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Maritime Engineering Journal

66
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2010 Navy Centennial Edition

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Factors affecting the creation of a naval service for Canada

Museums celebrate:

The navy centennial!

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- ***A "QL6" Technical Service Paper***

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Canada

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Cover: In true naval fashion, Citadel Coins (www.citadelcoins.ca) in Halifax's Barrington Place Shops went the extra distance to create this fabulous window-display tribute to the Canadian naval centennial. A well-deserved *Bravo Zulu* to owner Gerard Feehan and staff. *(Photo: Brian McCullough)*

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Commodore's Corner

By Commodore Patrick T. Finn, OMM, CD
Director General Maritime Equipment Program Management

Having assumed the duties of DGMEPM on the 13th of July 2010, I now have the responsibility of writing the Commodore's Corner for the *Maritime Engineering Journal*; a daunting task when one follows in the footsteps of the ever eloquent Rear Admiral Richard Greenwood. In this edition of the *Journal* I would like to focus on a single issue, and that is thanking RAdm Greenwood for his leadership of our branch over the last five years. His accomplishments were tremendous and too numerous to mention here. In thanking him, I would also like to reserve the remainder of this section of the *Journal* for his parting comments on leaving DGMEPM.

"The prelude to action…." — *Reprise*

By Rear Admiral Richard W. Greenwood, OMM, CD
Commander Canadian Defence Liaison Staff (Washington)

As I sit down to write this, my final Commodore's Corner, I am inevitably inclined toward "triple retrospection," reflecting on my past five years as DGMEPM, on the last 35 years as I complete the naval engineering phase of my career, and on the last 100 years as we collectively celebrate the centenary of the navy as a national institution.

When I wrote my first Commodore's Corner in the Fall 2005 edition, I noted that the threads of change and continuity served to both separate and connect the occasions of my first arrival in DGMEM in 1988 and my return as DGMEPM in 2005. Paraphrasing Admiral Sir John Jellicoe's famous observation after the 1916 Battle of Jutland that the prelude to action is the work of the "engineering branch"[1] I suggested that it is the application of a disciplined systems engineering approach — the "art of the solution," I called it — wherein lies the essential contribution of the naval technical branch to the navy and to the Canadian Forces. Jellicoe's comment was made in the context of engineering performance in the heat of battle, but I noted that in the same sense within our own context nearly a century later, the application of engineering skills must also be measured against the long investment of effort we make to develop and deliver the capabilities that will serve as the foundation for success in future battles. In his "Prelude to action" dispatch, Admiral Jellicoe acknowledged that the engineers continued to "perform their most important duties without the incentive" of seeing what was happening on deck during the battle. So too for us, our long investment of effort is often given without ever seeing the achievement of success from the day we arrive in a posting to the day we leave. Sometimes just being able to tell whether we are making headway toward an objective can be elusive.

Coming into the job in 2005, it seemed a particularly promising time for making some singular investments in future capability. Looking ahead to (an expected) three years as DGMEPM, the timing seemed ripe to achieve significant contractual headway on the *Halifax* Class Modernization (HCM) project, the Joint Support Ship, the Single Class Surface Combatant, and the *Victoria* Class In-Service Support Contract (VISSC). As events transpired, the only one of these to achieve contract in the three-year period was VISSC, and at that only by the slim margin of a month. Viewing things now from a "five years on" perspective, however, I can say there has been significant progress. Not only has VISSC been signed, but we have made substantial gains on the *Victoria* and *Windsor* extended docking work periods, and are about to start on *Chicoutimi* in a purpose-built submarine repair facility on the West Coast. For the frigates, all major com-

[1] From Admiral Jellicoe's Battle of Jutland dispatch: "Details of the work of the various ships during action have now been given. It must never be forgotten, however, that the prelude to action is the work of the engine-room department, and that during action the officers and men of that department perform their most important duties without the incentive which a knowledge of the course of the action gives to those on deck. The qualities of discipline and endurance are taxed to the utmost under these conditions, and they were, as always, most fully maintained throughout the operations under review."

DGMEPM Change of Appointment

CFSU (Ottawa) Photo Services

Assistant Deputy Minister (Materiel) Dan Ross presided over the July 13, 2010 ceremonies as Commodore Patrick T. Finn took up his appointment as DGMEPM. Newly promoted Rear Admiral Richard Greenwood has been appointed Commander of the Canadian Defence Liaison Staff in Washington, DC.

ponents of the HCM project are in contract, and *Halifax* is scheduled to enter mid-life refit in September. Also, the long-term National Shipbuilding Procurement Strategy announced on June 3 will support the relaunch of the Joint Support Ship project, as well as the Canadian Surface Combatant and Arctic Offshore Patrol Ship projects. We are not over the hump yet, but having a coordinated long-term strategy in place means that we are on track for putting the problematic boom and bust cycle of shipbuilding behind us. Finally, much progress has been made on a host of equipment/system capability & sustainment projects, and in securing an appropriate share of national procurement funds for the support of naval readiness. The fact that events did not move at the speed I anticipated led me to conclude that success is a multi-year concept, and that perseverance is clearly part of the art of the solution.

"The fact that events did not move at the speed I anticipated led me to conclude that success is a multi-year concept, and that perseverance is clearly part of the art of the solution."

In *RCN in Retrospect, 1910-1968* (UBC Press 1982, James Boutilier, ed.), the late Captain(N) Jim Knox touched on the evolutionary aspect of our business in a two-part paper entitled, "An Engineer's Outline of RCN History." The paper reviewed the technical history and experience of the RCN over its first six decades, right up to the integration of the forces in 1968. Capt(N) Knox concluded that Canada's naval technical history was "…a continuing process, the evolution of naval engineering." This evolution is epitomized today in the workhorse of the Canadian fleet, the *Halifax*-class frigate. The result of years of effective R&D, innovative design and production, and successful systems integration against many challenges, the frigates stand out for their operational success and versatility of design.

The start of the ship replacement program in the 1980s clearly demonstrated the criticality of the human resource dimension in meeting the technological demand. It became necessary to rethink priorities and to examine deeply held beliefs concerning the training and employment of engineers and technicians, with resultant changes to trade structures. The fact that these trade structures have changed again reflects a proper evolutionary response to the reality of technology convergence and the pressures of a shrinking demographic pool. The aim of the game now is to create ways to accelerate the throughput of the training system and increase the versatility of the output.

Looking back over one hundred years of the ebb and flow of naval materiel issues and challenges, a number of themes are surprisingly recurrent, notwithstanding the march of technology. In one way or another they can all be related to the development and exercise of adaptability along three parallel lines of operation — *platforms*, *people* and *purpose*.

Historically, the definition and delivery of naval platforms have yo-yoed between the twin imperatives of the march of technology and the evolution of the perceived strategic threat — the classic

(Continues next page...)

DGMEPM Change of Appointment

Photo by Brian McCullough

Among the many colleagues, family and friends on hand to congratulate Commodore Finn and Rear Admiral Greenwood were three former heads of the navy's engineering branch *(from left)*:

Commodore (ret.) Jim Sylvester (1997-2003);

Rear Admiral (ret.) Bill Christie (1970-72);

Commodore (ret.) Bill Broughton (1988-1990).

"technology-push vs. requirements-pull" dilemma. Increasing adaptability in platforms means that platform *capability* is becoming progressively more dependent on the integration of the whole rather than on the component capabilities of individual elements. Throughout our navy's history, from the initial acceptance of old RN warships, to the indigenous production of British designs and eventually the production of Canadian designed ships with (largely) foreign equipment, the most significant Canadian naval engineering input has been toward increasing sophistication and innovation in the systems integration of the whole.

Evolution has also accompanied the naval engineering trades and organizations, dockyard support facilities, governmental departments and mandates, and civilian industry itself in response to shifting perceptions of the stability and commitment of national purpose with respect to the navy as a national institution. Rear Admiral James Goldrick, RAN, expressed this last point very succinctly at the MARCOM naval centennial history conference in Ottawa last May when he suggested that the subtle, yet distinct difference between building a fleet and building a navy is that the one is a temporal materiel construct, the other an enduring institution and capability. For Canada this purpose has not always been constant, and the history of naval engineering in this country is a significant trail of great highs of technological innovation, and utter lows of disappointed opportunity and retrenchment.

As I think of HMCS *Halifax* entering her mid-life modernization refit later this year, I reflect that she is older today than *Saskatchewan* was when I joined her as a sub-lieutenant for engineer-officer-of-the-watch training in 1979 — notwithstanding that the *Halifax*-class frigates are still referred to by many as the "new ships." The significant difference is that the *Halifax* class is far more capable before modernization than was any of the steamer fleet at midlife in the 1970s. That this is even possible for a ship conceived during the Cold War and now reaching midlife in a post-9/11 world is a testament to the strong tradition of naval engineering continuity and adaptability that has sustained the Canadian navy through its first century, and which remains ever present as we enter a new century of naval service.

It has been my great pleasure and honour to lead the naval engineering branch and DGMEPM for the last five years, and to have participated in the weave of continuity, change and sustainment that links our efforts to those of our predecessors. It has also been an inspiration to me to have worked with so many people who remain committed to striving tirelessly for success against formidable challenges and frustrations without surrendering. I wish Commodore Finn all possible success and Godspeed as he accepts the baton to lead this outstanding community along the next leg of our great journey.

Yours aye,

R.W. Greenwood
Rear Admiral

Letters

I am very far from being an engineer (as the staff CFFS(H) Eng Div in the early 1980s would all too willingly attest!), nonetheless I found edition 65 of the *Maritime Engineering Journal* to be absolutely fascinating. I read it from cover to cover in one sitting. Beautifully written in language that even this Arts-educated Int (nee MARS) officer could easily understand, it is a model for explaining complex ideas in straightforward terms and once again demonstrates that "The Prelude to Action lies in the Engine/Boiler Room."

Keep up the great work. I look forward to the next edition.

Bravo Zulu

Capt(N) M.J. Barber
Director Intelligence Capabilities
National Defence HQ, Ottawa

Submissions to the Journal

The *Journal* welcomes **unclassified** submissions in English or French. To avoid duplication of effort and ensure suitability of subject matter, contributors are asked to first contact the editor. Contact information may be found on page 1. Letters are always welcome, but only signed correspondence will be considered for publication.

Continued thanks for sending retired naval engineers the *Maritime Engineering Journal*. As our paths wander ever further away in time, it is rewarding to read of the adventures we were involved in so closely.

A number of your articles in this edition (No. 65) touch on a recurring theme: the interrelationship of engineering systems. Small issues can easily be magnified if not tended. Engineering systems have many tentacles as well.

In particular, submarine engineers have had (during the operations of the O-boats at least) extensive experience in diesel generator repairs done in many different locales and with widely varying work parties. During submarine refits, those engineers also encountered significant repair concerns regarding "nip clearances," especially during the HMCS/M *Okanagan* refit in 1979. In all these cases there was a heavy reliance on boat's crew, however there was growing awareness and need for shore based fleet technical support engineers to apply their broad experience across the whole fleet. I'm sure that shared experience and knowledge should apply even today whether it is about equipment, systems or projects.

Finally, in the article about the *Halifax*-class DG investigation, it was good to see that the Naval Engineering Test Establishment was used as part of the team. In the late 1990s a diesel engine test facility was added to NETE about the same time as the building was upgraded in anticipation of such a need as the fleet was then changing to a much heavier reliance on this source of auxiliary power. A large part of engineering, of course, is anticipation of future requirements, conditions, faults and effects.

[**Dolphin 79** — Bet you wish you were here.]

Yours aye,

Capt(N) (ret.) Sherm Embree
East Sable River, Nova Scotia

CORRECTIONS

In the Forum section of our last issue (No. 65) two errors were inadvertently made during the editing of LCdr Dan Saulnier's article about two very fine retired RCN officers.

In the first instance, Vice Admiral Robert Stephens' surname received multiple "spelling options," and in the second instance Captain(N) Rolfe Monteith's wartime "ride," HMS *Hardy*, was accorded honorary "HMCS" status.

The *Journal* apologizes for the errors.

Objectives of the Maritime Engineering Journal

- To promote professionalism among maritime engineers and technicians.
- To provide an open forum where topics of interest to the maritime engineering community can be presented and discussed, even if they might be controversial.
- To present practical maritime engineering articles.
- To present historical perspectives on current programs, situations and events.
- To provide announcements of programs concerning maritime engineering personnel.
- To provide personnel news not covered by official publications.

Factors Affecting the Creation of a Naval Service for Canada

Article by Capt(N) Rolfe Monteith, RCN (ret.)

When New France fell to the British in 1763, the settled population already had a firmly entrenched military tradition in the form of militias. This was clearly tested during the two incursions by the United States during the War of 1812. An additional irritant during the 1800s was the frequent raids across the U.S. border into Canada by anti-British Irish republicans — the Fenians. No permanent naval institutions arose as a consequence, as even in the Great Lakes region there was total reliance on the Royal Navy. Throughout the century, the Admiralty remained firmly set against local navies within the Empire.

At the time of confederation in 1867, Canada had become a major maritime trading nation with the fourth largest merchant marine. By the late 1870s it was estimated that there were some 90,000 seafarers in the Dominion. Lumber was a significant trading commodity and provided the basis for a thriving shipbuilding industry, but by the late 1880s as sail gave way to steam propulsion, and iron and steel replaced wood for hulls, shipbuilding fell into decline. This coincided with Canada's national economic focus turning toward internal development, particularly railways.

Detail from the HMCS *Rainbow* room at Victoria's Maritime Museum of British Columbia. *(Photo: Brian McCullough)*

Continuing friction with the United States over fishing rights continued to be a cause for concern in both Ottawa and London. The British were unwilling to be drawn into a confrontation with the U.S., and this reality gave rise to an ongoing debate within the Dominion over how best to protect Canadian maritime interests. In 1870 the new Canadian government acquired and armed six schooners to create a maritime police force, and although this could have been the essential basis for a national navy, it was not to be. The maritime police force was disbanded in 1871. However, when it became clear by the mid-1880s that Britain was reluctant to respond to U.S. poaching, the Fisheries Protection Service (FPS) was established, and it was this force that formed the kernel from which the Royal Canadian Navy would eventually spring.

On the broader naval front it had been recognized that there was a need for protection in Canadian waters, so in 1881 an aged RN corvette, HMS *Charybdis*, was despatched to Saint John, New Brunswick, home of Canada's largest ocean-going merchant fleet and the seat of Canadian maritime power at that time. It must be remembered that, well into the 1880s, Canada was still one of the great shipbuilding and ship-owning countries in the world.

By the late 1890s the balance of naval power worldwide had changed profoundly. The Royal Navy was struggling to maintain superiority over the Franco-Russian Alliance, and Germany, Japan and the United States were developing ocean-going battle fleets. Britain needed the Empire, but the Empire was divided on how to address the evolving naval threat. One view was to pay a direct subsidy to Britain; the alternative was to use the funds to establish a national naval presence. Canada supported the latter proposal, but lacked the political will to navalize the Fisheries Protection Service. By the turn of the century the Department of Marine and Fisheries had a strength of eight armed cruisers, six

The cruisers *Niobe* (above) and *Rainbow* were acquired from the Royal Navy to become the first warships to be commissioned into the Canadian navy. *(DND photo)*

icebreakers and nearly 20 other vessels.

In 1904 two modern, high-speed steel-hulled cruisers with quick-firing weapons were ordered for the Fisheries Protection Service — *Canada*, a 200-foot vessel was purchased from Vickers Barrow for service on the east coast, and *Vigilant*, the first modern warship to be built in Canada, was constructed at the Polson Iron Works shipyard in Toronto for service on the Great Lakes. It was at this time that Britain announced its intention to abandon the Imperial garrisons and naval bases at Halifax and Esquimalt. The Canadian government's response was to take charge of both facilities, which represented a major shift in the Dominion's defence policy. (The defence budget nearly doubled from $4.2 million in 1904 to $7 million in 1907.)

In the summer of 1909 an Imperial Conference on defence was convened in London to address, among other things, a perceived naval crisis posed by the acceleration of German battleship construction. Also discussed was the situation regarding the establishment of local navies throughout the Empire. The British Admiralty had withdrawn its objection to this idea several years earlier after Australia announced, in 1906, plans to develop its own navy, thus rejecting the policy of an annual payment to London.

The Admiralty tabled specific proposals, including that Canada should have a minimum force of three *Bristol*-class cruisers and four destroyers, but preferably a fleet consisting of one heavy cruiser, four *Bristol*-class cruisers, and six destroyers. To initiate the Dominion of Canada's new naval entity the Admiralty offered to place two old cruisers on loan. As might be expected, the Admiralty envisaged that these forces would become part of the Imperial fleet in times of emergency. This of course opened up the Canadian political issue of Quebec's sensitivity to the "Imperial" implication. Creating a Canadian navy was one thing; establishing a unit of the Imperial navy was quite another.

In the end, the 1909 Imperial Conference in London became the next major stepping stone on our way to realizing a national navy. Much heated debate ensued in Canada, but on January 10, 1910 the Dominion Government introduced legislation for the creation of a Naval Service Act. The vision called for a fleet of 11 warships, all to be built in Canada at an annual expenditure of $3 million. The whole nation became engaged in the issue, and the Government narrowly won a federal by-election that month fought largely on the naval issue.

Finally, on May 4, 1910 the Naval Service Act of Canada was enacted into law. The navy's battle for survival had begun.

Captain Monteith served in the RCN from 1941 to 1970, and is a founding member of the Canadian Naval Technical History Association. He writes from his home in Surrey, England.

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Determining Ship Radar Cross-section using Computational Electromagnetics

Article by LCdr Ryan Solomon

In any modern warship design the minimization of radar cross-section — a measure of how detectable an object is by radar — is a key consideration. In the military environment, radar cross-section (RCS) plays a critical role from both an offensive and a defensive tactical perspective. The smaller an object's RCS, the better its ability to evade detection, which in warfare translates to maximizing the element of surprise and potential for success.

Since the late 1940s, research has progressed our understanding of the scattering properties of different objects after encountering impinging energy sources, and thus our ability to establish their radar cross-section. Through the aid of experiments and theory we can now apply analytical or empirical formulae to predict the RCS of many simple or basic shapes. Determining the RCS of complex targets having multiple irregular and basic shapes, however, becomes increasingly difficult.

Very little open literature has been published with regard to ship RCS. The free-space monostatic RCS of vessels (i.e. measured assuming a theoretically perfect vacuum and a single energy send/receive point) can be generally approximated by the empirical formula: $\sigma = 52f^{1/2} D^{3/2}$, where σ is the RCS in metres squared, D is the full-load displacement of the vessel in kilotons, and f is the radar frequency in megahertz. The data used to help derive this relationship were based on the median RCS measurements taken of various ships' responses to energy transmitted from low grazing angles in the X, S and L bands against the vessels' port and starboard bow and quarter aspects.

It must be noted that this formula is only considered accurate for what is known as the "optical" scattering region, one of three known regions defined by a comparison of energy wave size to the object to which it is reacting. When detection systems such as high-frequency surface wave radar are involved, which encompass the "Rayleigh" and "Mie" scattering regions, the formula is considered to be only a rough approximation. Furthermore, the formula only accounts for monostatic data, not any additional defining factors that arise from an object's material composition, orientation, intersurface interactions, energy properties such as polarization, frequency and phase, nor the ocean environment. All of these aspects influence RCS to some degree and contribute to what forms a very complex problem.

The most accurate method for determining RCS, and the current practice, is to conduct measurements experimentally by driving a ship in circles on a test range while exposing it to different energy sources. The scattered returns are analyzed and used to derive the ship's RCS signature in a horizontal plane. With the current cost of fuel, the reduced number of sea days for ships and the general strain on the navy's resources, this can be an expensive and time-consuming process that depends on good ship driving and finely calibrated test equipment to ensure acceptable results. While these measurements produce a realistic snapshot of the monostatic RCS at one frequency and grazing angle, any modification to the structure or change in the detection frequency or look-angle at the target can greatly alter the RCS and thereby minimize the value of the test measurements. Furthermore, our ranges currently do not allow for multiple, *bistatic* angle collection which would look at the scattered returns from different angles around the ship created by incident energy from one direction.

The potential variations of frequency, grazing angle and bistatic angle are endless, making it simply not feasible to conduct this work with a target the size of a ship. A person could spend months literally driving a ship in circles to collect the potential RCS information. Although ranges could never be completely replaced, a more realistic means of collecting and studying complex RCS data does exist. Through the use of computational electromagnetics it is possible to construct computer models that are easily adaptable to the myriad combinations of inputs required to build a more complete, albeit simulated radar cross-section picture.

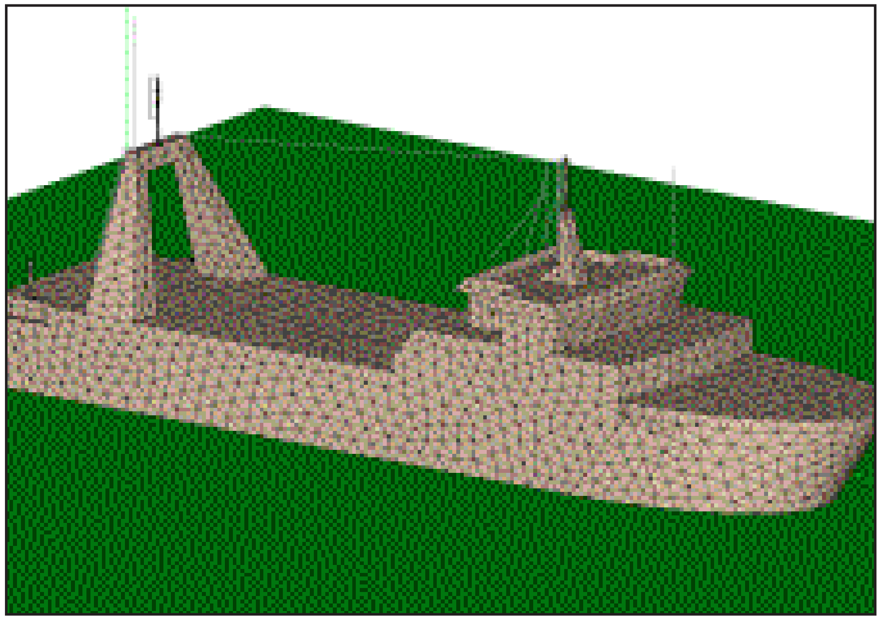

Fig. 1. The Canadian Coast Guard Ship *Teleost* was modelled in FEKO to determine its radar cross-section. The model's many sectioned surfaces represent the unknowns that were solved through computational electromagnetics to determine their response to an impinging energy source. *(Illustrations courtesy the author.)*

Computational electromagnetics

The field of computational electromagnetics (CEM) continues to advance rapidly with the development of software tools that employ different numerical techniques for analyzing electromagnetic properties. DND currently uses a number of these applications in support of antenna engineering to establish optimal antenna placement and to assess the impacts of electromagnetic interference and RADHAZ.

The CEM tools offer remarkable capability for determining and analyzing radar cross-section. They are able to accommodate multiple frequencies, energy characteristics and vessel orientations, and can produce data for both monostatic *and* bistatic RCS through the conduct of a single simulation. Many other defining elements such as material composition and environmental medium can also be factored in to further increase accuracy and replicate an actual environment. While it is impossible to account for every natural environmental influence (no simulation is perfect), a properly designed simulation can produce results within an acceptable +/- 3-dB limit. Such tools could potentially be used as a substitute for a majority of the range work involved in RCS work.

The basis for many programs involves creating a computer model of the target to be tested, either as a wire-grid replica or as a representation formed by connecting several small surfaces to make up the ship's outline. Newer software can load CAD-compatible models directly, but some programs require keying-in the basic shapes or wire segments by hand through reference to a ship's drawings.

Figure 1 shows an example of a model I created of the Canadian Coast Guard Ship *Teleost* in support of my master's thesis work. In this model a combination of surfaces and wires was used to represent the ship's main structure, antennas and other thin metallic structures. The surface material can be identified as metallic or dielectric, but in this case was assigned as a "perfect electric conductor" and placed on a metallic ground plane to represent the conductivity of the ocean in the lower HF band. The completed model was then meshed, or sectioned, into small surface areas or wire segments to form a number of unknowns that would be solved through the establishment of a matrix of linear equations. The simulation program required that basic parameters such as frequencies, energy polarization and phase and incident angles be selected, along with any other parameters needed to elicit the specific information intended to be captured from the simulation.

The real meat of these simulations lies in how the incident energy interacts with the target, and what resulting currents are produced on the unknowns. By means of these currents we can determine the created scattering fields at some distant point and, through comparison with the

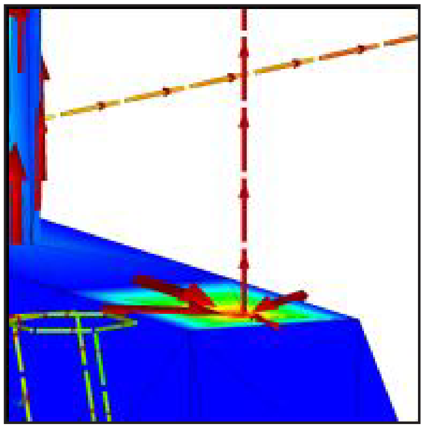

Fig. 2. Visual electromagnetic "currents" and colour intensity information were used to determine the characteristics of scattered energy, in this case on the Teleost A-frame and antennas.

incident fields, derive the RCS. The unknown currents are solved using Maxwell's equations through numerical modelling and through the boundary conditions applied to the problem. Different applications use various methods to perform these calculations either through full wave analysis (the complete calculation to Maxwell's equations) such as in the method of moments or the Finite Integration Technique which are very accurate, or through asymptotic techniques where precision can vary depending upon the applied approximations.

Using various post-processing tools, the RCS patterns, scattering fields and current direction, phase and strength can all be examined through both visual representation and analysis of data sets. *Figure 2* illustrates how different sized arrows were used to depict current direction and intensity on the antennas and mast located on the *Teleost*'s after A-frame. The *Teleost* simulations were applied in a high-frequency band, then compared with the extracted RCS values derived from experimental data produced by a high-frequency surface wave radar site in Newfoundland. The comparison results gave values that varied by 1-2 dB per orientation, and by only 0.7-dB when averaged. These represent excellent results and demonstrate the confidence in producing accurate RCS data using computational electromagnetics.

The downfall of these techniques, particularly the full wave methods where accuracy is at its best, is in the demand on computer processing time and memory requirements in relation to the number of unknowns created in the model's development. Obviously, the greater the number of unknowns (N), the higher the demand on computing power and memory, and the longer it takes to solve the simulation to a relation of N^3. The rule for sectioning wires is that they must be smaller than $\lambda/10$ (λ – lambda – being one wavelength in metres). As frequency increases, wavelength decreases, which subsequently reduces the size of the meshing. More surfaces and wires are thus required to cover the same area, but the number of unknowns to be solved has increased. For a warship model applied in the microwave range, this could mean hundreds of thousands of unknowns that could require weeks or months of computer time to solve. In some cases, even with the most advanced computers, the memory and processing demand would exhaust the CPU before the problem could ever be solved. This is the primary reason why many applications try to use approximations to speed up simulations, albeit at the expense of some accuracy.

Although building an initial ship model can be extremely time intensive, the flexibility to amend this design and apply various electromagnetic scenarios to produce a vast amount of data is extremely promising. Depending upon the size of the model, the applied frequency and the accuracy required from the results, radar cross-section can be readily determined through these techniques. As approximations become better and as computing power and memory continue to increase, the promise of analyzing warships in the microwave range becomes increasingly apparent. With these advances, and the ability to integrate more realistic traits such as travelling waves, the RCS test range could eventually become a validation tool to confirm the work of computational electromagnetics. The ability already exists to recreate threats as computer models and to analyze their EM properties as a contribution to intelligence work, and to simply learn more about these targets. The sizes of most missiles puts them in a category that could be analyzed today in the microwave range, and eventually feed such goals as target classification and identification.

LCdr Ryan C. Solomon (NCS Eng) completed a Master of Applied Science degree in electrical engineering at the Royal Military College in May 2008, focusing on high-frequency surface wave radar and bistatic RCS. This paper has been adapted from his master's thesis. LCdr Solomon is currently the subsection head for navy guns and targets in DMSS 6 in Ottawa.

Acknowledgments

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Canadian Forces Naval Engineering School Halifax —
A Mar Eng QL6 Course Technical Service Paper Adaptation

A Proposed Solution for Water Removal from the Controllable Reversible Pitch Propeller Oil System

Article by PO2 Carl Duval
Illustrations courtesy the author

Halifax-class frigates are fitted with a controllable reversible-pitch propeller (CRPP) system that controls the direction and speed of the ship ahead and astern by changing the angle of the blades on the propellers. There are two systems fitted on board, one for the starboard shaft and one for the port shaft, with the capability of cross-connecting in an emergency. Both are located in the after engine room.

The movement of the propeller blades is controlled hydraulically by an actuating unit (also situated in the after engine room) via oil tubes which run internally throughout the length of the hollow shaft lines and connect to a servo-motor piston mounted inside the propeller hub. The system is filled with oil and has a capacity in excess of 6,000 litres, not counting the associated piping, with most of the oil contained in the shaft line outside the hull.

The watertight integrity of the system is accomplished by system pressure when in operation, and by a header tank when not in use. The header tank is mounted in the after engine room one metre above the waterline to provide a gravity head pressure of approximately 0.1 bar (g) on the system[1]. The level in the tank is maintained by a dedicated replenishing pump that is controlled automatically. The CRPP system also interacts with the auxiliary seawater circulating system for cooling purposes via a heat-exchanger.

The CRPP system as currently fitted in the *Halifax*-class frigates does not have any built-in capability for removing seawater or other moisture that might inadvertently enter and contaminate the oil system. *(Photo: Brian McCullough)*

Water contamination

The CRPP system as currently fitted does not have any built-in capability for removing seawater or any other moisture that might inadvertently enter and contaminate the oil system. Contamination could easily occur through failure of the hub seals on the propeller, a heat-exchanger failure, a header tank or header tank pump malfunction which would negate the positive pressure on the seals in the hub, or a rapid change of oil temperature in the sump causing condensation to accumulate over time. The consequences of this are shortened oil life, sludge formation and corrosion which contribute to higher component wear and increased maintenance costs. Ultimately, such contamination could cause a CRPP system failure such as that experienced by HMCS *Ottawa* (FFH-341) when the ship entered Pearl Harbor, Hawaii in 2009 (as reported in their Periodic Engineering Letter for June 2009).

Water contamination, which is considered major when greater than 0.5% or 5,000 ppm[2], is usually detected through the monthly Oil and Coolant Condition Analysis Program (OCCAP) sampling, or through visual detection by the watchkeepers when the oil shows signs of emulsification. Technical bulletin "C-24-

599-000/TB-002 CRPP Hydraulic Oil Contamination — Oil Replacement and Cleaning Procedures" sets out procedures to follow if a ship cannot be docked to fully empty and remove contaminated oil from the system. The approximately 1,400 litres of oil in the sump must be replaced and a portable filtration unit installed to continue removing any remaining moisture from the oil while the system is in operation.

These procedures are costly and time-consuming. Replacing the oil in the sump requires seven barrels of 3-GP-357, listed at $371.05 per barrel through the Canadian Government Cataloguing System. The portable filtration unit is listed at $7,500 and the replacement cartridges for the unit (which uses two cartridges at a time) are listed at $667.30 each. This does not take into consideration any shipping and handling costs if no spare cartridges or oil are held on board, nor the time and personnel resources required to carry out the procedures. Also the disposal of the contaminated oil becomes an issue especially at sea or away from home port. From an operational standpoint, the shaft line would also need to be stopped and locked at sea, and the CRPP system locked out and tagged out to accomplish the procedure, possibly impacting a mission.

Off-line water removal options

One way to avoid the costly procedure now used when major contamination occurs would be to install an off-line CRPP water removal system. The built-in capability of an off-line system would continuously remove any water or moisture from the oil, thereby preventing any contamination from reaching a level where it could jeopardize the operation of the system or the ship. Three such CRPP off-line water-removal options were examined in a technical service paper prepared by the author in 2009 as part of his Mar Eng QL6 course requirements at Canadian Forces Naval Engineering School Halifax. Full technical details and specific costing information associated with the following options are included in the service paper.

Fig. 1. [Option 1] — A water-absorbing filter unit from RMF Systems. *(Courtesy www.stauffusa.com)*

[**Editor's note:** The order of Option 2 and Option 3 has been reversed from the source document so as to present the recommended option last in this article.]

Option 1 — Water-absorbing filtration

An off-line filter that uses a special water-absorbing spin-on cartridge as a pre-filter could easily be installed. The totally self-contained unit, which has its own dedicated pump, weighs only 18 kg and measures just 40 cm tall, by 36 cm wide and 33 cm deep (*Fig.1*). Two separate units would likely be required to serve the port and starboard CRPP systems, and both would require mounting brackets to be fabricated by a repair facility.

There are many advantages to this option — minimal training due to the simplicity of the system, ease of maintenance, a compact ergonomic design, and the capability to also filter dirt particles and thus extend the life of the main filters on the CRPP system.

As for disadvantages, the water-absorbing element can only hold 650 ml of water. To be fair, the unit was designed to be used only when topping up an oil system, not for continuous filtration. If a major contamination incident did occur, it would require many change-outs of the water-absorbing cartridges in a short period of time. Due to its small ca-

Fig. 2. [Option 2] — The vacuum jet dehydrator from Oilpure Technologies. *(Courtesy www.oilpure.com)*

pacity, a significant number of spare filter elements and cartridges would have to be held in stock on board the ship, especially during extended deployments. Disposal of the used cartridges as hazmat would also have to be considered.

Implementation of this option would cost approximately $42K, not including changes to drawings and training. The filter unit, operating supplies and materials account for $6,100 of this total.

Option 2 — Vacuum jet dehydration

An off-line vacuum jet dehydration unit operates on the principle that water or moisture evaporates at a lower temperature when in a vacuum. It heats the oil and then pressurizes it through a jet in a specially designed chamber to create the vacuum. This allows the water or moisture to "flash off" and be absorbed by the ambient air, leaving the "dry" oil to fall to the bottom and flow back to the sump.

The vacuum jet dehydration unit measures 62 cm tall, by almost 72 cm wide and close to 72 cm deep, and has a dry weight of 68 kg (*Fig. 2*). As with the previous option, a mounting arrangement would have to be fabricated.

The unit's main advantages are that it is highly automated, it will remove any moisture completely (even dissolved water), and with its capacity to handle 350 cc of dissolved water per day, one unit could service both CRPP systems.

The vaccum jet dehydrator also has many disadvantages. The system is fairly complex, so extensive training would be required for engineers and electricians, and a multitude of spare parts would have to be held in stores. Also, the dry oil drains back to the CRPP sump by gravity, which could be an issue in rough seas. The dehydrator also raises the temperature of the oil to close to the maximum recommended operating temperature of 70º C.

Implementation cost for this option would be around $45K. Dehydration unit, supplies and materials amount to $8,800 of the total.

Fig. 3. [Option 3] — The recommended PTU2 27 CJC Jensen off-line filter water separator. *(Courtesy www.klassenhydraulics.com)*

Option 3 (Recommended) — Off-line filter separation

The most effective option appears to be an off-line filter separator which uses a coalescing filter element to separate water from the oil (*Figs. 3 and 4*). The unit is self-contained with its own dedicated pump, and can be drained of water either manually or automatically. This option would have to be mounted on a robust platform since it has a dry weight of nearly 60 kg and measures 79 x 45 x 67.5 cm. However, since one unit could service both CRPP systems, it could be mounted on a fabricated extension to the existing main CRPP filters platform on the starboard side of the after engine room.

There are many advantages to this option. The size of the filter element, 27 cm in diameter, allows it to absorb up to 4.4 litres of filtered dirt as it separates the water from the oil and drains it away. This would greatly extend the life of the main filters on the CRPP system. Also, the operators would have the option of selecting which system to filter and could transfer oil from one system to the other if required by the use of manually operated valves. The training requirement would also be minimal due to the simplicity of the design.

Some of the disadvantages of this option are that it demands a more elaborate platform for installation, requires a significant amount of materiel in the way of valves and piping, and the size of the replacement filter element would require considerable onboard storage space for extended deployments. Hazmat disposal of the used cartridges would also have to be considered.

Implementation of this option would cost in the order of $48K, with the unit, supplies and materials making up $12,900 of that amount.

Recommendation

Three options were explored in this paper as possible solutions to the problem of inadvertent moisture ingress in the oil system for the *Halifax*-class controllable reversible-pitch propellers. The problems of corrosion, premature wear of components and sludge build-up from water-contaminated oil could possibly cause a system to become inoperable, and represent a considerable investment in time, money and effort to rectify.

While options 1 and 2 — the water-absorbing filter unit and the vacuum jet dehydrator — each offer excellent solutions in their niche areas, it is the third option, the off-line filter separator, that appears to present the most effective solution for the application in this study. Despite the slightly higher implementation cost, it is attractive because one unit could service both CRPP systems, and its simple design would keep the training requirements for maintainers and watchkeepers to a minimum. Furthermore, the unit's coalescing element would not become saturated with water and need replacement on a regular basis, thereby easing the maintenance periodicity and reducing the number of spare parts that would have to be carried. An off-line filter separator also has no impact on oil temperature, and the clean oil is pumped back to the sump rather than delivered by a gravity feed.

Given the always present risk of water contamination and the lack of built-in water removal capability in the CRPP system that is fitted on board *Halifax*-class frigates, it is recommended that the navy implement the installation of an off-line filter separator on a trial basis. If the trial proves successful, then it should be implemented on all *Halifax*-class frigates through a class-wide engineering change.

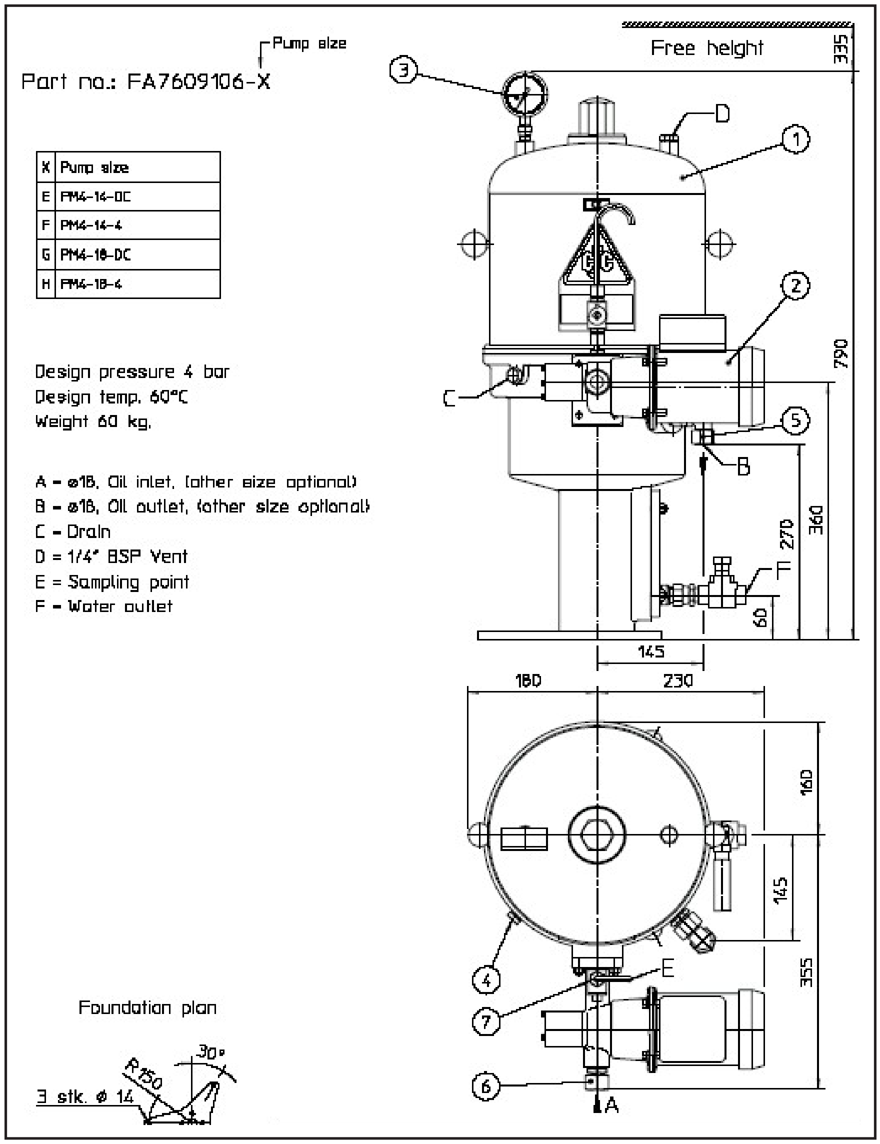

Fig. 4. The simple design of the Jensen off-line filter water separator would keep training requirements for maintainers and watchkeepers to a minimum. *(Courtesy www.klassenhydraulics.com)*

PO2 Carl Duval is the Auxiliary Machinery Supervisor on board HMCS St. John's. *This article was adapted from his QL6 course technical service paper.*

Acknowledgments

The advice of PO1 Terry Iedema in the preparation of this paper is gratefully acknowledged, as is the assistance of PO1 Jocelyn Naud (FMF *Cape Scott*) and the commercial suppliers who provided costing and/or technical information — Stephen MacLean (Stauff Canada), Rick Klassen (Klassen Specialty Hydraulics), Vichai Srimongkolkul (Oilpure Technologies) and Tom Geizer (Mueller Flow Control).

Notes

1. C-24-599-000/MS-001 Controllable Pitch Propellers and Propeller Shafting, 1997-06-27.
2. C-24-599-000/TB-002 CRPP Hydraulic Oil Contamination-Oil Replacement and Cleaning Procedures, 2004-10-01.

Reference

Petty Officer Second Class Carl Duval, "A Proposed Solution for Water Removal from the Controllable Reversible Pitch Propeller Oil System," Mar Eng QL6 Course Technical Service Paper, Canadian Forces Naval Engineering School Halifax, November 24, 2009.

St. John's and the Battle of the Atlantic

Reviewed by Brian McCullough

St. John's and the
Battle of the Atlantic
Edited, introduced by Bill Rompkey
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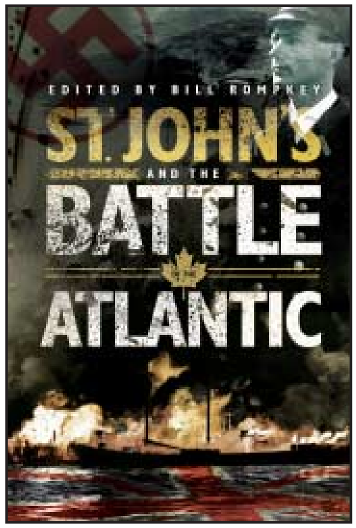

Bill Rompkey was just a kid living at number 17 Cook Street in wartime St. John's when "the navy" came calling one night. It was a visit he would never forget.

As the senator and one-time naval reserve officer describes in the preface to this edited collection of his and nine other writers' visions of the Newfoundland capital during the Second World War, the visitor that night was a naval rating "in full blues." The seaman had come to say thank you for the complimentary ditty bag full of amenities he had received — shaving gear, mitts, cigarettes and the like. It was the young Billy Rompkey who had packed the kit (including his own name and address) as part of his school's war effort.

"It's a memory that will never fade," Rompkey writes. "Nor will I forget the small role I had in the Battle of the Atlantic."

And that, really, is what this book is all about — the special relationship between the Battle of the Atlantic and the great port city on the Rock which historian Peter Neary once called the "Gibraltar of the West." With its superb natural harbour commanding the approaches to the Gulf of St. Lawrence, "Newfyjohn" was the seaward jumping off point for naval escorts shepherding the convoys across 2,000 miles of unpredictable ocean between North America and Britain. It was also the haven the sailors looked forward to on the return voyage.

Senator Rompkey's introduction to *St. John's and the Battle of the Atlantic* is infused with anecdotes and reads like a private, behind-the-scenes tour of a vibrant wartime city. It sets the historical context perfectly for the collection of stories that follows. Some of them, like Helen Porter's *Below the Bridge*, offer a gritty, yet humorous slant (this one of South Side, St. John's), but a darker side hits home hard in James Lamb's excerpts from *On The Triangle Run*, detailing the tragic loss of HMCS *Valleyfield* southeast of Cape Race, and in Darrin McGrath's chilling account (*Last Dance*) of a fire that swept through the Knights of Columbus Hostel during a dance on the evening of Dec. 12, 1942 and took the lives of 99 people.

The contrasts make for a compelling read, and the 60 black & white archival photographs just add to the appeal of this strangely intimate portrait of St. John's during her years "under the black cap cover."

And when it was all over, Rompkey notes, "The society and culture of Newfoundland and Labrador, old and solid, emerged from the war intact and yet altered…New political, cultural and social links had been forged with the Canadian mainland."

Update!

Salty Dips Vols. 1-9: The Centennial Collection

Naval Officers' Association of Canada (Ottawa Branch) © 2009
(www.noac.ottawa.on.ca)
CD (PDF chapters plus photos); indexed; $15.00 plus shipping

Now's your chance to pick up the complete collection of *Salty Dips*, the popular series of Canadian navy and merchant navy reminiscences. To celebrate the Canadian naval centennial, the NOAC (Ottawa Branch) has released a CD containing all nine volumes of *Salty Dips*, along with some great updates.

The first eight volumes have been revised to include many photographs not in the original printed versions, as well as new footnotes to clarify old terms and acronyms. A master index guides readers through the stories in the nine volumes.

Museums Celebrate Canada's Navy Centennial!

Photo tour by Brian McCullough

Maritime Museum of British Columbia, Victoria, BC —

Detail from "The Good Shepherd" by John Horton, featuring the corvette HMCS *Sackville* (K-181). The painting was on display at the Maritime Museum of BC and photographed with permission. (The porthole was not part of the display.)

The Maritime Museum of British Columbia launched its navy centennial activities with an exhibit of superb naval paintings by marine artist **John Horton**.

Elsewhere in the museum a visitor would find other navy related artwork in the form of ship's badges, gunshield art, "crossing the line" posters, illustrated voyage journals, and even examples of sailors' body tattoos.

"We are looking at art because art is emotional," said **Richard MacKenzie**, the museum's collections & exhibitions coordinator. "We are using formal and impromptu art to demonstrate (an) emotional connection with the navy."

Ron Morel Memorial Museum, Kapuskasing, ON —

Museum curator Julie Latimer shows off crests from the Ron Morel Memorial Museum's fine collection of memorabilia celebrating this Northern Ontario town's namesake navy ship, the *Algerine*-class minesweeper HMCS *Kapuskasing*. The ship's bell also hangs in this jewel of a museum located in three railroad cars!

Collections coordinator Richard MacKenzie and collections registrar Mary Swift stand by part of their wonderful navy centennial display at the Maritime Museum of BC in Victoria. The exhibit was designed to showcase people's pride in the navy, and the navy's pride in itself. Mission accomplished!

Canadian War Museum, Ottawa, ON —

Students Heather Moore and Brady Nielsen, visiting the CWM from Bayridge Secondary School in Kingston, got "into character" for the navy celebrations.

Maritime Command Museum, Halifax, NS —

Acting museum director Rick Sanderson shows a visitor part of the display in the museum's *Niobe* Room. It was fascinating to experience such an intimate connection to HMCS *Niobe*, one of the Canadian navy's first warships.

Prairie sailor: Naval Museum of Alberta, Calgary, AB —

If Calgary seems a tad inland for things nautical, don't tell that to this life-like example of the navy's finest standing Ready Aye Ready. In fact, the city boasts one of the finest naval museums in the country and is well represented on the active service list. Calgary is home to HMCS *Tecumseh*, the city's naval reserve division which has been on the books in one form or another since 1923.

Going to town for the navy! Maritime Museum of the Atlantic, Halifax, NS —

The Maritime Museum of the Atlantic in Halifax really went to town with this LEGO Navy Town in their HMCS *Horatio* area for kids. They even included the corvette HMCS *Sackville* in her white and blue camouflage paint scheme...and is that a great white shark nibbling at one of our submarines? Caps off to the members of the Nova Scotia LEGO Users Group who put this together.

2009 Naval Technical Officer Awards

The NTO awards recognize the dedication, hard work and technical excellence of NTOs in obtaining their training milestones during the previous year. Regardless of who wins any particular award, it is a significant accomplishment even to be considered a candidate. The 2009 awards were presented at the Naval Technical Officer Mess Dinner on March 25, 2010 at the CFB Halifax Wardroom.

Naval Officers' Association of Canada (NOAC) Award

Presented to the candidate with the best academic performance and officer-like qualities on completion of the Naval Engineering Indoctrination Course. **NCdt Matthew Daigle** accepted the award shield and the book, *The Ships of Canada's Naval Forces 1910-1985* from Cmdre (ret.) Mike Cooper, NOAC.

Mexican Navy Award

Presented to the candidate with the best academic standing and officer-like qualities on the NCS Eng Applications Course. Mexican Naval Attaché Captain Hector Capetillo presented the award plaque and Mexican naval sword to **SLt Meryl Sponder.**

L-3 MAPPS Saunders Memorial Award

Presented in the memory of Lt(N) Chris Saunders to the candidate with the best academic standing and officer-like qualities on the MS Eng Applications Course. Gwen Manderville joined Wendy Allerton of L-3 MAPPS in presenting the award plaque and the *Modern Marine Engineer's Manual* to **SLt Lisa Shields**.

MacDonald Dettwiler Award

Presented to the best overall naval technical officer who achieves Head of Department qualification. Richard Billard of MacDonald Dettwiler, presented the award plaque and naval sword to **Lt(N) Johnathan Plows.**

Weir Canada Award

Presented to the best overall Phase VI candidate who achieves MS Eng qualification. Serge Lamirande of Weir Canada Inc. presented the award plaque and naval sword to **Lt(N) Jarett Hunt.**

Lockheed Martin Canada Award

Presented to the best overall Phase VI candidate who achieves NCS Eng qualification. **SLt John Faurbo** accepted the award plaque and naval sword from Marc Charbonneau of Lockheed Martin Canada

Photographs by Formation Imaging Services, Halifax.
A photo of award winners and runners-up appears on our inside front cover.

Ninth MARCOM history conference "Best ever"

Article by Ada Wasiak

Distinguished historians and strategic analysts from around the world gathered at the Canadian War Museum in Ottawa on May 5 and 6 to present ideas and share their research at the Ninth Maritime Command (MARCOM) History Conference. *"The Canadian Navy and the Commonwealth Experience, 1910-2010: From Empire to Independence"* was featured as a part of Navy Week centennial celebrations and was the latest in a series of MARCOM history conferences designed to help those involved with the navy learn from its past and shape its direction for the future.

"My hope was that this conference would lead to a better understanding of the Canadian navy's place in history and the contemporary world," said Navy Command Historian and conference organizer **Dr. Richard Gimblett**.

Those in attendance came from Canada, the United States, the United Kingdom, India, Australia, New Zealand and Singapore. **Rear Admiral James Goldrick** of the Royal Australian Navy delivered the keynote address, "From Fleets to Navies: The Evolution of Dominion Fleets into Independent Services."

Keynote speaker Rear Admiral James Goldrick (RAN) and aide Sub-lieutenant Ben Thomson appeared to be enjoying Canada's naval centennial back-drop. ***(Conference photos by Brian McCullough)***

Commodore Patrick Finn, Project Manager Canadian Surface Combatant Project, chaired Session 5 of the conference: "The Prelude to Action — Programs, Engineering & Logistics." The ses-

Command Navy Historian and conference organizer Dr. Richard Gimblett: "Overwhelmingly positive feedback."

Commodore Pat Finn and Commodore Richard Greenwood listen to remarks from Jason Delaney of the Directorate of History and Heritage.

sion included a paper by Canada's own chief naval engineer, **Commodore Richard Greenwood**, Director General Maritime Equipment Program Management, on "An Engineer's Outline of Canadian Naval History, 1970-2010." It is a story of "platforms, people and purpose," Cmdre Greenwood said.

Dr. Norman Friedman, an internationally renowned and outspoken American naval analyst talked about the Commonwealth's approach to Atlantic warfare from 1945 to 1955. "The navy is seen as a way of enforcing peace overseas," he said.

Dr. Gimblett said that he has received overwhelmingly positive feedback, with many saying this was the best conference they'd ever been to. He said that what set this conference apart was the broad cross-section of military staff, politicians and interested members of the public in attendance. Many in the audience got involved, asking questions and providing points for discussion.

Vice Admiral Dean McFadden, Chief of the Maritime Staff, was unable to attend the conference, but his concluding remarks were delivered by **Commodore Peter Ellis**, Director General Maritime Force Development. The admiral put forward the new plan of Canada First, and an ambitious and optimistic vision for the second century of the navy. "A vision that remains consistent with the decision made by a still very young Dominion of Canada one hundred years ago this week, that it would see to its maritime defence through a navy capable of independent and sovereign action at sea.

"This 21st century will be a maritime century."

Ada Wasiak is the senior editorial intern at Beyond the Hill magazine with the Canadian Association of Former Parliamentarians. She attended the conference to research an article on the Canadian Navy Centennial. (Photo courtesy of the author.)

Naval Centennial Bell

The Canadian navy presented its commemorative Centennial Bell to the people of Canada in a ceremony in the Senate of Canada on May 4, designated Canadian Navy Centennial Day by the Government of Canada. On hand for the ceremony were Petty Officer Second Class **Erin Bonnar**, Petty Officer First Class **Steve Robak**, Petty Officer First Class **Dean Boettger**, and Petty Officer First Class **Dan Murphy**.

As described on the forces.ca (Canadian Naval Centennial) website, the bell was cast by the Fleet Maintenance Facility *Cape Breton* foundry in HMC Dockyard at CFB Esquimalt in Victoria from material representing the navy's century of service. Included among the artefacts were navigation tools, cap badges, shell casings, uniform buttons, a boatswain's call, ship fittings and equipment, and even flammable items such as pieces of uniform, letters and photographs that vaporized and added essence when the metal items were melted down.

Photo: Lt(N) Wendy Goulet, CNC Public Affairs

Cyclone ahead!

HMCS *Montréal* (FFH-336) rides at anchor in Halifax Harbour on a blustery wet day last March 23. The frigate was undergoing the first Ship/Helicopter Operational Limitation trial for the new Sikorsky CH-148 Cyclone maritime helicopter replacement for the navy. That's a contractor's test bird on the flight deck, as the first of the 28 new Cyclones on order weren't due to be delivered before November. *Montréal*'s flight deck had to be reinforced to handle the Cyclone's 13,000-kg maximum take-off weight, which is about 3,000 kg heavier than that of the old CH-124 Sea King helicopter the navy has been operating since the 1960s. *(Photo: Brian McCullough)*

News Briefs

(Fish & ships, anyone?)

"CANstructing" the Sardine Frigate

Article by Nathaniel Davis
Photos courtesy the Canstruction Team

Cans, upon cans upon cans! The design of this sardine-can frigate, which called for 1,650 tins, took 2½ hours to build. At the end of the project every tin of food was donated to the food bank.

Canstruction® is a trademarked competition of the Society for Design Administration that challenges engineers and architects, from students to seasoned professionals, to design and build structures out of non-perishable cans of food. With only a few simple rules of design, teams create sculptures that are often nothing short of fine art. Once the sculptures are built, judges survey the completed designs and choose winners in such categories as Best Meal, Structural Ingenuity, and Best Use of Labels. Following the competition all of the food is donated to the food bank.

The idea to enter the competition was planted in my mind several years ago by a fellow engineer in Toronto. Her civil engineering firm was taking part in the annual Canstruction competition, and eventually built an excavator — fitting for civil engineers! I thought there was no reason why we couldn't do the same thing here at National Defence in Ottawa. DND has a huge resource of engineers who could easily design and build a structure.

I thought we should keep it to a small group for our first try. Being a civilian engineer-in-training for the navy at the time, I invited a group of other navy EITs to join me — Phil Nitchuk, Joe Rossiter, Dalia El-Hawary, Phuong Mai, Thanushian Pathmalingam, Ryan McDermott, Michael Houser, Kristofer Knowles and Matthew Bullock. It would be a good way to showcase our skills and network with each other. After bouncing a number of ideas around we selected a design that we felt represented the navy well and presented us with a good challenge: we would build a scale model of a Canadian patrol frigate out of cans of sardines.

Typically, an engineering firm would design their sculpture and then request the money to purchase the materials, but in the federal government there is no money for these sorts of purchases. Our group of EITs went to work to fundraise the money to build our design. There was a possibility that we would not raise enough money, but we took the risk. The design required a minimum of 1,650 sardine cans, plus some chipboard. To our relief we received generous donations from our fellow DND employees and navy personnel, as well as from COSTCO. We easily achieved our goal, and for that we offer our sincere thanks. We would especially like to thank RAdm Richard Greenwood (DGMEPM at the time) and Capt(N) Michael Wood (COS MEPM) for their personal financial contributions and for the support they gave this project right from the beginning.

The first build of our sardine frigate took place at the Louis St. Laurent building in Gatineau, Québec on January 25, 2009. The "CANadian Patrol Frigate" was 4.3 m long, 0.54 m wide, and approximately one metre tall. It remained in place for a week, allowing staff to look at the miniature frigate and to remind them to donate to the food bank. The frigate was then rebuilt in May when all the teams competed in the first annual Canstruction competition hosted by the Ottawa Regional Society of Architects (ORSA) as part of Ottawa's annual Tulip Festival.

In the end, Canstruction is not about the competition at all. It's about team-building, and then donating the food to charity. It's just fun.

Nathan Davis graduated from the EIT program in June, and is now a project naval architect in the Ship Design section of DMSS 9 at National Defence Headquarters.

The team of Thanushian Pathmalingam, Phuong Mai, Nathaniel Davis, Ryan McDermott, Michael Houser and Dalia El-Hawary stand by their finished "CANadian Patrol Frigate" entry at the Ottawa Tulip Festival. Note the interesting use of toothpaste, deodorant and toothpick add-ons to create the ship's combat suite. If only it were that easy.

Plan in hand, Nathaniel Davis does it by the numbers at the May 2009 Ottawa Regional Society of Architects Canstruction competition during the Tulip Festival in Ottawa.

Canstruction project leader Nathaniel Davis and Joe Rossiter add cans to the model as Ryan McDermott sorts the chipboard layer guides. The rules allowed teams to use thin sheets of material for levelling and balancing, but not as load-bearing structures.

2009 NTO award winners and runners-up

Formation Halifax Imaging Services

(L to R) **NCdt Matthew Daigle, Lt(N) Susannah Chen, Lt(N) Johnathan Plows, SLt Stephanie Hartzell, Lt(N) Edward Sorensen, SLt Lisa Shields, Lt(N) David Irvine, SLt Meryl Sponder, SLt John Faurbo, SLt Brian Smith, Lt(N) Derek Booth, Lt(N) Jarett Hunt and Lt(N) Kevin Seidler. (*Unable to attend:* Lt(N) Emil Schreiner and Lt(N) Stephen McCormick.**

Award photos on page 18 —

National Defence / Défense nationale

News

CANADIAN NAVAL TECHNICAL HISTORY ASSOCIATION

1910-2010
NAVY CENTENNIAL EDITION

CNTHA's Journey of Discovery

During this 100th anniversary year of the Canadian navy it is opportune to remember that the success of the navy in its endeavours over the past century has been due to the dedication and hard work of countless naval, government and industrial people. A major aim of the Canadian Naval Technical History Association is to capture the naval technical development side of their story and, in co-operation with the Directorate of History and Heritage (DHH), make it available for study by generations to come.

Since 1992, CNTHA's Canadian Naval Defence Industrial Base (CANDIB) project has been successfully investigating and documenting the industrial aspects of naval procurement, from the role played by marine industry in naval research and development, to the work of the design houses and shipyards. Over the last few years a number of highly interesting and important aspects of Canada's naval technical history have been documented and turned over to DHH for its archives. Where much of this information was once in real danger of becoming lost forever, it is now available for use by researchers, authors, students and anyone with a curiosity about events leading up to many important naval acquisitions.

We are pleased to report that the CNTHA/CANDIB effort continues to acquire important historical information, both in written form and through oral histories. Interviews continue with leading figures on the industrial and government sides of the design and build of the *Halifax*-class frigates, as do those with key people involved in the genesis of the *Kingston* and *Orca* classes. We have been equally successful in interviewing people who were part of the build program for the supply vessel HMCS *Provider*, and the conversion of HMCS *Cormorant* to a diving support ship. The CNTHA is also now recording the events that gave rise to key combat system technologies in which Canada played a vital and unique role, and will soon begin capturing more facets of Canadian naval technical history relating to marine systems, naval architecture and personnel. It has been a fascinating journey of discovery, to say the least.

We invite you to visit our updated website which showcases our interview transcripts, photo gallery, and other features. We are always interested in volunteers to help with our efforts, so please consider participating. Contact us through the website at http://cntha.ca, or by telephone (Tony Thatcher) at 613-567-7004 ext 227. We wish everyone associated with our great navy all the very best in Canada's naval centennial year.

— Pat Barnhouse and Tony Thatcher

CNTHA News *Est. 1997*

CNTHA Chairman
Pat Barnhouse

CNTHA Executive Director and CANDIB Project Leader
Tony Thatcher

Directorate of History and Heritage Liaison
Michael Whitby

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