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Maritime Engineering Journal

CANADA'S NAVAL TECHNICAL FORUM

June 1998

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Port Weller Diary – A detachment commander's journal

Maritime Engineering Journal

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JUNE 1998

Our Cover:
HMCS *Algonquin* in 1979. The design for Canada's four *Iroquois*-class destroyers built during the 1970s grew out of politically doomed plans for a "general purpose" frigate. When *Iroquois* was commissioned in 1972, she became the first destroyer-sized ship in the western world to have all-gas-turbine propulsion. *(CF photo)*

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Editor's Notes

Welcome *CNTHA News*! Partners in the naval technical support effort

By Captain(N) Roger Westwood, CD
Director of Maritime Management and Support — Editor

This is my first opportunity to address the *Maritime Engineering Journal* readership as the *Journal*'s new editor. Before I get to the current topic, the incorporation of the Canadian Naval Technical History Association newsletter into the *Journal*, I would like to acknowledge the important work of the *Journal*'s authors and editorial staff in maintaining a first-class publication. As a faithful reader over the past 15 years, I recognize that these dedicated individuals have ensured that the *Journal* continues to provide an essential forum for our community. I salute the efforts of all those who have made a personal contribution to the *Journal*'s success and strongly encourage all members of our community to participate actively in this vital forum.

The *Maritime Engineering Journal* is pleased to welcome a new strategic partner to the publishing fold, in the form of *CNTHA News* — the newsletter of the Canadian Naval Technical History Association. Beginning with this issue, *CNTHA News* will appear as a regular "feature" piggybacked in the centre section of the *Journal*. Although our two publications share close editorial ties with one another, we will continue to maintain separate editorial decision-making boards.

It was nearly two years ago that the *Maritime Engineering Journal* first announced DGMEPM's "synergistic partnership" with the newly formed Canadian Naval Technical History Association (see "Piecing together our technical history," Editor's Notes, October 1996). As we told you then, the CNTHA was established to support the Directorate of History and Heritage's effort to pull together the official version of Canada's post-1945 naval technical history.

The association is chaired by former Assistant Deputy Minister for Engineering and Maintenance RAdm (ret.) Mike Saker who, like virtually everyone else on his committee, volunteers his time and effort to the cause. The association receives no budget from DHH, and in April the CNTHA faced a dilemma when it had to take over responsibility for funding its newsletter. DGMEPM, who had been working behind the scenes to prepare for this eventuality, quickly agreed to RAdm Saker's formal request to bring *CNTHA News* under the *Journal*'s funding umbrella.

It was a win-win decision if ever there was one. Apart from solving the CNTHA's immediate publication funding crisis, our teaming-up like this serves several purposes. To begin with, the opportunity for exchanging ideas and offering input to each other's efforts has now grown. This may be most people's first exposure to the naval technical history newsletter, but *CNTHA News* subscribers have been receiving the *Maritime Engineering Journal* with their subscriptions for over a year now. Already, we in the serving technical support community have benefited from this exposure through CNTHA-sponsored seminar presentations and historical articles in the *Journal*. (Our cover story on the beginnings of the DDH-280s is a perfect case in point.)

The CNTHA, on the other hand, stands to reap huge dividends by having more direct access to the serving naval technical community. And here I appeal to you. If you think you can contribute in any way to the documentation of Canada's post-war naval technical history with stories, documents, drawings, photos — please get in touch with the CNTHA at the numbers listed in their newsletter.

But there is more to it than that. And this is where it all comes together. By positioning the CNTHA newsletter as a high-profile insert in the *Maritime Engineering Journal*, it serves as a permanent reminder to everyone serving in Canada's naval technical support community that the present soon becomes the past. In other words, keep in mind as you do your day-to-day work that you are in the best position to maintain an accurate historical record of significant decisions and activities as they pertain to your area of expertise. Your conscientiousness on a daily basis will ensure that the story of Canada's ongoing naval technical effort will be faithfully preserved for generations to come.

Here's to a long, happy association.

The *Journal* welcomes **unclassified** submissions, in English or French. To avoid duplication of effort and to ensure suitability of subject matter, prospective contributors are strongly advised to contact **the Editor, Maritime Engineering Journal, DMMS, National Defence Headquarters, Ottawa, Ontario, K1A 0K2, Tel.(819) 997-9355**, before submitting material. Final selection of articles for publication is made by the *Journal*'s editorial committee. Letters of any length are always welcome, but only signed correspondence will be considered for publication.

Commodore's Corner

The Role of the MARE

By Commodore J.R. Sylvester, CD
Director General Maritime Equipment Program Management

By now I think we have all had the opportunity to reflect on the good news that our Canadian submarine service will continue with the acquisition of four British *Upholder* submarines. Of course, with deeper reflection comes the awareness of the challenges we now face in the operational and materiel support community to prepare for and accept these most welcome new elements of our renewed navy. As I mentioned in closing the last Commodore's Corner, work indeed does remain, opportunities for interesting challenges do abound, and the navy does continue to require our support.

Ironically, as I continue to visit and meet with the members of our Maritime Engineering community, I am challenged regarding both the employment opportunities for, and even the role of, the Maritime Engineer. While I am aware that there are significant concerns at all levels of the community, as private sector employment opportunities once again open up it is perhaps appropriate to comment now on the MARE role within the materiel team and also to discuss the ever-present schism between the profession of arms and engineering accreditation.

There is a very natural inclination to question the professional value of the MARE. Having been around this consideration several times in my own career, I can but simply reinforce that the MARE is a professional military officer — with a salty persuasion, of course. At sea, MAREs are integral members of the naval combat capability embodied in a warship (or submarine). Their particular contribution at sea, as ashore, is to translate the operational requirement into materiel action or materiel capability. MAREs contribute to the "management of violence," a singular role that separates them from other specialist officers who share in the risk of violence. It is this role, incidentally, that binds us to the naval operations community. Ashore, however, the MARE is but one element of the larger "collective" that includes engineering, technical, procurement, financial, logistic, production, human relations and administrative specialists — to name a few.

While professional engineering accreditation for the MARE is not at all discouraged, it is not absolutely necessary. The essential contribution — more complex ashore — is to ensure that operational requirements continue to be satisfied via the direct action of our own workforce or via work instruments contracted to the private sector.

Consider for a moment the magnitude of yearly fleet support. Canada's military and civilian naval support team, in partnership with industry, delivers approximately $300 million in direct, or contracted, goods and services via the Fleet Support Plan, and anywhere from $100 to $600 million in capital acquisition, depending on the number of active major Crown projects. The scope of this support is huge — the maintenance of documentation, procurement of spares, the repair and overhaul of equipment, the design/procurement/installation of configuration changes, delivery of maintenance work periods, deficiency diagnosis/rectification, operational testing/certification, and even (when we are fortunate) acquiring new weapon systems like submarines.

Administering this work is a complex undertaking. The variety of technologies is enormous, from the most basic sewage treatment plant to the most sophisticated command and control system. The particular role of the MARE in all this is to act as the interface between the warrior and the civilian materiel community — a unique, necessary and continuing role.

Returning to the *Upholder* acquisition, most of you are now familiar with the innovative features of this deal (see News Briefs in this issue). What is less evident is the often difficult, "behind-the-scenes" efforts that took place over the past four years to make this incredible opportunity a reality for Canada and the navy. MAREs were intimately involved and responsible, with others, for this success. I can tell you personally, as the lead negotiator over the final few months, that there is no substitute for the broad range of MARE experience, achieved at sea and ashore, in keeping the many conflicting requirements and industrial objectives in balance while never losing sight of the primary operational need. This is but one high-profile example of the type of employment that MARE officers (and many others in the naval technical community) are doing every day in Ottawa, on the Coasts, and, for a lucky few, around the world!

It would be remiss of me, though, not to highlight that there are other employment options available to professional military officers. MAREs are encouraged to pursue these positions as they are absolutely necessary in ensuring that individually, and collectively, we develop as part of the broad fabric of the CF general service officer — not simply as civilian-accredited specialists in uniform.

Our particular technical backgrounds and practical problem-solving skills position us very well to excel at a wide range of non-traditional opportunities such as serving in diplomatic and UN missions around the world, providing technical insight to the intelligence service, formulating CF/international policy, serving as equerry and escort to members of the Royal Family — even orbiting the earth in the space shuttle. The list goes on. While I can safely guarantee you that your service to the public will never make you rich, I cannot think of a more enriching and varied experience within many complex and interesting support partnerships.

Forum

[Editor's Note: The following two articles were developed from correspondence between LCdr R.W. Jones and Capt(N) I.D. Mack. In the true spirit of "keeping the dialogue open," the authors kindly agreed to prepare their comments for publication in the *Journal*.]

Some Concerns with Alternate Service Delivery

Article by LCdr Robert W. Jones

I want to thank Capt(N) Mack for his article, "Speaking the Unspeakable..." (*Maritime Engineering Journal*, October 1997), discussing the issues of trust and teamwork and the responsibility of senior MARE officers to enhance the dialogue.

One issue that I believe needs a thorough airing within our naval team is the implications of alternate service delivery on the exercise of authority, accountability and responsibility within maritime engineering support activities. Since 1995 I've been told to embrace change and risk, adopt a business approach to my professional life (which conflicts with our military ethos), and make way for ASD as it will bring about unimaginable efficiencies in naval support activities.

My experience with ASD causes me concern in the following areas:

• Authority — ASD promotes the establishment of mini-fiefdoms, stove-piping and operating independently of the navy's authorized structure;

• Accountability — ASD promotes the attitude, "Get the job done and deal with the consequences later," often with little visibility on the situation from the authorized chain of command;

"In the current climate, many managers are embracing new concepts because they are in deep over their heads with little direction."

• Responsibility — ASD assigns roles to contractors which conflict with those roles mandated to existing naval engineering support organizations. I further believe that ASD affords greater opportunities for contractors to play meaningful roles in engineering support activities at the expense of the professional development of the members of the naval engineering team (both uniformed and civilian).

I know that I could be accused of turf protection in this issue...to which my response would be, "You're absolutely right!" In the current climate, many managers are embracing new concepts because they are in deep over their heads with little direction. The MARE Council is an excellent forum for our leadership to wrestle with the implications of ASD, stake its position, and then broadcast it to the navy team. If we are to embrace ASD, then let us, as Capt(N) Mack says, "enhance the dialogue" and go forward with our eyes wide open to its consequences.

LCdr Jones is a Marine Systems Engineer with DQA 5 at NDHQ.

Points to Consider on ASD

Article by Capt(N) I.D. Mack, OMM, CD

LCdr Jones' concerns regarding the impacts of alternative service delivery in the delivery of maritime engineering services are not unique to MAREs. As Base Commander of CFB Halifax, I have wrestled with ASD across a wide spectrum of services, and the same questions are germane throughout.

LCdr Jones states as fact that "a business approach...conflicts with our military ethos," that it leads to the establishment of "mini-fiefdoms...operating independent of the navy's authorized structure," that it encourages "getting the job done and dealing with the consequences later," that it encourages the transfer of MARE responsibilities to contractors at the expense of our own professional development.

DND's ASD policy states: "All non-core activities shall be moved to the private sector when an external provider has been determined to be more cost effective using the departmental ASD Methodology and Business Case Analysis." How is this in conflict with our military ethos? Surely, non-core support services must be delivered as cost-effectively as possible to maximize our profit margin in terms of the funding available for front line operational defence capability (e.g. warships, tactical air support and airlift, and soldiers). However, where such support services are "core," perhaps we have not been rigorous enough in clearly identifying those posts, or in selling our position as critical enablers ashore for MAREs and the technicians they lead to be able to do their jobs well at sea. Furthermore, the ASD policy does not in any way absolve CF or DND members from being responsible for what contractors deliver as services, so "core" must include the military and civilian jobs we need to develop and maintain the expertise for assuring value from the private sector. But perhaps the old models are too expensive.

Given that the ASD policy was only enunciated in 1995 and has yet to lead to the transfer of major responsibilities to industry (CFB Goose Bay only now approaching such status), it is premature to conclude that it drives DND/CF entrepreneurs to operate outside of the navy's authorized structure. Many argue that, soon after industry shoulders much of our traditional workload, the navy will not have the expertise to be the "real" technical authority. I see the ASD challenge as one of ensuring we have a system of professional development for MAREs and DND civilians which gives us the experience and education needed to solicit and assess advice from industry and/or larger navies on our navy's technical issues. I

admit that this is no small challenge as the complexity, pace of change and costs of defence systems increase exponentially. Change is the key.

Naval engineering has always included risk analysis, a form of meeting today's requirements based on an evaluation of the potential consequences. When I joined the navy, refits of the "cadillacs" occurred every two years using in-house resources. With experience, reliability-centred maintenance tools and an acceptance of greater risk, we increased the time between refits to five years and contracted-out the refit workload. Admittedly, ASD is inherently more risky in a business where the consequence of error can be huge. Therefore, we must entertain mandated ASD activity by selecting appropriate response strategies to mitigate increased risk, such as insistence on ISO 9000 certification and avoidance of monopoly situations. Again, "for every action, there needs to be a reaction."

I reject the notion that ASD encourages the transfer of responsibility. There will always be someone in the navy responsible for the delivery of maritime technical services, whether by our own internal service provider or by the private sector. However, I can envisage a new role in how we discharge these duties. My vision is a structure integrated with our maritime private sector brethren. Rather than maintaining positions in large DND teams, we would fill positions in maritime industries at various times in our careers. This was done to some extent during the TRUMP project under the "Training with Industry Program" (TWIP). As we have all learned at sea, it is the educated engineering mind coupled with experience that allows us to be held accountable for technical readiness, not our ability to do every job therein. I know that the approach I have suggested is easier said than done. It requires study and trial development before we can be confident of retaining enough "check and balance" in MARE knowledge and experience to deliver on our unique accountability.

"My vision is a structure integrated with our maritime private sector brethren."

In the final analysis, LCdr Jones has concluded that inadequate resource (a.k.a. ASD) is leaving many "over their heads." I accept that we cannot do our jobs the way we have in the past, that we must create a new vision for doing our essential work differently, given the resources we will be allowed. And here LCdr Jones and I are in complete agreement — this is priority work for the senior MARE leadership. As a member of the MARE Council, I will propose ASD as an agenda item at the next meeting.

Capt(N) I.D. Mack has been promoted commodore and appointed Assistant Chief of Maritime Staff at NDHQ.

Systems Engineers as Leaders

Article by LCdr Sean Midwood

The purpose of this paper is to address leadership within the realm of systems engineering and how this pertains to us as MAREs. Systems engineers need to recognize that the absolute key to their project's success is strong, dynamic leadership. I don't know how often I have heard from fellow MAREs that they just want to do engineering — that leadership is of lesser importance. This perspective runs contrary to how I perceive the MARE's role.

Systems engineering is the foundation upon which all projects are set. It is the key to a project's ultimate success or failure. Conceptually, systems engineering brings together all the necessary people, products and processes to ensure a project's success, which is definitively validated through customer satisfaction. This is not a one-shot deal. The need for the systems engineering process is usually articulated through a customer's expressed desire for a new or modified system, or through demonstrated deficiencies (ops, support, training, etc.) in an existing system. The challenge, then, is to iteratively define, refine and settle on a satisfactory solution that is necessarily heavily biased by cost, schedule and performance parameters. Since this process continues for the entire life of a system, the vision and outlook of those involved must be virtually prophetic in nature.

By necessity, systems engineering must be multidisciplinary and fully integrated. No "islands," or sacrosanct elements must be allowed to exist (including classified programs, which are too often kept hidden behind veils of secrecy only to be doomed to failure for lack of an effective systems engineering process). It is this systems engineering process, via a *well-led* integrated product team (IPT), that ensures the customer gets what he wants in the shortest possible time and at a realistic cost. The ability to put aside personal and team egos in favour of the ultimate lifelong success of the project is paramount.

What does this mean for us as systems engineers? To begin with, it means we have to be able to see the big picture — to understand the relative importance of all facets of a project (including compromise) and how they relate to cost, schedule, and performance. It is our job to know the relative strengths and weaknesses of our individual team members, and correct shortcomings where necessary. We must recognize the need for forward thinking, and have the ability to envision our product and the overall system through the complete life cycle. It also means that we have to ensure that our IPTs, at whatever level of responsibility, understand the goals of the project and are kept highly motivated toward achieving those goals. THIS IS A LEADERSHIP ROLE! It is not for the weak of heart, or for those with narrow vision. As systems engineers it falls to us to ensure our systems engineering is made effective by planning, implementing and controlling this highly integrated process along the lines of its tenets, and by infusing our team members with both the confidence and the will to fully participate.

LCdr Midwood is the project manager for the Canadian Towed Array Sonar System.

How the DDH-280 Began

Article by Hal Smith and Shawn Cafferky
[*From a paper presented to the 1998 West Coast Naval Engineering Seminar, Jan. 21-22, 1998*]

The General Purpose Frigate

In April 1963 a federal general election resulted in the return of a Liberal administration led by the Right Honourable Lester B. Pearson, overturning the previous Conservative administration of the Rt. Hon. John Diefenbaker. This event was to bring to an end a brief period of relief — admittedly only moderate — from the fiscal restraint that had characterized naval shipbuilding programs in the late 1950s.

At the time, the RCN was heavily engaged in shipbuilding programs. Two ships of the four-ship *Mackenzie* class were still building and would commission later in the year. The conversion of the *St. Laurent* class to DDH type ships equipped with variable-depth sonar was well advanced, with the first ship (*Assiniboine*) to commission during the summer. *Annapolis* and *Nipigon*, laid down as *Mackenzie*s, would complete in 1964 as DDHs. *Provider*, the first of a planned three operational support ships, would complete in the fall. The purchase of three *Oberon*-class submarines from the Admiralty had been approved in principle, although negotiations were stalled while industrial offsets were being worked out. Plans were in train for the conversion of the *Restigouche* (and, in time, the *Mackenzie*) classes to DDHs. The centrepiece of the program, however, was the construction of eight "general purpose frigates," the first truly new design undertaken by the RCN since 1948.

These ships were intended to replace the aging destroyers built between 1943 and 1948, maintaining a measure of flexibility in the fleet and providing a measure of air defence which had been lost with the withdrawal of fighter aircraft from *Bonaventure* in 1962. For the time, the design was reasonably advanced. Although the proven Y-100 steam machinery was retained, automatic machinery control was planned. A twin 5-inch gun for surface action and bombardment, a Tartar medium-range and two Mauler short-range missile systems for air defence, and a digital tactical data system with automatic data link were to be fitted. An important feature was a major improvement in communications, particularly HF communications, and in electronic warfare equipment. Anti-submarine warfare (ASW) equipment, however, was to be considerably less extensive than in the DDHs; hull-mounted and towed search sonar, but only a single mortar and a small weapon-delivery helicopter rather than the larger and more capable Sea King. The design was further complicated by the requirement to transport, land and provide initial support to 200 troops (with 13 tons of vehicles) for United Nations style operations.

The preliminary design of the GP frigate was a searching test of the 1961 reorganization of Naval Technical Services from a professionally-based organization (constructor, engineering, electrical, ordnance and supply branches) to a functional one (ships, fighting equipment, aircraft, support facilities, naval supply). The Naval Staff was also reorganized with "requirements" directorates closely linked to the corresponding technical divisions. After a settling-down period, this proved very effective in bringing staff, ship and fighting equipment people together in working out a preliminary design (although it caused other problems we will not pursue here). The sketch design of January 1962 described a 3300-ton ship capable of 27 knots, at a cost of $33 million per ship.

Unfortunately, as the design developed further, the ship grew. Largely because of fighting equipment requirements, particularly the need for sufficient space for antennas forward of the flight-deck and clear of the weapon firing arcs, the missile system weight and the need for greater generator capacity, by June 1962 the ship's displacement had grown to 3800 tons and the projected cost had escalated to $42 million per ship. This attracted the ire of the Deputy Minister and Treasury Board staff, and a protracted battle at very senior levels ensued before compromises on all sides settled on some fighting equipment changes and the acceptance by the Government of an average cost of about $36 million. This controversy became widely known outside DND, and had the lasting and very unfortunate effect of creating considerable distrust between the navy and the Department of Defence Production on the one hand and the Deputy Minister and Treasury Board on the other.

The basic difficulty — one that would continue — was the impracticability of fitting up-to-date fighting equipment in a modified *St. Laurent* hull and the virtual impossibility of estimating the cost of fighting equipment accurately when much of it was still in development and would not be delivered until four years or more from the date of program approval. This was coupled with the unwillingness of the Government to recognize that warship costs were inherently high. Even the cost of the *Restigouche* class ($26 million per ship) was regarded as grossly excessive, and these ships were only a modest development of a 1948 design.

A Time of Indecision

The new government had a very different attitude toward Defence policy than its predecessor. In 1960 the previous government had very reluctantly accepted the new military policy of NATO, calling for increased conventional forces and the forward ASW posture that it implied. The new government, on principle and (more pressingly) because of the financial plight of the country, was not at all willing to continue along this path. Further, the new defence minister, the Hon. Paul Hellyer, was intent on reorganizing the armed forces and was willing to accept a twenty-five percent reduction in the Defence budget imposed by the Finance Minister in return for a relatively free hand within the department. It came as little surprise, therefore, when the Minister announced two days after he took office that he would take a "cold hard look" at the Defence programs being planned, singling out the controversial GP frigate for special attention. A freeze on new capital programs and a reduction of the Defence budget followed in the next six months.

The naval budget reduction was savage (a five-year freeze at $284 million in 1963 dollars, rather than $307 million in-

creasing to $516 million by 1967). Aside from its immediate implications (paying off four Tribal-class ships, all ten minesweepers, and reducing complement by four percent), it threw all future programs into confusion. This was increased by the Minister's not unexpected announcement in November 1963 cancelling the GP frigate, largely on cost grounds, but in terms that also cast doubt on its purpose and, by implication, the wisdom of the navy in proposing it. The navy thus embarked on a far-reaching review of its future building program.

The next several months were marked by what may politely be called indecision. The navy's efforts were not helped by the Minister's formation of a parallel Maritime Systems Study Group independent of the armed forces, and his proposal of a new force structure (for all three services) of his own devising, which he required the services to cost. The Defence white paper of March 1964 was of little help, being primarily concerned with the Minister's plans for integration of the three service headquarters and the eventual unification of the three armed services. Studies considered alternatives from helicopter carriers to nuclear submarines. However, opinion eventually coalesced on the necessity for guided-missile destroyers (DDG), an opinion shared by the Minister's study group. Clearly the design would draw heavily on the GP frigate, although the Assistant Chief of Naval Staff (Air and Warfare), Cmdre A. B. F. Fraser-Harris, warned his staff, "One thing is quite certain and that is the words 'GP frigate' must never be used again."

Operational requirements, ship characteristics and three possible sketch designs were prepared during June and July 1964 and approved by the Naval Board a few days before its extinction by the integrated Defence staff on Aug. 1. By the end of August, a proposal for four ships was ready for submission to the Chief of the Defence Staff. The proposed DDG was a more powerful version of the GP frigate in all but name, without any compromises imposed by troop lift. It incorporated a sophisticated 5-inch automatic gun, three missile systems, ASROC, SQS-505 sonar (but no helicopter) and a top speed of 30 knots, possibly with Y-100 machinery and gas turbine boost. Equally impressively, the cost was estimated at $68 million a copy.

The DDH-280 is Born

In the end all this effort came to nothing. On Sept. 2, the defence minister wrote to the chief of the defence staff (CDS), Air Chief Marshal F. R. Miller:

> ...it is important that the principal elements of the Maritime Forces be considered at an early date, and I request specific recommendations and options.

HMCS *Athabaskan*: sprucing up in 1980 *(Canadian Forces photo)*

Exactly what followed is rather puzzling, and will no doubt keep naval historians occupied for some time. In the immediate aftermath of headquarters integration, any formal structure for providing strictly naval advice to the CDS had largely vanished. Furthermore, only the CDS had access to the Minister and was well placed to know his views. We conjecture that the CDS knew that the Minister was likely to reject the DDG proposal on both policy and financial grounds, and made this clear to the remaining senior naval officers in CFHQ — VAdm K. L. Dyer, Chief of Personnel in the new dispensation, and RAdm R. P. Welland, Deputy Chief of Operational Readiness. He must have suggested that they would be wise to propose something different — something that could be laid down quickly to put work into the shipyards. The result was startling. In the words of LCdr (later Commander) P. D. Barnhouse, on the staff of Director General Fighting Equipment at the time,

> Sometime [in September 1964] LCdr Dan Mainguy of DNFER wandered into our offices with a photocopy of an envelope with some hieroglyphics on it. This apparently had been the musings of Admirals Dyer and Welland...the previous evening in which they had sketched out plans for a repeat *Annapolis* class....This became the DDH 280 — a ship that "grew like Topsy" from the original concept.

VAdm Mainguy has confirmed this account, adding that at a meeting shortly afterward with the Chief of Naval Technical Services, RAdm J. B. Caldwell, and Director General Ships, Cmdre (later RAdm) S. M. Davis, it was decided to make provision for a future point-defence missile system by adding 25 feet to *Nipigon*'s length.

In any event, the envelope appears to have been translated quickly into the appropriate staff papers, considered by a CDS Staff meeting, and transformed into a recommendation from CDS to a Defence Council meeting in October 1964. The staff paper stated that there was a requirement:

• in the defence of North America, to improve our...ocean surveillance capability and to demonstrate a capability to locate and track submarines...in peace; and

• in NATO, to improve our capability to defend Atlantic sea communications and protect shipping in our area of responsibility.

These seem modest enough aims, implicitly redefining the primary role of the navy as ASW operations in the northwest Atlantic. The proposed program for 1965-70 begins:

> To improve our ASW capability and replace overage ASW ships, four DDH class ships [should] be built based on a lengthened *Nipigon* hull

HMCS *Algonquin*: helicopter operations *(Canadian Forces photo)*

> fitted for CHSS2 helicopter operations and with space allowance for later installation of a suitable point defence missile system when available. The program would commence late 1966 [and] complete 1971 at a unit cost of $35.5 million — excluding helicopters and the missile system.

The remaining items were the upgrading of seven of the *Restigouche* class in 1965-70 ($65 million), the refit and improvement of *Bonaventure* in 1966-67 ($8 million), the building of one more replenishment ship in 1966-69 ($18 million), and the procurement of an added eight CHSS2 helicopters ($13 million).

The proposed DDH is described as having:

- hull and machinery equivalent to present *Nipigon* (sic) class with additional length of 25 feet to permit future fitting of missile system;
- the CHSS2 helicopter system;
- the AN/SQS-505 integrated variable-depth and hull-mounted sonar system;
- five-inch gun for anti-surface and shore bombardment;
- [provision] for an AA missile system to await future development of an appropriate system...at an estimated cost of $2 million;
- improved command and control system, appropriate communications and electronic warfare equipment; and
- Jezebel passive sonar system.

No decision was made at the meeting, as the army and air force proposals had yet to be examined. However, the Minister seems to have been pleased, for his memoirs quote his diary of the time:

> It is a big improvement on the staff work we have been getting. The presentation on *Provider* is something I have been waiting for. It clearly demonstrates that an extra *Provider* on each coast will increase our 'on station' capability more for the cost involved than anything else we could do. The DDH seems to make sense. Also the updating of the balance of the fleet with better sonar, ASROC, etc. All in all not a bad program.

The Minister recommended the program to Cabinet in November, adding an additional replenishment ship and another *Oberon* for good measure. And, with the exception of the extra submarine, this is what Cabinet approved. We can only marvel that a proposal sketched on the back of an envelope could be transformed into superior staff work in six weeks.

The DDH-280 grows...and grows

It now remains to sketch the development of the design to mid-1965, and to explain how and why the "repeat *Nipigon*" that so pleased Mr. Hellyer became the much larger and more advanced ship that was eventually built. The naval architects set about what RAdm Davis describes as the relatively simple task of inserting 25 extra feet into a *Nipigon* hull, finally settling on locating it forward of the superstructure. However, since *Nipigon* itself had only marginal roll stability in the operational light condition, it was not surprising that the result failed to meet accepted stability criteria given the added top-weight of a heavy gun and a missile system. The naval architects increased the beam and draught of the ship by a moderate amount, and relocated the flight-deck to forecastle deck level — a proposal already developed for an early version of the *Restigouche* conversion.

The proposed lowering of the flight-deck caused considerable anguish to the naval aviators. It was pointed out that experience with helicopter trials in *Assiniboine* indicated that the amount of water and spray reaching the lowered flight-deck would expose the helicopter to enough corrosion damage to make on-board maintenance unsustainable for long deployments. Projections close to and above the flight-deck posed an unacceptable flying hazard. Further, if the helicopter were in its ready station on the flight-deck, the A/S mortar could not be fired without damage to the aircraft. There was also serious concern that the ship's short roll period of 6.5 seconds might make it impossible to haul down the helicopter safely in heavy weather. They asked for a roll period of at least 9 seconds — preferably longer.

As RAdm Davis wrote later with commendable restraint,

> ...this presented us with a dilemma. We had just increased the beam to give us adequate stability...and now the fliers were asking for less stability so that the roll would have a longer period. Practically, all that can be done to achieve these diverging demands is to increase the size of the ship.

Meanwhile, as the fliers asked for a slower roll, the fighting equipment merchants were pleading for a longer ship. This grew out of the long gapless range requirement for high-frequency communications and the extensive electronic warfare installation, leading to requirements for a large amount of antenna space. With the helicopter precluding any antennas abaft the hangar and the gun and missile firing arcs precluding them forward of the superstructure, there was nowhere to locate the required antennas. So length, beam and displacement grew so much that, to quote RAdm Davis again,

> we were now close enough [to the GP frigate hull] that it was sensible to capitalize on the earlier work and proceed on this basis....As a perfectly innocent inquiry, I noted that...the beam was now adequate to accommodate a double hangar with space for two helicopters. And was anyone interested in this? Alas, this simple explanation was never accepted and I was [later] accused...of deliberately increasing the beam...to provide the additional hangar space.

By the end of March 1965 the ship had the hull (though not the internal arrangement) of the despised GP frigate — and two helicopters. There was more to come. With the Y-100 machinery of *Nipigon*, the increased size of the ship would reduce its top speed to at best 27 knots (DG Ships' more pessimistic engineers thought it would more probably be below 26 knots) and the operators still wanted 30 knots if they could get it.

The Gas Turbine Power Plant

At this point someone remembered that United Aircraft Canada had submitted an unsolicited proposal for all-gas-turbine machinery for "the proposed new class of ships, the DDG" in November 1964, and had amplified it in February 1965. There seems little doubt that, although no formal request for the proposal had been made, UAC was prompted to submit it. During the development of the earlier DDG design, the question of gas turbine boost had been raised. As was its job, the Naval Engineering Design Investigation Team (NEDIT) had been investigating gas turbines for use in future designs for some time, necessarily involving talks with UAC among others. After a briefing by the company attended by senior operational and technical staff and by representatives of DDP, the Director of Marine and Electrical Engineering (DMEE) and NEDIT began a detailed investigation of the alternatives proposed by UAC.

Capt R.G. Monteith (DMEE), a young captain whose career had been spent mostly in air engineering, summarized some 60 pages of technical analysis when reporting in April that

> An all-gas-turbine propulsion plant offers great potential advantages for use in small warships and in particular for the DDH class. It is considered that the special qualities of the gas turbine such as gain in performance and efficiency at low temperatures, inherent simplicity, ease of operation and low requirements for watchkeepers, and a potential for low ship staff maintenance, together with the exceptional military advantage of the potential low noise signature, make the all-gas-turbine plant the optimum propulsion machinery for the DDH....Main propulsion gas turbines have already been adopted for more than 50 warships of the frigate and destroyer type....Unless steam plant manufacturers bring about significant improvements [in] warship steam plants, they may well become obsolete for small warships in the next few years.

When the report was circulated for comment, the criticisms were muted. The Director of Fleet Maintenance, a very experienced (and conservative) marine engineer of the old school, commented

> ...the military, operational and technical advantages together make the gas turbine plant attractive....The two main dangers — the transmission/reversing problem and the fact that navies around the world have neither proposed or truly evaluated a GT as a base load marine turbine — are mentioned in the paper, but in [my] opinion are not sufficiently stressed.

DFM was correct. While gas turbines were widely used as boost engines in conjunction with a steam or diesel main plant, no western navy had yet made the leap to all-gas-turbine machinery. Capt Monteith has since recorded that he was advised during visits to Admiralty and BuShips in early 1965 that an all-gas-turbine plant was premature. However, there are advantages to being a small navy.

DG Ships, in making a recommendation to CNTS, laid relatively little stress on the advantages of increased range, quick starting, better working conditions and economics, although he recognized that gas turbines "would probably be the power plant of the future." Possibly prompted by DGFE, he wrote

> ...the pre-eminent factor governing a move from steam propulsion is that of improved operational performance by significantly reduced machinery and radiated noise. It is believed, therefore, that the decision must be based on whether or not a significant noise reduction can be achieved with reasonable expenditure of time and money and with appreciable confidence that a working plant can be achieved.

For much the same reasons, he preferred a transmission arrangement combining turbine-electric drive at base load with all-mechanical drive for the boost plant to a simpler and safer all-mechanical transmission, both with controllable-pitch

Huron* and *Iroquois* in 1981. *(Canadian Forces photo)

propellers. If difficulties were encountered in the early stages of design, he said, it would be relatively easy to go back to mechanical plant, the main reduction gearing being identical in both. He concluded unequivocally that there should be a change to gas turbines for the DDH. With brutal frankness he remarked that since only four ships were at risk, "if misfortune arises it will be relatively limited," though he stressed the necessity for shore-testing the prototype plant. The RCN was willing to accept a degree of technical risk that larger navies, with their more extensive building programs, found too high.

In the new headquarters organization, there was no clear way of submitting the proposal to the judgment of the naval operators. CNTS therefore submitted the proposal to a "naval advisory group" — composition unknown, but undoubtedly including admirals Dyer and Welland — in late May. This group accepted the recommendation for change, although insisting on the less risky all-mechanical transmission. From this point the proposal wended its way through the Vice-Chief of Defence Staff to a CDS Staff meeting, which took the opportunity to review and approve the operational requirement as it had now developed, as well as the gas turbine proposal. Prudently, both the Deputy Minister and CDS questioned the cost of the ship modifications, and asked that the cost be reviewed before presentation to the Minister in Defence Council. And so a CDS recommendation for a change to gas turbines reached Defence Council in July 1965.

It is interesting to note that the grounds for change presented to the Minister were somewhat different from those given to CNTS by DG Ships. He was told that gas turbines:

- can increase the maximum speed of the DDHs from 27 knots to slightly more than 30 knots;
- can increase the endurance range at economical speed (14 knots) by over 25 percent;
- can reduce the underwater noise signature by a significant amount, thus reducing an enemy submarine's detection capability and improving our own detection ranges; and
- will provide increased plant reliability with anticipated operating costs being 80 percent of similar costs for steam plants.

The submission also mentioned a reduction in complement of ten men per ship, increased ship availability obtained by overhaul through replacement, and the advantages of quick start-up and improved safety. For the Minister's further edification, four technical annexes provided some 70 pages of detailed information. And finally it provided information on cost (an increase of $5 million over an unchanged basic ship cost of $142 million) and impact on the shipyards (a delay of six months, with the first ship to be laid down in August 1967 and to complete in October 1970).

Perhaps because the matter was the second of two agenda items — the first being an exhaustive and argumentative examination of a new officer structure for the coming unified force — the debate was brief. After a presentation by DG Ships and some discussion of the effect of the change on the ship's Canadian content by the DDP representative present, the Minister approved the change.

Envoi

And so the basic shape of the DDH-280 class was determined. When *Iroquois* commissioned in July of 1972, she was the first destroyer-sized ship with all-gas-turbine propulsion in the western world. The DDH design was to encounter further changes, primarily in its fighting equipment, which will not be followed further here. The resulting costs and delays caused the program to become the subject of very considerable controversy between the navy and the financial mandarins of the Treasury Board and the Deputy Minister's office. The designers were accused — somewhat disingenuously, but not entirely without justification — of warping the Government's decision to build small, cheap ships into an opportunity to build ships even more advanced than the detested GP frigate.

This controversy was a significant factor in the establishment of "civilianized" control of National Defence Headquarters in the early 1970s, with far-reaching effects that are still coming to light. However, in the possibly biased view of one of us, the building of the DDH-280s, described in 1977 as "among the finest ships in NATO," saved the navy from perhaps permanent technical obsolescence through the difficult 70s.

A Note on Sources

This paper is informal, and purposely not ornamented with the usual historians' footnotes. A more detailed and fully referenced historical narrative can be provided on request. We have based this account so far as possible on material in Naval Central Registry files and on CDS Staff and Defence Council documents now in the National Archives and the Directorate of History and Heritage, DND. We are grateful to the archivists who provided us with copies of documents at very short notice.

This paper could not have been written without access to unpublished postdoctoral studies by RAdm (ret.) S. Mathwin Davis, DG Ships from 1961 to 1965. We and all other historians of Canadian naval technology are greatly in his debt. We also acknowledge the valuable contributions of other former naval officers and civil servants who have recorded their recollections of the time in the Canadian Naval Technical History Collection, DHH. These contributions take on particular importance because several important files relating to the DDH-280 are missing from the National Archives — we hope temporarily.

Dr. Hal Smith (MIT, 1961) served in the RCN from 1947 to 1966 before joining the staff of the University of Toronto, where he taught until 1993. Since retiring, he has taken up naval history as a hobby, and is research director of the Canadian Naval Technical History Association (CNTHA).

Dr. Shawn Cafferky (Carleton, 1996) is a historian, formerly on the staff of the Directorate of History and Heritage, who now teaches at the University of Victoria. His book on the RCN's development of the helicopter-carrying destroyer is currently being reviewed for publication.

Simulation and Training in the Canadian Navy

Article by LCdr S.W. Yankowich

Over the past decade, the Canadian Navy has undergone a comprehensive equipment modernization program. While the introduction into the fleet of complex and expensive equipment systems enables the potential for substantial enhancement of operational capability, full realization of this potential is contingent upon the availability of system specific, high quality training processes. Traditional reliance on academic instruction reinforced with prolonged "at sea" experience is a costly and increasingly inefficient means for imparting satisfactory training. System complexity and capability, coupled with reduced operational budgets and fewer available sea days, have necessitated implementation of more efficient and cost-effective training processes. This paper examines the potential of simulation-based trainers employing commercial technology to better meet the training requirement.

Policy

In recognition of the potential of simulation to increase training efficiency and reduce long-term training and maintenance costs, both NDHQ and Maritime Command have implemented policies requiring maximum application of simulation for the purpose of training:

> "Simulators may be introduced as a part of an operational equipment acquisition or as a stand alone project. It will be normal, however, for simulation to be included as part of the normal operational equipment acquisition process."[1]

> "….maximum use is to be made of simulators, synthetic trainers and reconfigurable display technology within the facilities of the naval training infrastructure. Opportunities for simulation emulation and promising emerging technologies shall be investigated whenever training plans are developed or revised."[2]

Expanding the role of simulation within the naval training infrastructure poses a unique set of challenges. Individual trainers must target and enhance a subset of essential skills required by the operations and/or support occupations. Combined in the context of an interlocking simulation based training infrastructure, every naval training task and objective must be systematically addressed and exercised. The end result will be better overall preparedness and lower training/maintenance costs. Effectively, since well-designed trainers enhance realism by providing substantial flexibility in a diversity of training scenarios, less operational sea time will be spent "refreshing" basic and intermediate skills, while more time can be dedicated to higher value training and operations.

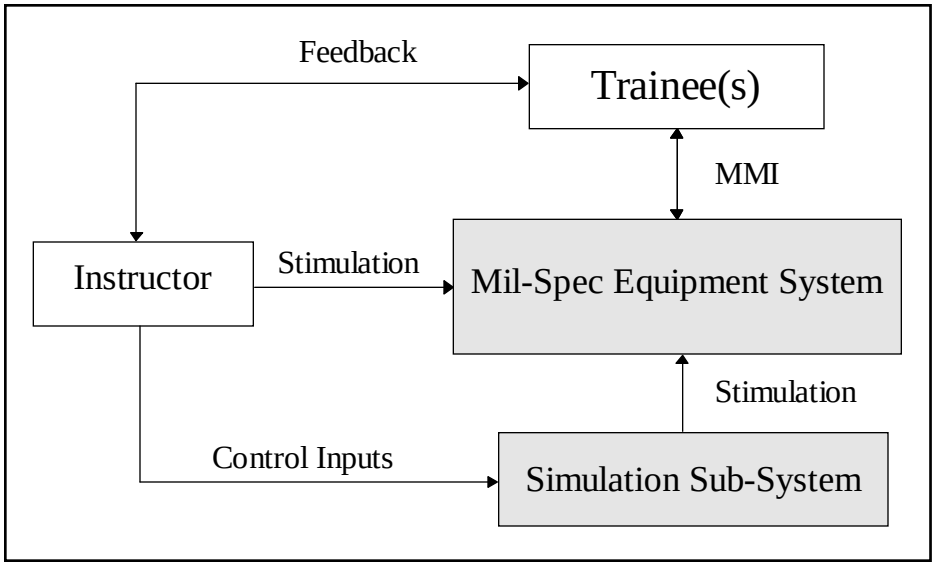

Figure 1. Mil-Spec Simulation/Stimulation Trainer Architecture

As of today, more than 30 trainers are either in service, under construction, or submitted for approval. When completed, the training infrastructure will be comprised of two broad categories of trainers — operator trainers and maintenance trainers.

Operator Trainers

Maritime Command has identified five levels of operator training. Level 1 (individual) training imparts basic occupational procedures for use within the confines of the individual station environment. At Level 1 the operator learns how to perform specific tasks and operate assigned station equipment. Examples of Level 1 trainers are the Tactical Acoustic Trainer (TAT) and the Junior Officer Bridge Simulator (JOBS).

Level 2 (subteam) training imparts advanced procedural skills for use within the confines of the subteam occupational structure. At Level 2, the operator learns how to perform his or her individual tasks within a limited team environment. Examples of Level 2 trainers are the Naval Combat Operator Trainer (NCOT), the IMCS Shore Based Simulator Trainer and the Blind Pilotage Trainer (BPT). Most Level 2 trainers are also capable of providing Level 1 training.

Training Levels 3, 4 and 5 build on the skills learned in Levels 1 and 2 with the aim of integrating the individual operators into a cohesive operations room team. At Level 3, the operator is trained in how to perform his or her individual tasks within a single ship operations room team environment. Examples of Level 3 trainers are the *Halifax*-class Combat Systems Training Centre (CSTC) and the *Iroquois*-class Command and Control Systems Trainer (CCST).

Level 4 (multiunit) training expands on Level 3 training by emphasizing procedural and tactical decision-making in a coordinated, multiship, multithreat environment. The generic Operations Team Trainer (OTT) and the *Halifax*-class Operations Room Team Trainer (ORTT) are examples of Level 4 trainers.

Level 5 (Task Group) training emphasizes procedures for co-ordinated multiunit operations at a task group or joint operations level. The aim of Level 5 training is similar and complementary to Level 4 training with the distinction that Level 5 training must exercise a ship's operations room team's ability to support Task Group operations as directed by the Task Group Commander. The Maritime Tactical Operations Group Simulator (MTOGS) and the proposed ORTT Level 5 Extension are examples of Level 5 trainers.

Maintenance Trainers

Maintenance trainers target and develop the skill sets required by individual or teams of equipment maintainers. Application of simulation for this type of training facilitates implementation of numerous critical maintenance scenarios in a controlled environment which is difficult, dangerous and/or expensive to replicate with operational equipment. By off loading maintenance training from operational equipment to dedicated trainers, hands-on training time is increased, wear and tear is reduced, and maintainers are exposed to a greater diversity of faults. Examples of maintenance trainers are the Maintenance Procedures Trainer (MPT) and the CANTASS Maintenance Simulator Trainer.

Simulation-Based Training

The use of simulation for the conduct of maintenance and operator training improves overall training effectiveness by expanding the diversity of training scenarios, increasing trainee throughput and instructor/student ratio, improving operator/maintainer safety and reducing in-service equipment wear and tear. Weighted against these benefits are the associated development, implementation and supportability costs. Factors such as recurring and non-recurring engineering costs, risk, life-cycle cost, and infrastructure requirements must be carefully evaluated against the training mission and the existing capability of legacy trainers. Depending on this cost/benefit analysis, a trainer architecture can be designed which leverages available technology to maximize the benefits of simulation while minimizing overall cost.

Traditional trainers implement a combination simulation/stimulation based architecture requiring the mil-spec equipment system with which the trainee interfaces to be externally stimulated for the purpose of training. With this approach (*Fig. 1*), discrete equipment interfaces are driven or stimulated in such a manner as to produce the desired equipment response. These stimuli are created either manually or through a simulation subsystem dynamically controlled by the instructor. Training feedback is generally limited to the instructor's ability to directly monitor each trainee's performance. An example of a simulation/stimulation based architecture is the SG-150 radar stimulator in which the actual radar receiver is stimulated via synthetic RF energy injected into the waveguide.

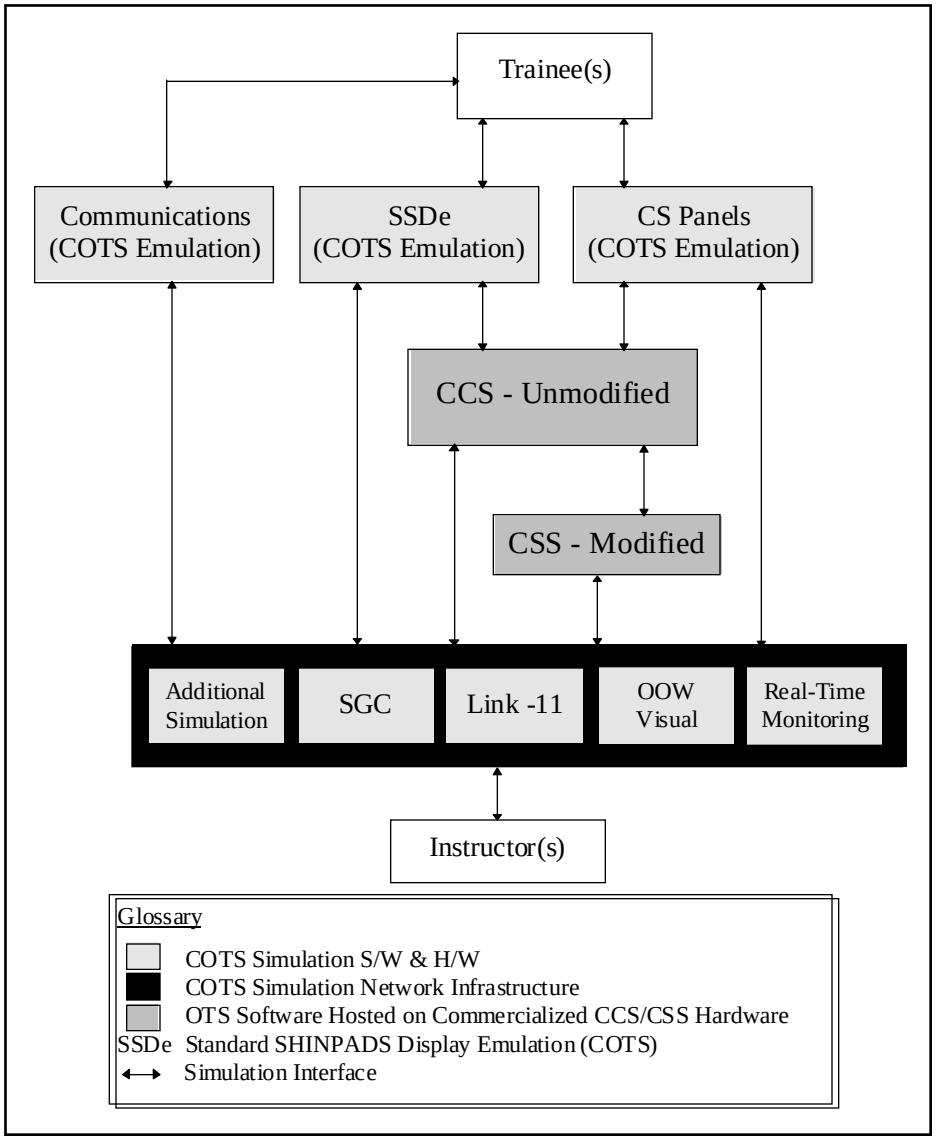

Figure 2. ORTT Simulation Architecture

By maximizing use of actual operational equipment, this architecture supports maintenance training on most standalone equipment systems. The effectiveness, however, is limited by the capacity of the simulation/stimulation capability to replicate desired maintenance scenarios. For complicated and expensive equipment systems such as a shipboard CCS or IMCS, this limitation is compounded by the requirement for the actual mil-spec equipment system to be included as part of the trainer.

In the operational context, this architecture is useful for the provision of Level 1 to Level 3 training (e.g. CSTC) and can be readily extended to enable adequate Level 4 and 5 training for shipboard systems employing rudimentary command and control functionality (e.g. OTT). However, the complexity of technology employed in the *Halifax*, *Iroquois*, and *Kingston* classes of ships, and the extent to which this technology is integrated into the operator and command team functions, have rendered this previously cost-effective trainer architecture cumbersome, expensive and impractical. In the Combat Systems Training Centre, for example, an entire *Halifax*-class CCS is replicated using mil-spec equipment identical to the shipboard configuration. Interfaces to the CCS are either simulated or, such as with the SG-150 and SPS-49 radars, stimulated by the actual peripheral

EVALUATION CRITERIA	TRAINER ARCHITECTURE	
	Mil-Spec Sim/Stim	COTS Simulation-Based
Recurring Engineering Cost	High	Low
Non-recurring Engineering Cost	Medium	Medium
Lifecycle Cost	High	Low
Training Effectiveness	Medium	High
Flexibility/Scaleability	Low	High

Table 1: Comparison of Mil-Spec Simulation-Stimulation (Sim/Stim) and COTS Simulation-Based Architectures.

equipment. This architecture provides excellent maintainer and operator Level 3 training, but its "wrap around" design is expensive, difficult to support, and cannot facilitate provision of comprehensive Level 4 and 5 training without substantial and costly modification to its architecture.

Limited fiscal resources, escalating equipment complexity and substantial advances in commercial-off-the-shelf (COTS) simulation technology have resulted in a shift of trainer design emphasis away from costly mil-spec simulation/stimulation architectures to more affordable and flexible simulation-based architectures implemented in either a dedicated or On Board Training (OBT) configuration. With simulation-based trainer architectures, as much of the equipment system as possible is simulated using COTS software and hardware. This approach minimizes life-cycle, recurring and non-recurring engineering costs and facilitates implementation of flexible, scaleable and efficient trainers. In circumstances where, due to system complexity, the non-recurring development cost prohibits complete simulation of all or part of the system, the flexible architecture enables integration of a COTS solution with simulation/stimulation of the relevant system interfaces. Dedicated simulation-based trainers such as NCOT, ORTT and MPT and on-board simulation-based trainers such as the proposed ORTT L5 extension reflect this fundamental shift in design philosophy. *Table 1* provides a summary of the comparative advantages and disadvantages of simulation-based trainer architectures to traditional mil-spec simulation/stimulation trainer architectures.

NCOT and MPT

NCOT and MPT are dedicated reconfigurable simulation-based trainers designed respectively for the provision of operator Level 2 and maintenance training. Their architecture employs exclusive use of simulation software developed and hosted in COTS networked environments wherein the specific system performance, interface characteristics and man-machine-interface (MMI) are high-fidelity emulations of the actual equipment systems. Reconfigurable COTS trainee stations enable seamless emulation of different equipment systems. A versatile scenario generation and control (SGC) capability enables instructors to create and dynamically execute training scenarios while simultaneously monitoring the progress of all trainees. Individual operators are trained through real-time interaction with high-fidelity simulation and prompt instructor feedback.

EVALUATION CRITERIA	OBT ARCHITECTURE	
	Built-in Simulation	COTS Sim/Stim
Recurring Engineering Cost	High	Low
Non-recurring Engineering Cost	Low	Medium
Lifecycle Cost	High	Low
Training Effectiveness	High	High
Ease of Use	High	Medium
Fidelity	High	Medium
Availability	Medium	High
Flexibility/Scaleability	Low	High

Table 2: Comparison of Built-In and COTS Simulation OBT Architectures.

ORTT

ORTT is an operator Level 3 and 4 simulation-based dedicated *Halifax*-class operations room trainer. While it is possible to satisfy this training requirement with a wholly COTS based trainer architecture (similar to NCOT), the complexity of the *Halifax*-class CCS and the scope and fidelity of simulation required for effective real-time training necessitates a different and more cost-effective approach. Simulating the entire ship's combat system with COTS products would incur both significant program risk and substantial non-recurring development costs. As an alternative, the ORTT architecture minimizes these liabilities by leveraging in-service software and hardware to the maximum extent practicable.

Specifically, the ORTT uses unmodified off-the-shelf (OTS) CCS software hosted on non-militarized AN/UYK-507 computers rebuilt with less expensive commercial components. Rather than reinventing the required sensor and weapon simulation capability from scratch, maximum reuse is made of the CSTC's OTS Combat System Simulation (CSS) software and non-militarized hardware. All remaining CCS and CSS interfaces are simulated using COTS technology. Extensive simulation of required functionality (including Link 11, communications, SGC, panels, operator displays, and OOW visual), also implemented entirely with COTS technology, emulates required parts of the combat system and drives the simulated interfaces. A comprehensive integrated real-time monitoring capability enables the provision of prompt feedback on trainee performance and detailed post-exercise debrief. *Figure 2* provides an overview of the ORTT system architecture.

On Board Training (OBT)

In an OBT configuration, simulation software is used to emulate actual shipboard equipment systems. This simulation capability is integrated either as a permanent capability of the operational system (e.g. *Halifax*- and *Iroquois*-class CCS shipboard training modes) or, as shown in *Fig. 3* for the proposed ORTT Level 5 trainer, hosted in a COTS environ-

ment and interfaced to the operational system using COTS technology. In terms of recurring and non-recurring engineering cost, training value and ease of implementation, both OBT options have respective advantages and disadvantages (*Table 2*). As a general rule of thumb, however, new equipment systems in the procurement stage should make maximum use of OBT through integration of the desired training functionality into the deliverable system. Where this approach is not cost-effective, COTS based simulation architectures can be used to emulate the appropriate system.

Summary

Applying simulation technology to the naval training requirement is not a trivial undertaking. Simulated equipment systems must elicit the desired thought processes and responses from trainees without imparting negative training. Realistic, high-fidelity simulations of intricate real-time equipment systems, such as a ship's radar and CCS, are rarely available off the shelf and can be extremely difficult to develop. Hardware, software and network architectures are in a constant state of evolution. Without adequate foresight, today's state-of-the-art simulation system could be insupportable tomorrow.

Notwithstanding these liabilities, the advantages of providing simulation-based training through the application of OBT and/or COTS derived solutions are formidable. OBT, if specified early in the procurement process, enables the provision of effective, user-friendly training as a built-in equipment system capability. Dedicated training architectures employing COTS technology are flexible, scaleable and significantly less expensive than previous mil-spec simulation/stimulation architectures.

Conclusion

Current and emerging simulation technologies offer considerable potential for the provision of efficient and cost-effective training. Depending on the training mission, simulation-based trainers can be designed which maximize the advantages of COTS technology while retaining specific functionality inherent in legacy trainers and/or mil-spec systems. With decreasing operational budgets and fewer available sea days, the role of simulation in the training process is, and will continue to be, fundamental to the navy's ability to maintain maximum operational readiness.

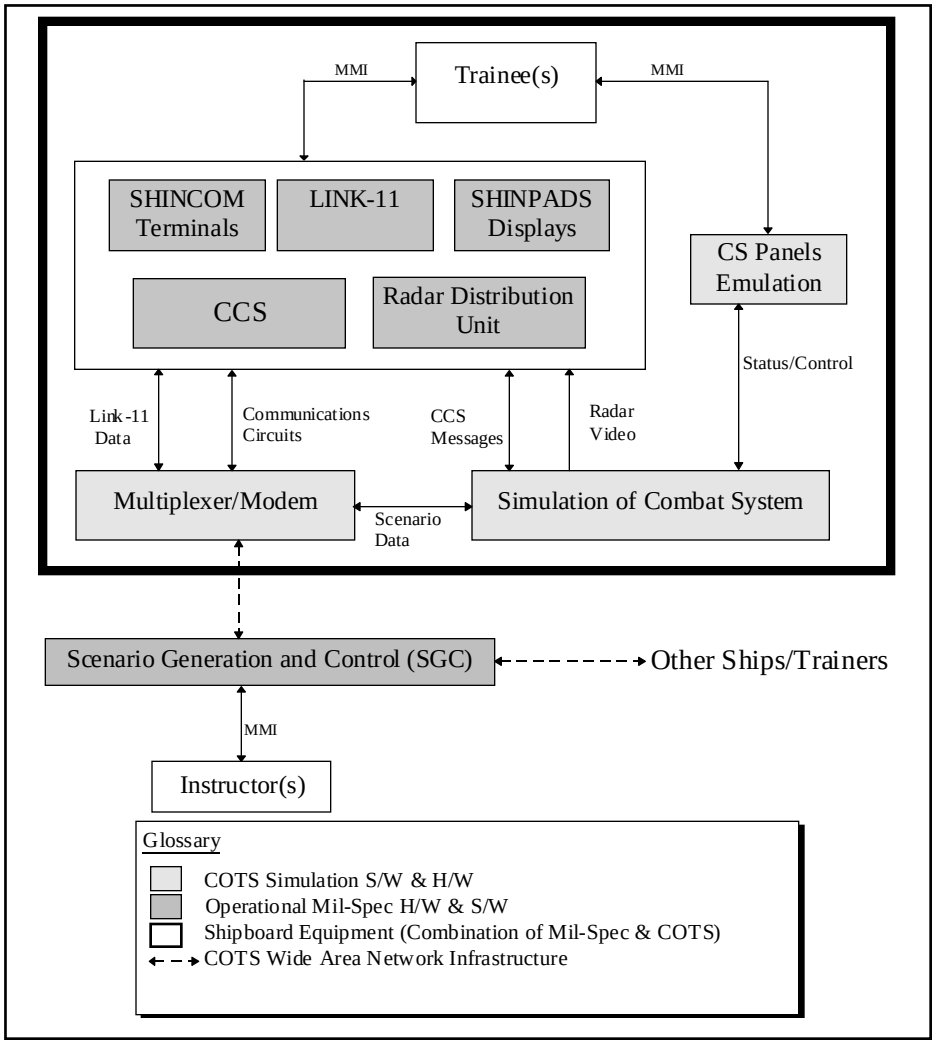

Figure 3. ORTT Level 5 Extension Simulation Architecture (Proposed)

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[1]NDHQ Instruction 04/91 (1150-110/P56 (VCDS)) April 1991

[2]MARCORD 9-47 - Maritime Command Training Policy

MARC 4500-7 (NO2 COS) 25 July 1995

Operations Team Training Policy - MARC: 4985-1 (N3 P&O) 29 June 1993

LCdr Steve Yankowich is Combat System Trainers (CST) Project Manager for PMO CPF

Port Weller Diary

Article by LCdr Robert Jones
Photos courtesy of Port Weller Dry Docks

In April 1997 while serving in the Directorate of Quality Assurance HQ in Ottawa, I learned that I was to be appointed detachment commander for HMCS *Athabaskan*'s extended work period (EWP) scheduled for July 28 to Nov. 21 of that year. At the time there were three possible candidates for the EWP contract, collectively spread across the breadth of eastern Canada — Port Weller Dry Docks in St. Catharines, Ont., Dominion Bridge in Quebec City (Lauzon), P.Q., and Halifax Shipyards Limited in Halifax, N.S.

The EWP is designed as a compressed refit — a period of short duration and intense activity. The scope of known work for the *Athabaskan* EWP was estimated to be 80,000 direct labour hours, with the contractor possessing the ability to absorb a further 10,000 hours of unscheduled work. Work would focus on four main areas:

- improvement of auxiliary machinery systems;
- preventive maintenance on the ship's structure, hull and tanks;
- improvement of habitability systems; and
- improvement of the combat systems suite.

Recent changes to policy governing the award of refits had a major impact on where the *Athabaskan* EWP was actually conducted. Up until early 1997 it was assumed that no East Coast warship refit activity would take place outside of the Halifax geographical area. The award of the contract to Port Weller Dry Docks on June 20, 1997 put the navy back into the situation of the nineteen-eighties and early nineties where East Coast contract refits could be carried out in commercial yards anywhere between St. Catharines, Ont. and St. Johns, Nfld. It was a good wake-up call.

Port Weller Dry Docks is just inside the Welland Canal between locks one and two. The approach can be tricky for a warship with an eight-metre draught. *(Photo copyright Wayne Farrar Photography, courtesy Port Weller Dry Docks)*

Vessel turnover: July 29, 1997. *Athabaskan* CO Cdr Lenny Edmunds with Mike O'Connor (PWGSC) and Port Weller general manager Charles Payne (standing).

Port Weller's geographical location is very interesting. Dig out a map of Ontario — St. Catharines is due south of Toronto, on the southern shore of Lake Ontario. (Having spent the best year of my life at Staff College in Toronto, where seeing the lake meant you were looking south, it was strange to look out across the lake and see the CN Tower on the horizon to the north!) Port Weller Dry Docks (PWDD) is just inside the Welland Canal between locks one and two.

Because of its location, PWDD was seen to present the greatest risk as the EWP completion date of Nov. 21 was precariously close to the St. Lawrence Seaway closing date (traditionally mid-December). Any significant schedule delay posed the risk of having the vessel stranded in Upper Canada until the following April, or having to tow it back to Halifax with incomplete work. It was further recognized that St. Catharines, as a refit site, would impose substantial additional costs in terms of temporary duty assignments, logistics, engineering support and administration for the navy.

During May and June while the DMCM/*Iroquois*-class desk officer in NDHQ (Irek Kotecki) was refining the work package and preparing for (and then conducting) the bidders conference, I was involved with planning the EWP on-site organization and assisting in writing the letter of delegation giving me authority to act on DGMEPM's behalf in St. Catharines. My core on-site group was made up of five technical consultants headed by Dave Jones, along with a QAR hull spe-

cialist, a military supply technician responsible for government supplied material, and five members of HMCS *Athabaskan*'s crew.

During my time on the project I kept a daily record of events (no doubt thinking it might come in handy should I ever stand condemned before a naval board of inquiry or a contract settlement review board). The following are edited excerpts from my journal recorded over the course of the five months I spent with the *Athabaskan* EWP. I believe there is no more challenging shore job for a member of the naval engineering community than being part of an on-site refit team. The issues are the same as those experienced in a sea posting, with the added challenge of having to form an effective team from day one in the contractor's facility, and establishing a relationship of trust with a commercial contractor who, at the end of the day, must balance customer satisfaction against the bottom line. I hope my journal excerpts offer some insight to the day-to-day challenges of refit life.

***Athabaskan* EWP: "There is no more challenging shore job for a member of the naval engineering community than being part of an on-site refit team. The issues are the same as those experienced in a sea posting, with the added challenge of having to form an effective team from day one in the contractor's facility."**

Halifax
Thursday, June 5, 1997

In an effort to resolve the dispute (and avoid the painful process of the contract settlement review board) between Halifax Shipyards Limited and the Crown over the HMCS *Iroquois* EWP (Aug. 2- Nov. 17, 1996), PWGSC chaired a meeting of the two groups. Both sides are willing to deal and an agreement was reached on outstanding defect advice notices, 1379s (work arisings), and premium time issues. The lesson for *Athabaskan* is to develop a system whereby work can be progressed while the 1379 price is being negotiated. The time line for *Athabaskan* is very optimistic. On a more positive note I'm pleased to have George Holmes from MCDV Detachment Halifax join us as part of the *Athabaskan* team.

Ottawa
Wednesday, June 11

Spoke with Dave Jones on the outcome of his meeting in *Athabaskan* on support. The minimum on-site staff augmentation from *Athabaskan*'s crew will include a senior supply technician, two junior supply technicians, one Certificate 3 marine engineering technician, and one naval weapons technician. Next EWP meeting is scheduled for 0815 Friday, June 27.

NDHQ Hull
Friday, June 13

Athabaskan DMCM/IRO Project Manager Irek Kotecki was ready for me to review the QA portion of the bid submissions. All bids were compliant from a QA technical perspective. (When I was informed later that *Athabaskan* would be going to Port Weller Dry Docks, I was told to plan for a visit to Port Weller July 2-3 — right in the middle of my leave period!)

NDHQ Ottawa
Monday, June 16

1 CFQAR (Halifax) regional commander in town today to discuss resource allocations for the three refits starting this July (*Athabaskan, Montreal* and *Quest*).

Halifax
Friday, June 27

(*Athabaskan* EWP Planning Meeting)

On board *Athabaskan* at 0755. The planning meeting run by the XO (LCdr Brian Mosley) went very well. Items included: schedule of events leading to turnover of custody (TD funds for FMF engineering inspectors; docking officer; and crew repatriation); environmental portfolio; load banks; storage of pyros package; contractor's request for a cable tagger; and catering requirements for ship's staff during turnover period. (After the formal meeting broke up, EO LCdr Randy Comeau took us on a tour of the ship's engineering spaces. Spent the remainder of the day in 1 CFQAR HQ.)

Moncton (on leave)/St. Catharines
Wednesday, July 2

What a long day! Good old Dad got up at 0400 to take me to the Moncton airport. Reminds me of just over twenty years ago when he took me over to CFB Moncton to catch the bus which started me off on my basic training. Arrived at Pearson International Airport and waited for Cdr Dan McVicar (DMCM/IRO) and Irek. Nearly missed each other because I was waiting in Terminal 2 and they were arriving Terminal 3! Arrived in St. Catharines at 1000. Dave Jones' flight from Halifax was delayed due to fog and he arrived around 1130. We all made it to Port Weller Dry Docks just in time for lunch. Met PWDD's refit management team. After lunch we toured the yard and spent the remainder of the afternoon discussing agenda items for tomorrow's kick-off meeting.

St. Catharines
Thursday, July 3

Met with the Crown's team for breakfast at 0730. Arrived at the yard at 0845 for an in-house meeting. The first thing that struck me was that our PWGSC contract officer was not aware I was the on-site team leader — he believed that Dave Jones was. (Three pages of my journal were devoted to the EWP kick-off meeting which covered such items as key personnel, lines of communication, the master schedule, new work, material supply, and technical issues. No big surprises, although the Crown did introduce a new work item.)

Hull
Friday, July 18

Martha (my long-suffering wife of twenty years) drove me to the Louis Saint Laurent Building this morning so I could pick up the specification package for the *Athabaskan* EWP. Received a draft of the Letter of Delegation (based on the HMCS *Montreal* docking work period). Our situ-

Port Weller contract manager Claude Zucchet processed close to 500 work estimate requests during the EWP.

ation in this EWP is much different in that the PWGSC officer is not on site (I am the delegated PWGSC Officer for authorizing 1379s for work arisings or new work up to $5,000). I recommended to Cdr McVicar that he brief Cmdre Gibson (DGMEPM) on this difference. I'm willing to do anything in this brave new world of increased risk, but without an on-site PWGSC officer we might find ourselves falling behind in processing the big-ticket 1379s and losing control of the arisings budget.

Ottawa
Saturday, July 19

Finally got the rental car. Spent all afternoon pressing and packing. I will be glad to get down to St. Catharines. I'm very fortunate to have this opportunity and am looking forward to the challenges. I've had great support from the DQA administration staff , especially Cpl Majewski.

Ottawa/St. Catharines
Sunday, July 20

Got on the road at 0935 (via the United States to avoid traffic from the Molson Indy Car race taking place in Toronto). Met Pierre Brousseau of my on-site team during supper at the hotel. He arrived from Halifax via Montreal a day early. Cpl Jim McDonald (GSM sup tech from 1 CFQAR staff in Halifax) arrives late tonight. Time seems to have gone into slow motion since I arrived at the hotel. We face the world tomorrow at 0800.

St. Catharines
Monday, July 21

Arrived in the yard at 0800 and introduced myself to Charles Payne, general manager of Port Weller Dry Docks. Brian Bonwick (PWDD material control manager) showed us around the facilities. Very impressive — clean, bright and air-conditioned. Phones will be fully hooked up by Wednesday. Cleaned out my desk (I think it was stored in a grit blasting bay). After lunch, met with *Athabaskan*'s advance party (CPO2 Dorion, PO1 Moore and LS Byrnes). Finished the day putting the office in order.

Tuesday, July 22

Received our first defect advice notice from PWDD. The contractor was missing page 12 of 16 from the mechanical portion of a particular spec. I contacted the LCMM and he faxed me the missing page — page 12 of *15*! I called the LCMM again — this time he faxed me page 12 of 17! (Eventually he faxed the entire mechanical portion of the spec — all 17 pages.) Dave Jones arrived today from Halifax. Spoke briefly with him this evening. He is very tired after a long day of driving. We are going to have a tough time securing accommodations in St. Catharines. (Niagara tourist region in summer — weekly rates — nobody wants to know you — check again after Thanksgiving weekend. Have a nice day.)

Solar gas turbines being prepared for installation: Two large access ports were cut into the side of the ship at the AMR to accept the machinery.

Thursday, July 24

Another full day. Throw ten people together 1500 kilometres from home and expect an instant team — that's the beauty of a DND organization! Gave Andrea Lococo (detachment secretary) $45.00 to buy office supplies. I've got a great secretary. Started to put together office files — logs, work estimate requests and report folders. Will meet *Athabaskan*'s navigating officer, Lt(N) John Power, tomorrow (he will fly in from Montreal where *Athabaskan* is spending the night before beginning the Seaway leg of their transit). Hope the ship doesn't think I'm acting like "Chicken Little!" (Earlier in the day I had raised the NAVO on *Athabaskan*'s bridge cell phone to relay my concerns over the approach to PWDD's outfitting wall). There be dragons out there in the channel approach to the wall at PWDD.

Friday, July 25

A roller coaster day. Lt(N) Power arrived around 0845. At first he was not impressed with what he saw of the navigational situation. He had no confidence that there was sufficient water to bring the ship alongside safely. The situation improved significantly once John met with Captain Anil Soni, an experienced inspector from the Seaway Authority, and received an updated chart of the approaches (objective evidence, so to speak). In hindsight the project should have sent John up here three weeks ago — "Time spent in recce is seldom wasted."

Saturday, July 26

One week down, twenty left to go. Ship arrived today. What a thrill to see the ship in the approaches to lock 1 from the PWDD tower. PWDD had all hands assembled for the arrival. It was amazing — at 1600 there was nobody to be seen; by 1640 everybody was there. John Mens, the PWDD assistant dock master, stood on the dock gate. At 1840 *Athabaskan* (Cdr L. Edmunds) was secured alongside PWDD.

Sunday, July 27

Spent the first hour giving a tour of the yard to the EO and XO. We discussed the concern that the ship could be towed out if PWDD can't complete the job on time. (The remainder of the day was a whirlwind of activity devoted to destoring the ship.)

Tuesday, July 29

Vessel turnover occurred at 0900 and was straightforward with no ceremony. The Crown's management team attended the PWDD production meeting this morning (first priority is pumping off the fuel and oily water in the water-compensating fuel tanks). Before heading back to the hotel I went down to the ship to see how

Preparing seatings for the torpedo handling system.

the pumping operation was going. There had been a small flood in 12 mess because a seabay inlet valve had inadvertently been left open. (Fortunately, *Athabaskan*'s upper deck ER — LS Butler — had been retained to advise on fuel and oily water removal. This young man intervened to prevent a small flood turning into anything worse.) Discussed PWDD's security arrangements for the ship.

Wednesday, July 30

The seagulls departed this afternoon. (I am referring here to the headquarters management types who swoop in, squawk a lot, eat your food, dump all over you, then fly off, leaving you to clean up the mess!) It was a productive day. I still have some concerns over the commercial firefighting procedures, i.e. the defueling scenario. PWDD seems to be genuinely grateful for the assistance of the on-site team.

Thursday, July 31

What a day trying to get a flight organized for the upper deck ER. It was an administrative nightmare!

Saturday, Aug. 2

The laker *Montrealais* pulled in ahead of *Athabaskan* (after moving the ship 120 feet aft). The conditions for coming alongside were bad — high winds. *Montrealais* had trouble exiting lock 1 and damaged her propeller when the wind blew the stern of the vessel against the wall. Prior to her coming alongside I recommended to the supervisor that he close all "X" openings in *Athabaskan.*

Thursday, Aug. 7

The contractor informed us today about lead contamination in the paint and their efforts to quantify the impact. (The ship's base coats of paint contained lead. PWDD went ahead and instituted a lead control program to comply with Ministry requirements.)

Friday, Aug. 8

Walked around the ship late this afternoon. A protective deck covering was being laid down on the decks. Starting to see progress in the AMR stripout.

Saturday, Aug. 9

PWDD hard at work today preparing the dock for *Athabaskan.*

Monday, Aug. 11

It's good to have Roger Barakett, the FMFCS docking officer, on site to give advice on getting the ship ready for docking. The weather is very hot and muggy. This morning there was an incident in the forward pump room when a party of dockyard workers came close to passing out in the space because of inadequate ventilation. We sorted this out with the production, QA and safety managers.

Tuesday, Aug. 12

Irek Kotecki and Mike O' Connor (PWGSC contract officer) arrived on site by 1000. Ship docked today. (Everything went very well thanks to genuine teamwork established between PWDD staff and Roger.)

Tuesday, Aug. 19

I'm really happy today because my naval combat dress arrived — finally, I have pants that fit comfortably. Received a couple of big 1379s today ($250,000). Irek gave the OK for the contractor to order material. The propeller-lifting eyebolts are still not tested.

Wednesday, Aug. 20

Dave Jones and I spent a good part of the day with Joe D'Achille (PWDD planner and outfitting foreman) putting together a network chart for the AMR. (This meeting went very well and paid big dividends over the course of the EWP.)

Wednesday, Aug.27

Progress meeting was really interesting. Rob Huston, PWDD's senior planner, took the lead in stating Port Weller's position. PWDD claims it is on target (we disagreed). Claude Zucchet, PWDD's contract manager, raised the issue that manhours for arisings are approaching 1000.

Tuesday, Sept. 2

At 1100 we met with the PWDD steelworkers. They are frustrated over trying to cut seats and brackets out of GSM steel and make sense of our documentation. (This was due to a mix-up. They were trying to work from a guidance document rather than a specification.) George Holmes and Dave Yeomans (FMFCS hull inspector) did a good job of giving a visual presentation of the tank structure work required.

Wednesday, Sept. 10

What a depressing day. The class desk in DGMEPM is not happy over my attempts to sort out our load bank requirement conflict with *Preserver.* (It appeared that the *Athabaskan* EWP and *Preserver* refit might require the use of load banks at the same time. DMCM/IRO eventually sorted this out.) The return stores problem seems to have a temporary fix. (We had been returning stripout materials — i.e. electronics cabinets, valves, etc. — to the supply system through CFB Borden, but the work had not been forecasted in their estimates and the base balked at the mounting cost. DMMS procurement support officer Peter Green made arrangements for us to return our stores to Halifax via commercial road transport.)

Friday, Sept. 12

Met the Speaker of the House of Commons today (the Hon. Gilbert Parent — from Welland) when PWDD management invited me to attend a coffee reception in their boardroom. After coffee I gave the Speaker a quick tour of *Athabaskan*.

Wednesday, Sept. 17

The better part of the morning was spent updating the EO and XO and discussing their visit early next week. The XO will be briefing Cmdre Morse's staff sometime in the near future on the refit status and reactivation. We said goodbye to PO2 Wilson today (*Athabaskan*'s ship's staff). We are going to miss him, but glad that we have PO2 McDonald and MS Arsenault on site to replace him.

Wednesday, Sept. 24

(Notes from progress meeting:) Overall, a very good day. LCdr Pierre Boulet (MARLANT N37 staff officer) provided some good guidance from the MARLANT perspective. Mike O'Connor (PWGSC contract officer) runs a very good progress meeting — i.e. no surprises. PWDD is back on track with overall progress assessed at 46%, and 50% of elapsed time. I estimate the ship will be delivered a week behind schedule.

Friday, Sept. 26

A very busy day. Ship's department heads arrived at 1015. Ship will take the strawman set-to-work and reactivation plan and massage it for their input.

Wednesday, Oct. 8

We all had lunch together today (PWDD and the Crown's management team) and it has become clear that PWDD will be forwarding some sort of impact claim. Dave Jones believes it will cover material, AMR specification deficiencies and set-to-work. Also informed this morning by LCdr Comeau that the formation staff have a concern over the liability for set-to-work. There is no provision in the contract for a set-to-work team. To mitigate risk, navy watchkeepers must be involved in testing and setting to work critical systems.

Set-to-Work Phase

At this point the tempo of the EWP changed dramatically with the focus on set-to-work activities — "putting Humpty Dumpty back together again," as Dave Jones would say. Set-to-work was a balancing act between two conflicting activities — finishing the work in the AMR while trying to conduct machinery trials in that same space. Fuel, HP air, load banks, integral piping systems were all necessary prerequisites to this phase. But first, the ship needed to be back in the water.

Friday, Oct. 17

Undocking meeting chaired by PWDD's John Moss. Well organized and attended by all the key members. Three more of *Athabaskan*'s engineering staff arrived on site today in preparation for the set-to-work. I also authorized 850 hours of premium time for Saturday and Sunday.

Sunday, Oct. 19

Everybody was out in full force today for the undocking — two days ahead of schedule! PWDD had the ship ready to move out of the dock by 1130, but Seaway traffic caused a delay of three hours (everybody is trying to get out of the lakes before freeze-up). Only two minor leaks were detected and they were quickly repaired. The ship was secured alongside by 1600.

Wednesday, Oct. 22

Cold weather precautions must be put into effect. Hanger is critical. Set-to-work delayed as HP air-compressor trial now postponed to Monday.

Friday, Oct. 24

PWDD fueled conventional tanks (86m^3) with assistance provided by ship's staff.

Tuesday, Oct. 28

The load bank team from FMFCS Production arrived today (Dean Wells, Ed Olczwyk, Francis Rouselle and Carl Crawford).

Wednesday, Oct. 29

Long day. The 1000-kW diesel generator was flashed this evening, not without a few hiccoughs. We discovered fuel lines and seawater cooling lines disconnected. We learned a few good lessons about checking out our systems with greater scrutiny.

"I experienced trust and teamwork at its best..."

Thursday, Oct. 30

After the production meeting I asked to speak to PWDD management over the issue of *Athabaskan*'s freshwater tanks. (The ship was undocked without passing a "holiday" test — objective proof of effective paint coverage on structure and shell plating.) I explained that I spoke with our technical experts who believed our spec was achievable and I recommended another test be conducted.

Friday, Oct. 31

I'm beat — three days of set-to-work down and another twenty-one to go. The 1000-kW D/G has really turned into a saga. Last night we were talking about completing the heat run by 2100 and doing the droop trials at 1130 today. Two problems: pyrometers (four are duff) and high differential pressure across the LO filter. This afternoon Cpl McDonald worked the phone with Cpl Jensen at Base Supply Halifax to try to get 12 thermocouples shipped out to Toronto tonight. It will be another long day tomorrow.

Saturday, Nov. 1

Completed the heat run and governor trials on the D/G. PO1 Babineau and his crew did a great job of picking up thermocouples in Toronto last night and getting them installed by 0800 this morning. (Cpl McDonald and Cpl Jensen really were instrumental in making this all happen.) The only minor disappointment is that we could not achieve the time spec criteria for sudden application of full load. D/G trials were completed only one day behind schedule.

Wednesday, Nov. 5

We had a setback on the Solar (gas turbine) trial. There appears to be a short in the Girolami controller's 26-volt system preventing initiation of the start sequence. Also, we are going to hit a snag in superchlorinating our freshwater tanks — we can't dump the water in the canal.

Friday, Nov. 7

Black Friday. We experienced major problems with the LO system on the starboard Solar gas turbine.

Saturday, Nov. 8

A long but successful day. Discovered the problem with the starboard Solar G/T. Focused our attentions on the port Solar while awaiting spares for the starboard from Halifax.

Sunday, Nov. 9

Hurrah! We had a successful heat run and speed droop trial on the port Solar G/T. Carl Crawford (FMFCS) did a great job of adjusting the governor and the droop trial was completed in an hour.

Monday, Nov. 10

Very discouraging day. It looks like the starboard Solar has a major problem with its gearbox seal. The defect advice notices are really pouring in now. The class desk gods are not happy about the premium time I authorized. I have no alternative if we are to meet schedule.

Tuesday, Nov. 11

Good news. When I left the yard we had about 90 minutes of the heat run on the starboard G/T remaining. The culprit

Sunday, Oct. 19 — Undocking day!

for our LO problem was a seized scavenge pump.

Wednesday, Nov. 12

Snowed last night — took me 15 minutes to clean the ice and snow off the car windows. PO1 Lacey discovered a major problem with the starboard standby lube oil pump today (not associated with the EWP work package). LCdr Comeau and his CERA are aware of the problem and discussing options. (A replacement pump was installed by Port Weller the following week.)

Friday, Nov. 14

LCdr Comeau and his basin trial team arrived on site today.

Sunday, Nov. 16

Another red letter day. A successful basin trial on the port side.

Monday, Nov. 17

The *Athabaskan* crew is doing a good job of reactivating the ship. (The crew was watchkeeping on specific pieces of equipment on a 24-hour basis.)

Wednesday, Nov. 19

The 1148 Report of Inspection dominated the day's discussion.

Friday, Nov. 21

The turnover ceremony (in the CO's cabin) was simple but significant. Ship's cleanliness is of a very high standard. It was an honour to have lunch in the main cafeteria with the EO and XO among the crew. *Athabaskan*'s crew has been terrific. PWDD deserves a lot of credit.

Wednesday, Nov. 26

Today was devoted to writing the cover letter on the 1148, cleaning up outstanding 1379s, and writing a letter of reference for Andrea (our faithful secretary).

Friday, Nov. 28

Last day for Andrea. We held our last production meeting at 0900. The work is complete. We've had some good times with the PWDD staff and I'm going to miss working with these men, especially John McWhirter and his team. At 1100 the XO and I attended a coffee reception held for the Ontario Minister of Trade, the local MP, the old and new mayors of St. Catharines, and their respective staffs. Captain Soni met with the NAVO this afternoon. I provided the NAVO with copies of all correspondence between PWDD and the Seaway on water levels for departure.

Saturday, Nov. 29

Ship opened for PWDD employee tours.

Tuesday, Dec. 02

Another glorious day in the banana belt. Started off the day in *Athabaskan*'s wardroom waiting for the 0830 in-house meeting on ship's departure. Captain Barkhouse (QHM pilot) arrived while I was waiting for the crew to be dismissed from divisions. At the meeting I was introduced to the new CO (Capt(N) Gauvin, who had just arrived the night before). Departure meeting was held on the bridge again with a necessary cast of thousands.

Thursday, Dec. 4, 1997

On board at 0615 to say goodbye to crew. Strange mix of emotions today. Ship finally got away from the wall at 0830 (delayed an hour-and-a-half by Seaway traffic). It's good to see the ship get away — the crew was anxious to get home to Halifax. After the ship left, the yard seemed completely empty.

And so ended the on-site activity for *Athabaskan*'s extended work period. The following day I braved the Hwy 401 gauntlet through Toronto and arrived back in Ottawa in time for supper. Much more work remained with the FMF phase, but the focus shifted to the class desk distributing and analyzing the reams of refit data we had collected. Aside from my detachment commander's report, my direct involvement in the *Athabaskan* refit ended and I resumed my duties within DQA . As I was writing this article, I learned that *Athabaskan* needs to be redocked sometime this summer to rectify a problem of paint leeching into her freshwater tanks — a personal disappointment as it disrupts *Athabaskan*'s ops schedule.

I consider myself most fortunate to have had the opportunity to work as an on-site refit detachment commander in a commercial facility. I experienced trust and teamwork at its best, and gained a whole new appreciation for the capabilities of both PWDD and the navy's refit team of FMFCS engineering and production personnel, LCMMs, item managers, MARLANT N37 staff, and *Athabaskan*'s crew. Hopefully, the naval engineering community will continue to be involved with on-site refit activities.

LCdr Jones is a Marine Systems Engineer with DQA 5 in NDHQ.

East Coast Naval Technical Support Seminar:

MARE Graduation Mess Dinner Guest of Honour Speech

by Captain(N) (ret.) Sherm Embree

[Capt(N) Embree retired from the navy this past spring after more than 32 years of service as a Marine Systems Engineer in ships, submarines and various squadron, dockyard and headquarters positions. His last appointment was as Director of Maritime Management and Support in NDHQ. As guest of honour at this year's Naval Technical Support Seminar mess dinner on April 22, Capt(N) Embree delivered the following address which has been abridged and edited for publication in the *Journal*.]

Thank you for your kind introduction, and for your invitation to attend the seminar and this mess dinner. My congratulations to the MARE prize winners again — I hope your careers will be as wonderful a combination of idealism and pragmatism as mine has been, and with some success too.

On that note I would like to give you an overview of some of the themes that have been apparent to me during the past three decades, themes I was pleased to see so well expressed and highly stressed in your seminar. The best part of my speech is that it will be shorter than any of the seminar presentations! Hopefully, though, I can leave you with some thoughts to remember.

I want to talk about pride in ourselves, in our profession, in our navy/CF team, and in our nation. I use the word "pride" cautiously because it can lead to unhealthy arrogance and other faults. But pride can also contribute to self-confidence, team effectiveness and national strength.

Let me first reflect on ourselves as individuals. Through my work in the navy and the Canadian Forces I have come to be proud of our common high sense of responsibility, initiative and co-operation — three characteristics which, even though they go hand in hand with loyalty, courage, honesty, adaptability, personal development and integrity, I find to be all-encompassing signs of a capable individual with innovative tenacity and a human touch. If one of these three characteristics predominates without being moderated by the others, then we are not complete as humans. Responsibility and initiative without co-operation gets us nowhere. By applying these characteristics, we soon recognize when to lead, when to follow, and when to get out of the way.

I have also noted the tremendous improvements we have made over the years in our professional development, social behaviour and ethical values. Discussions are now much more frequent on such great dilemmas as:

• short- vs. long-term priority (e.g. the fleet support plan)

• the individual vs. community (i.e. initiations)

• loyalty vs. truth (i.e. whistle-blowing), and

• hard justice vs. compassion (e.g. drunkenness on the job).

This does not mean that political correctness has eliminated team spirit or characters from the navy, it just means that we must have respect for others.

And what about our role as navy engineers? Are we engineers? We must continually examine ourselves and what we are doing so that we may make choices we can be proud of. When you choose the navy, both you and the navy are better off by having made a conscientious choice. To me, the navy and CF offer engineers an unprecedented variety of employment applying engineering, and more career choices than any other employer.

As engineers we apply the scientific method to whatever we do. Whether we are refitting a submarine, writing an OPDP about the just war philosophy, or downsizing an organization, we apply an engineering thought process. This is true in industry as well. We must simply recognize that engineering discipline is not limited to heat balances and quadratic equations.

You have enough challenges already (as we heard during the seminar), but as I leave this career I must challenge the next generation of naval officers. Our navy is in great shape with new submarines contributing to the fleet mix, good leadership and good people in the technical community. But I must point out the two remaining challenges that, in my opinion, my generation of naval engineers is leaving for you to overcome. They are:

• Block obsolescence — the expensive prospect of potentially having to replace 12 ships at one time. In the past this has contributed to an acrimony within the Canadian shipbuilding industry that is not apparent in industries supporting the army and air force; and

• The recurring boom or bust cycles in our MARE branch and coincident strains between occupations and organizations.

There are many ways to overcome these hurdles, but we continue to trip our way through. We must overcome the human failings of jealousy, greed and envy as we pursue personal advancement, and aim for responsible and aggressive teamwork. Our greatest professional disease could well be procrastination. I can only encourage your on-going initiative and co-operation toward resolving these issues.

You are the people I have worked and played with. Keep up the traditions and

the team spirit. The individual attributes of responsibility, co-operation and initiative working together with team spirit can only lead to success. Keep on working that one navy team irrespective of your current position. And whatever the work, know the value of public money and always respect the public perspective on how it is being spent. We might well spend $3 million dollars out of public view on a minor shipalt, but to the public even $400,000 of that would represent a great United Way campaign success.

As we have heard so many speakers say at the seminar, our navy and CF team should be a harmonious relationship between operations and support. We cannot separate operators from technicians, production from engineering, or the coasts from NDHQ. We must have a perspective of others' views and a combined team that I like to call "support to operations." That is a team we are all involved in, contributing our individual capabilities for the benefit of Canada.

Teams are built on mutual respect not on a hierarchy. Leadership of teams is built on respect as well, not on orders or sarcasm. Good relationships also mean communication, personal contribution, trust, grace and forgiveness. Respect is the foundation of trust, problem-solving and team-building. I believe that true respect is given before it is earned. In my view, the respect we share as members of the CF is one of the strongest unifying forces for all of Canada.

As Canadians we are fortunate — there are no wars in this hemisphere, the economy is on the upswing, there is unprecedented respect for human rights in Canada, and we have a social democracy second to none.

We have one Canadian weakness, though, and that is a lack of respect for government institutions. I haven't figured out yet whether that is Canadian idealism wanting something better, or cynicism. I do know that we tend to criticize ourselves in private or within Canada, but we have every right to be confident and proud in public and on the international scene.

Members of the Canadian Forces recognize the greatness of our country regardless of the region of origin. *J'aime mes amis québecois. Durant les années soixantes au collège militaire royal, nous avons grandi dans notre fierte et loyauté envers le Canada.* National defence and public service is high-value work that gives personal satisfaction and generates beneficial national pride. Keep it up by combining your individual, professional and team abilities. Please keep it up for Canada's sake.

Finally, we all need loyal friends like you and those I have enjoyed throughout my career. It has been good sailing with you. May god bless you and this Canada.

Greenspace: Maritime Environmental Protection

The Hydromem™ Bilgewater Treatment System

Article by LCdr Mark Tinney

Over the next year or so the navy will replace the oil/water separators (OWS) on the *Halifax*- and *Iroquois*-class ships with new, more capable units as part of the Maritime Environmental Protection Project. This has become necessary due to spiralling support costs for the filter elements in the existing gravity-based separators, and more importantly due to the inability of the units to comply with new, more stringent certification criteria proposed by the International Maritime Organization (IMO).

The new Hydromem™ system is being developed for the navy under a contract awarded in October 1997 to Water Technology International Corporation of Burlington, Ontario. The system was selected for its ease of operation and maintenance, and its ability to reliably maintain effluent quality within the prescribed limit of 15 parts per million total petroleum hydrocarbons (15 ppm TPH) required by the IMO, and (potentially) the more stringent regulations of 5 ppm TPH for inland waters demanded by the Canada Shipping Act.

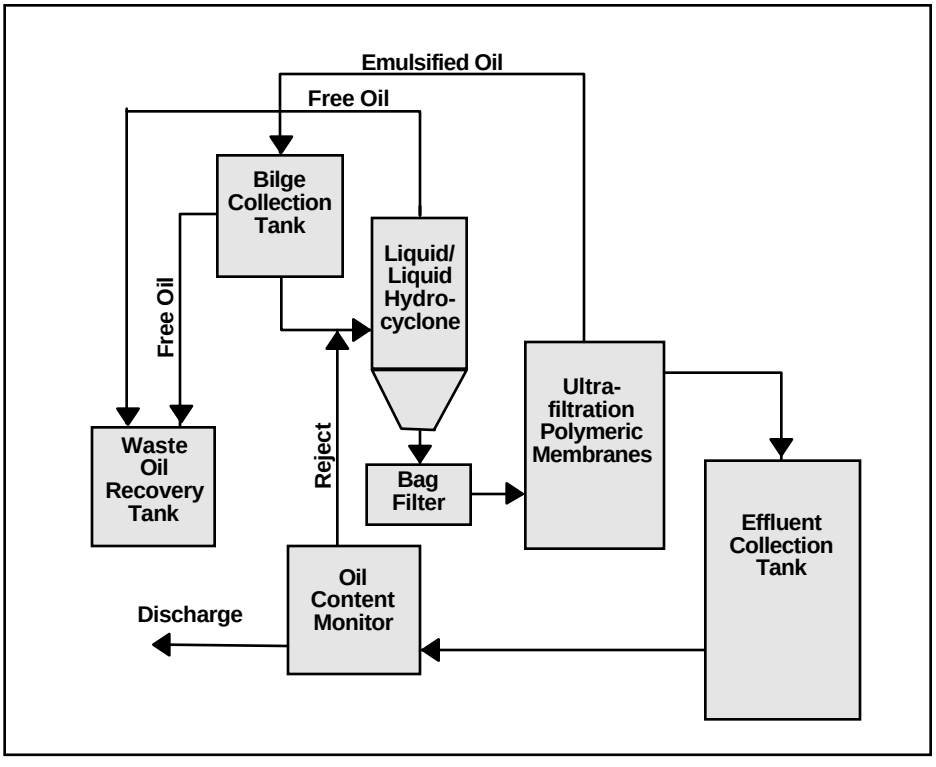


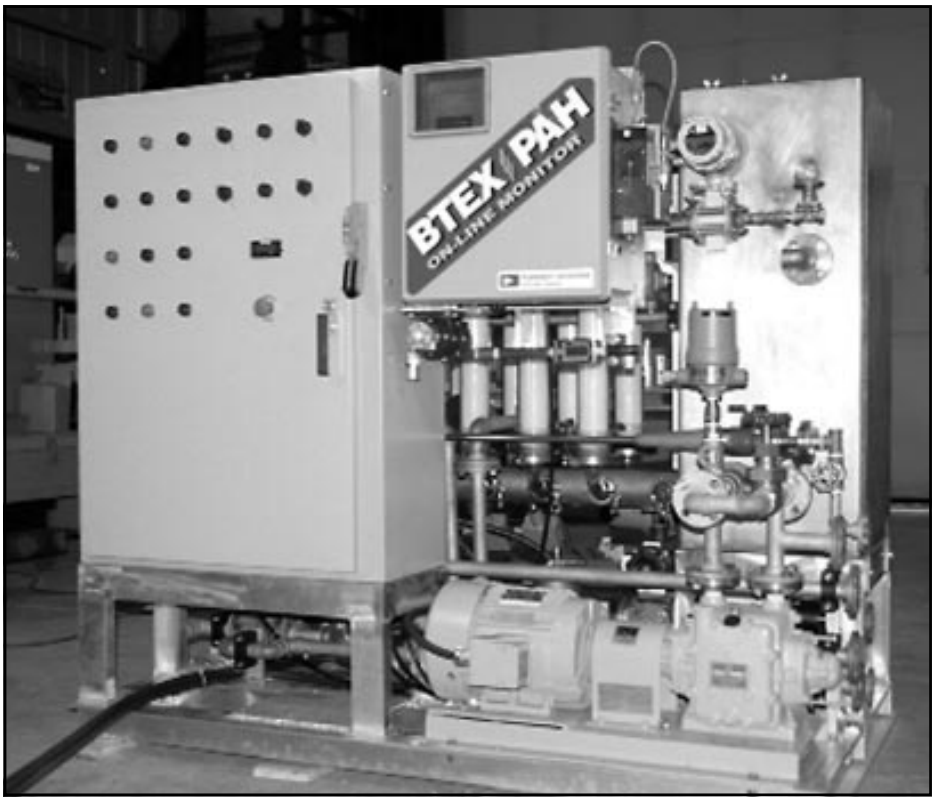
Fig.1. The Hydromem™ Process

The new separator weighs in at 1000 kg and is modular in construction so it can be disassembled at pierside and brought into a machinery space in sections and installed in the same footprint as the existing unit. The unit is designed to process 4000 litres of bilge fluids in a 12-hour period, after which an automated filter cleaning cycle will be initiated. The requirement to clean the filters will depend entirely on the bilge "cocktail" which has to be processed.

Here's how the system works. Through the use of the bilge stripping system, bilge fluids are directed to the bilge collection tank (*Fig. 1*) where some of the free oil separates naturally from the water and is drawn down to a waste oil recovery tank. A sensor monitors the level in the collection tank so that when the fluid level rises to a preset upper limit pumps are energized to draw fluid from the bottom of the tank, through a strainer and into the Hydromem™ system. The fluid is then fed through a liquid/liquid "hydrocyclone" centrifugal separator which will separate the free oil from the water and divert it to the waste oil recovery tank. The remaining liquid is passed through a bag filter before entering the ultrafiltration polymeric membranes to filter out any remaining emulsifications.

The output of the membrane modules is fed into an effluent collection tank where it is monitored continuously by an oil content monitor to ensure it meets the 15 ppm quality limit before being directed overboard. If the output fails this test, it is fed back to the inlet of the Hydromem™ system to be reprocessed. Although the entire process is normally controlled fully automatically by a PLC, the unit can also be controlled manually if necessary.

The hydrocyclone is basically a cone-shaped miniature centrifugal separator with no moving parts, yet infinitely more efficient than a conventional separator. Hydrocyclones function by separating materials of differing densities based on their difference in specific gravity. As bilge fluids enter the unit at a designed inlet pressure, the incoming velocity is converted to tangential velocity which imparts a centrifugal force on the feed. The feed then moves down the cone section of the hydrocyclone, the tangential velocity increases and the centrifugal force rises upward of 3000g. Water, being heavier, moves to the outer wall of the hydrocyclone while the lighter oil migrates to the core. By applying back pressure to the water phase, the oil is forced to flow axially up to the top discharge connection of the unit where it is diverted to the waste oil tank. The separated water exits from the bottom connection and is then passed through a two-micron bag filter before being filtered by the membrane modules.



The new Hydromem™ oil/water separator system destined for shipboard installation this fall will fit in the same footprint as existing units. Some of the spindle-like ultrafiltration membranes are visible to the left of the tall effluent collection tank at right. The PLC controller is on the left. *(Photo courtesy Water Technology International Corporation.)*

Great care has been paid to designing the separator for easy maintenance access. Replacing the ultrafiltration membranes should be a rare requirement, but when necessary it will be easy to perform. Cleaning the membranes is an automated process accomplished simply by pressing a button on the control panel which will initiate a back-flush procedure. In its current configuration, the only consumable component is the bag filter which will have to be checked daily.

The project team is considering several upgrades to the system which will even further improve operation and maintenance. One involves the addition of an automated process to flush the membranes when the flow rate through the ultrafiltration modules drops below the preset amount. Another upgrade would add a solid/liquid hydrocyclone upstream of the liquid/liquid hydrocyclone which, by removing and diverting the majority of the solid matter to a solid waste collection chamber, would greatly improve the service life of the bag filters.

Given the problems that the fleet has had with the existing OWS it is not surprising that a great amount of interest has been shown by ships' MSEOs wanting to be first in line to receive the new Hydromem™ system. The project staff are well aware of the requirement and are endeavouring to get the units into all ships as quickly as possible. Factory acceptance trials commenced at the end of May, after which the units will undergo IMO certification trials in June. If all goes well, installations will commence this fall.

LCdr Tinney is the DMSS project manager for the Maritime Environmental Protection Project.

Book Reviews

Cadillac of Destroyers: HMCS *St. Laurent* and Her Successors

Reviewed by Roger Sarty

Ron Barrie and Ken Macpherson, Cadillac of Destroyers: HMCS St. Laurent and Her Successors (St. Catharines, Ont.: Vanwell Publishing Ltd, 1996), 104 pages; numerous photographs; tables. (ISBN 1-55125-036-5, $29.95)

Cadillac of Destroyers is an account of the 36 destroyers and modern frigates designed and built in Canada since 1945. Readers of the *Maritime Engineering Journal* will be particularly interested because the excitement of the story is primarily in technological innovation — innovation in which the Canadian navy has led the world.

The sleek *St. Laurent* and near-sister classes that entered service in 1955 through 1964 were the most advanced anti-submarine destroyers of their time. This initial series of building programs had not even been completed when the navy revolutionized the capabilities of the destroyer type by integrating hangars and other equipment for handling heavy helicopters into the *Annapolis* class and similarly converting the original *St. Laurents*. The *Iroquois* class of the early 1970s further developed the concept with twin hangars, and introduced gas turbine propulsion, another world first. The current *Halifax*-class frigates have continued technological leadership in gas turbine propulsion, engineering control systems and tactical data processing and display. The production of these frigates, as the text rightly declares, is "the largest and most complex project in Canadian military history."

The book begins with a tight introductory chapter that is perhaps a bit too succinct. In some cases equipment and systems are merely listed without description. That will not be a difficulty for the readers of this journal, but a more general audience might not fully grasp the achievements of the navy and industry. It must be mentioned, however, that the account of DELEX — the navy's Destroyer Life Extension Project of the 1980s — is the best I have seen in any book.

The bulk of the book includes photographs and histories of all 36 vessels, together with useful tables giving technical specifications and the full sequences of commanding officers. The histories of the ships include snippets from personnel who served in them and, from the engineering point of view, mention accidents and failures as well as the many achievements. The photographs and their captions are superb. Ron Barrie and Ken Macpherson have deftly selected shots that have good detail, capture key changes, and yet show each vessel to beautiful advantage.

Given the fact that these ships are virtually synonymous with the Canadian navy as it has developed since the Second World War, this compact, well-laid out, splendidly illustrated book is a must for both serving and former members.

Roger Sarty is Senior Historian at the Directorate of History and Heritage in Ottawa.

The Maritime Defence of Canada

Reviewed by Lt(N) Greg Alexander

"The Maritime Defence of Canada," Roger Sarty, The Canadian Institute of Strategic Studies, 1996, 223 pages with biographical references and index, illustrated, ISBN 0-919769-63-2.

The Maritime Defence of Canada is a collection of eight essays that cover the crucial years in Canada's maritime development from the 1890s through to 1950. Written by Directorate of History and Heritage Senior Historian Roger Sarty, this well-researched work superbly weaves together the surrounding circumstances and the many forces at work in the foundation and development of maritime defence in Canada.

I found Sarty's narrative very helpful in two particular ways: first, for its abundant supply of details and interesting facts surrounding our defence heritage; and second, but more importantly, for its fresh perspective on where we are today as a nation involved with maritime defence. As always, history provides the proper frame of reference for dealing with the present and facing the future. The dynamics at work today are much the same as they were a century ago as our government continues to grapple with the politics, fiscal constraints and international relations associated with its decision-making on defence issues. The outcomes are often surprising, and not always in line with what we think is best.

Sarty documents the crushing effects of peacetime on the adequate maintenance of maritime forces. Public opinion is seldom persuaded on the necessity of maintaining maritime defence readiness until the time of crisis has arrived — or until it is too late. Now that we are in the post-Cold War era, should we be surprised by the challenging times we face?

Read *The Maritime Defence of Canada* — and enjoy.

Lt(N) Alexander is the Staff Officer for DGMEPM in NDHQ.

News Briefs

"Upholding" our submarine capability

On April 6, 1998 the Honourable Art Eggleton, Minister of National Defence, announced that Canada will acquire four modern *Upholder* diesel-electric submarines from the United Kingdom's Ministry of Defence. The decision comes none too soon. Canada's three 1960s-vintage *Oberon*-class submarines have now exceeded their expected service lifespan.

The acquisition features new and innovative ways of doing business. For example, the submarines will be obtained through an eight-year lease-to-buy agreement. The lease payments will be bartered for the ongoing use, by UK forces, of Canadian training facilities in CFBs Wainwright, Suffield and Goose Bay. At the end of the lease Canada will pay the UK one pound sterling for full title to each submarine.

There is more to this acquisition than just the four submarines. The Submarine Capability Life Extension Project will deliver four submarines with essential Canadian modifications, as well as a suite of land-based trainers, the complete technical data package, an initial stock of spares, and conversion training in the UK, ashore and at sea for up to 360 Canadian submariners. Along with the lease-to-buy arrangement which spreads the cost over eight years, savings from the earlier-than-scheduled retirement of HMC ships *Provider*, *Nipigon*, *Annapolis*, *Terra Nova* and *Gatineau* will contribute to the project's overall affordability.

Why the *Upholder*s? As Minister Eggleton pointed out in his announcement, these submarines are "hardly broken in," and Canada's submarine capability is being renewed for roughly one-quarter the cost of designing and building brand new submarines. While the number of boats increases to four from the existing fleet of three *Oberon*s, approximately the same total number of crew members will be employed because of the reduced complement of the *Upholder*s (49 crew per boat compared to 67 for each *Oberon*).

The *Upholder*s are definitely more spacious, too. When asked by *The Ottawa Citizen* to comment on the accommodations, Chief Petty Officer Rouillard replied, "To start off with, the mattress is going to be thicker and the head room is almost a foot more. You've got built-in lockers and all these racks...They're much nicer."

The submarines will be reactivated and certified "safe-to-dive" prior to their handover. The first boat is expected to arrive in Canada in the summer of 2000, with the others following at six-month intervals. The trainers will be relocated to Halifax shortly thereafter. Once the modifications have been completed in Halifax, these latest additions to the Canadian fleet will enter operational service as the quietest conventional submarines in the world, armed with (in our opinion) the best torpedo in the world — the Mk 48.

The boats have not yet been renamed. All four *Upholder*s will be given new names before they are recommissioned in Canada.

The decision follows four years of often difficult negotiations, and reaffirms the government's stated policy in the 1994 white paper of maintaining multi-purpose, combat capable forces. The project team, which will employ up to 28 people, is now planning for the challenges that will come in the implementation phase. **— Cdr Richard Payne, Project Manager, Submarine Capability Life Extension Project, NDHQ Ottawa.**

Acoustic Surveillance

A contract with MDA Halifax was signed in February to improve the Canadian Acoustic Surveillance Work Station (CASWS) fitted in the naval ocean surveillance centre *Trinity* in Halifax. CASWS receives beamformed time-series data from the Integrated Undersea Surveillance System (IUSS) arrays terminating in Argentia, Nfld., performs high-resolution narrowband and broadband processing on the data and displays the result via an advanced operator/machine interface. CASWS is based on commercial off-the-shelf technology and resides in a VME backplane.

A dual beamformer will be added to CASWS to allow the simultaneous processing of two arrays. Associated with the new beamformer are modifications to the signal processing algorithms, including improved normalization for the detection of transients and selectable beam processing. An automated cross-fixing tool will be added to the existing geographical plot to assist in target localization. The exchange of contact data generated by CASWS will be made through a new interface to the Maritime Command Operational Information Network — MCOIN III.

This contract is partially funded by the Chief of Research and Development, and by the National Search and Rescue Secretariat which is interested in using CASWS to detect and localize maritime emergencies based on their acoustic signatures. Noises associated with the breakup of a ship, such as an explosion, are detectable acoustically, but the existing IUSS equipment is not optimized for this. It is this void in coverage and capability that CASWS will fill. **— LCdr Thomas Robb, DMSS 7-2-2, PM CASWS**.

Calling all Canadian USNPGS Monterey Grads

The Canadian chapter of the alumni association of the USN Postgraduate School at Monterey, CA is trying to contact all serving and retired CF graduates. Please contact LCdr Sean Midwood, DMSS 7-8/PM CANTASS (819) 994 -8532/fax 997-0494 (smidwood@dmcs.dnd.ca), or Maj. Ian Glenn, DASPM/PM UASTAS (819) 997-9777 (inglenn@ibm.net). Graduates are also requested to register at the NPS web site http://www.nps.navy.mil/~alumni/

MARE Training Awards

(Photos courtesy CFNES Halifax)

With the completion of every training year, MARE award boards are convened to identify those officers who have distinguished themselves from their peers in the pursuit of engineering excellence and leadership. The following awards were made during this year's West Coast (Jan. 21) and East Coast (Apr. 22) technical support seminars.

1996 CAE Award

SLt Phil Gould receives the 1996 CAE Award during the West Coast technical seminar in January. The CAE Award goes to the candidate displaying the highest standing in engineering excellence, academics and officer-like qualities on the MARE 44B Applications Course. Capt(N) Dave Marshall made the presentation on behalf of CAE's marketing manager for marine control systems, Wendy Allerton.

MacDonald Dettwiler Award

Lt(N) Richard Rankin (HMCS *Onondaga*) receives the 1997 MacDonald Dettwiler Award from company representative John Moloney for best overall MARE achieving Head of Department qualification. Runners-up were Lt(N) Sean O'Sullivan (RMC), Lt(N) Mark Sheppard (*Venture*) and Lt(N) Norbert Duckworth (CFNES). *(CFB Halifax photo by Cpl. S. Gervais)*

1996 Peacock Award

Lt(N) Mark Sheppard (*Venture*) receives the 1996 Peacock Award from company president Randy Hammel during the West Coast seminar. The award recognizes the best overall MSE achieving 44B qualification. Runners-up were Lt(N) Lloyd Cosby (HMCS *Charlottetown*) and Lt(N) Chris Edley (CFNES).

Lockheed Martin Award

SLt Rick Blythe (CFNES) receives the 1997 Lockheed Martin Award from company rep Bruce Baxter for best overall CSE candidate having achieved 44C qualification. Runners-up included SLt Sebastien Richard (CPF Det.), SLt Gabriel Joseph (CFB Esquimalt BIS) and SLt Pete Angel (NDHQ DDCEI). *(CFB Halifax photo by Cpl. S. Gervais)*

1997 Peacock Award

SLt Phil Gould (HMCS *Ottawa*) receives the 1997 Peacock Award before the Apr. 22 East Coast mess dinner from Dr. George Xistris, director of NETE. Runners-up were SLt Ray Jonkers (CFNES), SLT Scott Garriot (CFB Esquimalt Base Ops), and SLt Jody Hook (HMCS *Vancouver*). *(CFB Halifax photo by Cpl. S. Gervais)*

Northrop Grumman Canada Award

SLt Paul Mondoux (CSEAC 9701) picked up the 1997 Northrop Grumman Canada Award for achieving the highest standing of engineering excellence, both in academics and officer-like qualities, during the Combat System Engineering Applications Course. Capt(N) Gerry Humby (CO FMFCS) made the presentation on behalf of Northrop Grumman Canada general manager John Murray. *(CFB Halifax photo by Cpl. S. Gervais)*

CANTASS Update

Progress Review Meeting no. 44 was held at Computing Devices Canada (CDC) during the first week of May. Work on CANTASS Baseline III is nearing completion with the first installation slated for CFNOS this summer. The CANTASS array receiver replacement is scheduled for installation in all units by the end of this year. The video graphics recorder replacement will be installed concurrent with the array receiver work to minimize disruption to the system and ship's staff.

HITASS Acceptance and Training: The PMO for CANTASS witnessed successful factory acceptance tests on the high-fidelity tactical acoustic sensor simulator (HITASS) at CDC in March. HITASS is a portable towed array mission simulator which enables operators to design mission scenarios and execute them on any of the 14 CANTASS systems now in service. Operator training was conducted in May for the East Coast users and during the first week of June for the West Coast. Initial feedback on the system was very positive.

CANTASS Mission Simulator: Solid progress continues on the CANTASS mission simulator (CMS) project. All hardware and software system-level tests have been successfully completed. Array Systems Computing Inc. is busy finishing off final system integration activities in preparation for factory acceptance tests in June. Additional work will include an interface for a Sony DIR-1000 digital tape recorder to provide a common media storage device for transferring acoustic information between shore- and sea-based units. Preliminary draft documentation on CMS is available on the CANTASS DND internal web site: http://131.134.143.230/dgmepm/dgmepm/dmss/dmss7. — **LCdr Sean Midwood, Project Manager CANTASS, DMSS 7-8.**

(NETE photo by George Csukly)

NETE Facilities Upgrade

The Naval Engineering Test Establishment has supported the operation and maintenance of naval equipment and systems since the building of the *St. Laurent*-class destroyers in the early 1950s. Since that time, NETE has been housed in an adapted pre-1935 naval ammunition depot located in Ville LaSalle, Quebec. Although NETE's expertise has continually grown and expanded into new areas of technology, the physical facility itself has remained relatively unchanged. In mid-August 1995, planning began for the replacement of the deteriorated roof structure and the erection of a modern three-storey fireproof office and workshop building.

The inauguration of the renovated facility took place on July 8, 1997. DND guests present at the official ribbon-cutting ceremony included Cmdre F.W. Gibson, DGMEM; Capt(N) S.B. Embree, DMMS; Mr. R.A. Spittall, DMSS; and Capt(N) J.R. Sylvester, PM CPF, along with representatives from PWGSC, CFB Montreal and the City of Ville LaSalle. — **Raeann Rose, Project Administrator, NETE.**

Update: Maritime Coastal Defence Vessel

HMCS *Saskatoon* (LCdr Mark Richardson, commanding) was delivered to the Commander, Maritime Operations Group 5 on May 27. *Saskatoon* is the tenth of 12 vessels to be furnished to the Canadian navy under the MCDV Project. Significantly, the ship was accepted with the smallest number of outstanding CF 1148 (Report of Inspection) items so far in the delivery schedule. The last two MCDVs are not far behind. HMCS *Brandon* is scheduled for delivery during the first week of September, while HMCS *Summerside* is expected by year's end. — **Cdr Dan Lorimer, Project Manager MCDV, Ottawa.**

Maritime Engineering Journal Objectives

- 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.

NETE awarded ISO 9001:94 certification

After 18 months of preparation, NETE obtained its ISO 9001:1994 quality system registration on Feb. 6, 1998. NETE already had a well-developed set of individual guidelines and standard operating procedures in place, but it was felt that a more structured and comprehensive system would bring consistency to its operations. The upgrade would ensure that clients continue to receive high-quality test and evaluation engineering services, and would facilitate examination of the quality system by external auditors.

The effort to demonstrate the conformance of NETE's engineering test and evaluation services to the ISO standard was performed under the auspices of a project raised by DMMS 2, and was spearheaded by an internal six-member quality engineering team assisted by consultants from Groupe Conseil PENTACLE Inc. In consultation with practically all NETE personnel, the quality engineering team spent 12 months drafting work procedures for all essential elements of NETE's operations. Training in the new standards and trial implementations commenced in July 1997, after which the complete quality system was subjected to a thorough precertification audit by a committee consisting of personnel from CFQAR, Groupe Conseil PENTACLE Inc. and QETE. Formal auditing of the system was conducted in mid-December by Intertek Testing Services (formerly Warnock Hersey Ltd.).

Adherence to ISO 9000 standards is recognized as an authoritative indicator of a distinctive competency, professionalism and level of quality in the workplace. For this reason, the Naval Engineering Test Establishment is justifiably proud to follow FMFCS as only the second DND unit to have achieved ISO 9000 certification.
— Claudine Leblanc, Project Leader, NETE.

Cmdre J.R. Sylvester, DGMEPM, presents NETE's Claudine Leblanc (above right) with the test establishment's upgraded ISO certification. At left, the commodore unfurls the banner with NETE director Dr. George Xistris. ***(NETE photos by George Csukly)***

National Défense
Defence nationale

JUNE 1998

News

CANADIAN NAVAL TECHNICAL HISTORY ASSOCIATION

Greetings to Readers of the *Maritime Engineering Journal*

A few years ago a handful of enthusiasts gathered to discuss how they might pull together the information required to tell the story of the technical developments of our naval service. They began by sending letters to a few hundred retired personnel, seeking their support and direct input. Happily, over forty respondents provided personal anecdotes, ranging from one-page letters to career reminiscences worthy of publication in their own right. Many more people sent in notes, memos and old papers they thought might be of interest.

Encouraged by this early success the founders of this movement expanded and formalized their committee to become what is known today as the Canadian Naval Technical History Association. In the summer of 1996 the CNTHA produced its first newsletter as a method of establishing two-way communication (to solicit information from the community and to feed back some snippets in return). To date, the CNTHA has produced four newsletters which, along with complimentary copies of the *Maritime Engineering Journal*, have been sent to our nearly 300 members under the auspices of the Directorate of History and Heritage and our strategic partner, DGMEPM. As you can see, our newsletter is now happily situated in the centre of the *Journal*, a position we hope to occupy for many years to come. However, that depends entirely on the continuing support of contributors.

To all our new readers, we hope you find our endeavour interesting and we look forward to hearing from you.

Mike Saker

Inside this issue:

CNTHA News is the unofficial newsletter of the Canadian Naval Technical History Association, published by the Director of History and Heritage, NDHQ Ottawa, K1A 0K2, telephone (613) 998-7045, fax 990-8579. Views expressed are those of the writers and do not necessarily reflect official DND opinion or policy. The editor reserves the right to edit or reject any editorial material.

About the CNTHA

The Canadian Naval Technical History Association is a volunteer organization working in support of the Directorate of History and Heritage (DHH) effort to preserve our country's naval technical history. Interested persons may become members of the CNTHA by contacting DHH.

A prime purpose of the CNTHA is to make its information available to researchers and casual readers alike. So how can you get to read some of it? For the moment there is only one copy of the Collection, situated at the Directorate of History and Heritage located at 2429 Holly Lane (near the intersection of Heron and Walkley Roads) in Ottawa. DHH is open to the public every Tuesday and Wednesday 8:30-4:30. Staff is on hand to retrieve the information you request and to help in any way. Photocopy facilities are available on a self-serve basis. Access to the building requires a visitor's pass, easily obtained from the commissionaire at the front door. Copies of the index to the Collection may be obtained by writing to DHH.

Drop by. Give us a look.

Canada's First Nuclear Propulsion Option

The estimable Constructor Commodore R. Baker, on loan to the RCN from the Royal Corps of Naval Constructors as Naval Constructor-in-Chief (1948-56) was inclined to assert to those in Operations that, "It's not so much what you want as what we, in Technical Services, are able to provide." This exhortation was not always well received and it is interesting to see how it worked out in the case of an early Canadian nuclear propulsion option.

Nuclear propulsion was an enthusiasm of RAdm Brian Spencer (Chief of Naval Technical Services, 1958-1961). He had begun his naval service with the RN in (it is believed) the coal-fired *Emperor of India* and hankered after a career that would span the realm of fuel from coal to nuclear power. Serving first as Engineer-in-Chief (1955-57) he tried to persuade the Naval Board of the desirability of studying nuclear propulsion. Early in 1957 the Admiralty sought the RCN's interest for a joint team to work at the UK Atomic Energy establishment in Harwell. It seemed that a plant for a fast tanker would be appropriate to consider and by year end the team was in place.

Now indeed the operators were heard from, with regard to a need for Canadian submarines and with the surprising observation (no technical opinion having been sought) that the submarines could be built in Canada. Needless to say, Spencer allied himself with these aspirations, and by early 1958 the Naval Board generally agreed to the requirement for nuclear propelled submarines in the RCN, and to study the feasibility of manufacturing nuclear plants and submarine hulls in Canada.

By the fall of 1958 Spencer had become CNTS, and a Nuclear Submarine Survey Team (NSST) had been set up. Its membership included: Cdr(E) (later VAdm) R.St.G. Stephens, Cdr(L) (later RAdm) W.B. Christie, LCdr(L) C.R. Nixon (later DM/DND), Const. LCdr J.M. Ashfield and Lt(E) (later Capt) S.E. Hopkins. As well we were later joined by CNTS's first woman officer, Lt(W) R. Dwyer, and by Mr. W. Mayo from Dept. of Defence Production.

As for my own involvement I was an unknown quantity to Spencer, but as his deputy it was largely left to me to "get on with it" as the team's leader. However, as a gentle acknowledgment that I knew little about submarines and even less about nuclear propulsion, I was sent to the UK to visit facilities and to attend the Senior Technical Executives Course at Harwell. So in mid-October 1958 the work of the (very technical) NSST began in earnest with the intent to finish in June 1959.

To say the least, we got off to a shaky start. For some time we were unable to contact the USN until a high-level meeting developed a "Means & Extent" agreement that would enable us to discuss relevant nuclear propulsion topics with the appropriate authorities. Meanwhile, we visited U.S. shipyards involved in submarine construction and canvassed proposals from shipyards and machinery power companies in Canada, all of whom were anxious to be considered. In all of this period I don't recall that we had any contact with Operations branches — we had more or less shunted Assistant Chief of Naval Staff (Plans) aside. Understandably VCNS demanded that we produce an interim report and that "ACNS(P) continue to co-ordinate the whole business." Alas, we took this rather lightly, particularly since there had been no evidence of any "co-ordination" from ACNS(P).

At any event, we proceeded with the work and produced our lengthy report (nearly 200 pages) by end-June 1959. As well, we prepared two supplementary reports dealing with the selection of shipbuilders and machinery contractors. Toward the end of July I made a report to Naval Board in which I reiterated our cost estimate of $65M per boat, with an ongoing annual program expenditure of about $50M and more than $25M for logistic and training facilities.

Thus, in short, the RCN had indicated an interest in nuclear propulsion, the best opportunity being in submarines. The NSST had taken a year to study the matter and concluded that building nuclear-powered submarines in Canada was feasible but expensive. Naval Board's reception, though cordial and complimentary, was non-committal and they simply presented a submission to the Chiefs of Staff Committee urging approval in principle.

Undoubtedly the cost implications were very demanding, but a decision was not helped by a visit in the fall of 1959 by the RN's Flag Officer Submarines who, perhaps with a view to selling British conventional submarines, spoke in very favourable terms of their continuing usefulness. This presumably contributed to an aide memoire to CNS in November 1959 which reviewed the pros and cons of conventional and nuclear submarines. It concluded:

> Nuclear submarines are preferred but as long as cost is the main consideration, then the Service should be equipped with conventional submarines of proven US or UK design constructed on the basis of equal priority with surface vessels of the planned replacement program.

There appeared to be a turning point in March 1960 when the RCN reiterated to Cabinet Defence Committee its desire to introduce its own submarine service, but noted that a unit cost of $65M "placed nuclear submarines beyond our reach without a substantial increase in the Naval budget." Not surprisingly, Cabinet Defence Committee accepted all this and so began the lengthy and tortuous deliberations that led, in 1963, to the acquisition of three *Oberon*-class submarines.

On reflection it does not seem to me that we in Technical Services were as judicious as we might have been. Certainly we worried away more or less successfully at a range of technical, logistic and financial problems and, in so doing, became submarine "experts" in a field that was not particularly crowded with relevant talent. But we ought to have had continuing access to operational experience relating preferably to underwater vehicles. Probably this would not have made any difference to the final decision, but it might have given the team rather more legitimacy in the eyes of Naval Board. However, it was all very broadening, and since the *Oberon*s are still in service today the outcome was a good deal better than we might have anticipated — four decades ago.

S. Mathwin Davis Phd.D; Rear Admiral (Ret'd)

[Who were the Canadians, if any, who joined the team at Harwell? — *Editor.*]

A CNTHA Pilot Project

The CNTHA has begun to develop an extensive collection of documents, letters and anecdotes contributed by individuals in response to our request for ideas and information. Our curator, Phil Munro, has done a terrific job of sorting and cataloguing the information. While the documents have highlighted many significant decisions, events and projects that have affected engineering and technical developments in our navy since World War II, they also show that there are many gaps in our data base and that we have really only collected a very small portion of the information needed to accurately and justly portray our naval technical history.

Time is taking its toll of those who led us through World War II and set the stage for the postwar Canadian design and development of naval vessels. Recording their recollections is a high priority. We must accelerate the information collection process, which requires that the CNTHA become more proactive.

Our first task is to develop a timeline from 1945 to the present which correlates major policy decisions, ship design and acquisition programs, innovative system/equipment developments, and the people who participated. A pilot project will then examine a segment of the timeline, concentrating on one discipline, e.g. combat systems. Data will be gathered and catalogued, after which the process will be assessed and amended as necessary to drive the collection of outstanding historical information.

Activities will take place on three levels, with much of the work going on in parallel. The first level encompasses the development of a macro timeline of the major ship design, development, acquisition and update projects since WW II. The second level activity will expand on this, overlaying such aspects as the phases of the projects, the introduction of major technical innovations, the key players, the organizations involved, the introduction of support and training facilities, and changes to the Supply system, etc.

The third level activity will involve the formation of a focus group to take a segment of the timeline, correct it, fill in missing issues and key decisions, identify sources of information and solicit coordinators to gather the data. Winding up this pilot project will be the evaluation of the process and its application to the remainder of the CNTHA project.

The success of the project depends on people like you. The CNTHA must capture the experiences of those of all ranks who have served and who are serving. It may be our so-called Canadian psyche, or just the innate modesty of naval persons, but people seem to be judging their own roles as insignificant. "I was just part of the team," they say, yet when they relate their experiences it is very clear that their contributions were far from insignificant (even though they arose during what some might have regarded as routine engineering and technical work). These memories are critical to identifying the people who participated and to whom credit must be given. This includes our uniformed and DND civilian personnel, as well as our other government department and industrial counterparts.

All information is valuable. When our team asks you about projects, events and people, please reach back into your memory and help as much as you can. Let the CNTHA judge where it fits into the overall picture. In the meantime, your letters, anecdotes and recollections are still much-needed and will be most welcome. Indeed, they are key to helping us flesh out the timeline and chart our course.

Jim Dean

We'd love to hear from you…

If you have information, documents or questions you'd like to pass along to the Canadian Naval Technical History Association, please contact:

Roger Sarty, Senior Historian,
Directorate of History and Heritage, NDHQ, MGen George R. Pearkes Bldg.,
Ottawa, Canada K1A 0K2
Tel.: (613) 998-7045/Fax: (613) 990-8579

We look forward to hearing from you.

Letters

Thank you for the invitation to sit in on your meeting of Feb. 18. The venue in the Bytown Naval Officers Mess and the discussions were reminiscent of the many meetings I attended there as Secretary to the Canadian Naval Aviation Technical History (CNATH) Project from 1992-96.

I was involved with the Naval Aviation Technical History Project in soliciting, collecting and processing material from contributors; coordinating material for processing as a manuscript; working with a publisher and printer; and marketing, selling, and delivering our final product "*Certified Serviceable — The Technical Story of Canadian Naval Aviation.*" It is with this background that I make the comments below.

The time frames of the two projects are different. The aviation history dealt basically with a 25-year period, late WW II to unification. The CNTHA must cover from WWII to the present, and hopefully be the genesis and catalyst for recording and archiving developments as they occur rather than having to retrieve material from ever fading memories.

The aviation history was fortunate to have the Canadian Naval Air Group, with chapters across Canada, as a network from which to solicit material and purchase the final product. Your project seems to be even more fortunate, as in addition to retired members you have currently serving personnel who have become involved. In addition, they can perhaps learn from the past. While new technologies are available and continue to develop, many of the problems of resources and politics will remain. How these were overcome in the past by determination and ingenuity may well provide valuable lessons.

The availability in archives of the material which you compile will enable researchers to produce papers for your and other learned journals and symposiums, articles for newsletters and content for training modules. It will provide data which could be published in book form of specific endeavors, or broad histories of

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Letters (cont'd)

various periods if someone wished to do so at a future date.

The Naval Aviation History Project found that anecdotal material (from not only naval and civilian technical officers, but from the chiefs, petty officers and other ratings who had to "make it work") can add a lot of background to the more formal histories and papers. These inputs should be sought, as many did not always see things the way the record might indicate.

Soliciting and then receiving inputs from volunteers can be a very long process. Commitments are always made with good intentions, however in retirement there always seems to be more to be done than when one was working, and targets slip to the right faster than an inter-departmental government project. I got the feeling there was a determined perseverance amongst your team that will result in the success of the CNTHA Project. Might even submit a bit myself!

In a recent meeting with Rolfe Monteith I learned that he plans a cross Canada tour in September. All those of his era who have not contributed as yet should be forewarned to do so, or have a valid explanation ready.

May the CNTHA Project exceed the Naval Aviation Technical History Project. Those who become involved feel a well-deserved sense of achievement.

Yours aye,

G.S. (Gord) Moyer
LCol (ret'd) (former (E)(AE); 140-41; AERE/MARE)

[Editor's Note: Committee meetings are open to anyone who wishes to attend. Call our secretary at DHH to determine when the next one is scheduled.]

(To LCdr Richard Gimblett)

I read with pleasure that you have been assigned the task you describe in the *CNTHA News* of December 1997. I may be able to help you in connection with the "lost years." I was on the staff of the Manager Electrical Engineering HMC Dockyard, Esquimalt from 1946 to 1948 and thence to the *Crescent* as Electrical Officer and made voyage to China and back in 1949. I was responsible for preserving the electrical gear in *Crusader* when she was paid off into the reserve fleet and I have a few anecdotes about that exercise.

The China cruise was one of the highlights of my early career; the way out and the way back; the mutiny in Nanking and as one of those ordered to appear before the Mainguy Commission I was pretty close to the inside story. As I had a keen interest in sports, I played on the ship's fastball team and got to know quite a few of the men. Often over a beer after the game we would talk about life in the Navy of those times and their feelings about the future shape of the service and their ideas about how it should go. One of my retirement occupations has been to 'write up' my recollections of events in my life that made my career so fascinating and rewarding; I am enclosing a few samples which pertain to that period. If you find them helpful I would be pleased to dredge up some more. I think I might even recount the features of the very day of the mutiny. It was a memorable incident!

I look forward to hearing from you in due course.

Sincerely,

Melvin T. Gardner
7 Rue de la Sapinière
1340 Ottignies, Belgium
Email: melvin.gardner@infoboard.be

The Collection

The collection now stands at 335 items, the most significant of the additions being a major contribution from Jerry Proc. Jerry is a volunteer in the *Haida* preservation group, and has made extensive research into the ship's radar, asdic, IFF and, most importantly, communications systems. Moreover, he has expanded the research into general shipboard fittings and operations both past and present. The result is a splendid compilation of naval communications history. It is available on the Internet under: http://www3.sympatico.ca/hrc/haida and subpages.

Another item of interest is the Engineering Officer's report of the grounding of HMCS *Huron*, 13 July 1953 in Korean waters. This report describes the efforts to refloat and effect damage control. It differs in some respects from the story in *Thunder in The Morning Calm*, a book about Canadian Naval Operations in the Korean theatre.

Any contributions from a single paragraph to a book can be sent to me directly:

- by mail: 673 Farmington Ave., Ottawa, Ont., K1V 7H4
- by fax: (613) 738-3894
- by E-mail as436@freenet.carleton .ca

Phil Munro

Sonar History: Help Wanted

I'm currently working on the history of towed sonar 1949-64. The main sources will be material in the National Archives, and there is some valuable material in the CNTHA collection already. However, I'd like to hear from anyone with sea experience with AN/SQS-504, particularly during its development and evaluation in *Crusader* 1955-60, in *Crescent* after 1960, and in the Improved *St. Laurent* class, *Annapolis* and *Nipigon* after 1963.

I'd also like to hear from anyone who worked with the late Colin diCenzo, the NDHQ project officer during the production of SQS-504 by EMI-Cossor, 1957 onward. All contributions are welcome, from a couple of paragraphs to a brief essay. (Similar information on SQS-505 will also be needed later, so feel free to send notes on that as well.) Please send your input to Phil Munro so that it can be acknowledged and indexed as part of the Collection, but get in touch with me directly at (250) 595-1867 if you have questions.

Hal Smith
Sonar Coordinator