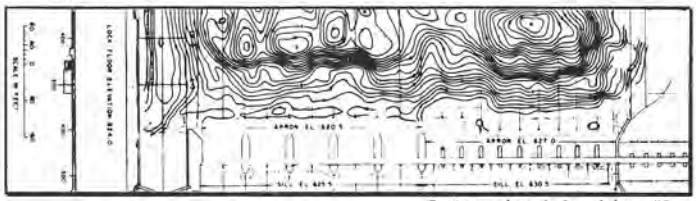
The Problem: Rapid Turnaround

To keep river navigation open on the ever-changing Mississippi River System, the St. Paul C.O.E. requires quick turnaround on accurate survey charts at the job site.

36 foot survey launch with 9 channel sweep.



Contours along lock and dams #6, Mississippi River.

The Solution

ROSS built two 50-foot sweep survey systems with full processing capabilities to fit aboard the corps' 35 and 36 foot survey launches.

A powerful 32-bit Hewlett-Packard computer runs ROSS menu-driven software from survey set-up through editing and post processing. An A...E size color plotter aboard the survey launch produces finished charts on site the same day.

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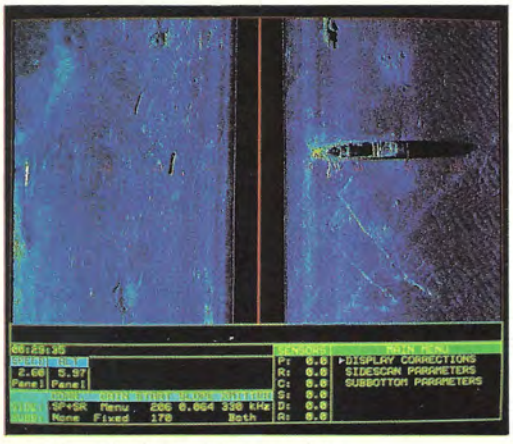

Monitor displays sidescan data, sub-bottom data, time, sensor status and menu information.

Model 972 SIDE SCAN Sonar features:

- Display resolution 1280 x 1024 x 128
- Undistorted side scan displays with the water column removed and corrected for slant range and towfish speed
- Available simultaneous side scanning and sub-bottom profiling
- Available towfish sensors: speed, roll, pitch, compass, depth and altitude

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