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Maritime Engineering Journal

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Summer 2003

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Maritime Engineering Journal

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DEPARTMENTS

FEATURES

Cover: The NATO Seasparrow Project has changed dramatically in its 35-year history, especially in the two decades since Canada joined the consortium on Oct. 14, 1982. *(Photo courtesy NATO Seasparrow)*

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Commodore's Corner

Naval Vessel Safety Management — Making contingency for the "enemy within"

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

On the morning it exploded and sank to the bottom of the Barents Sea, the nuclear attack submarine *Kursk* was the most advanced weapon of its kind in the Russian fleet. At 156 metres and 18,000 tonnes submerged, this huge vessel carried twin nuclear reactors and a formidable load of lethal weaponry. The submarine was also equipped with ten watertight compartments and a double hull for maximum survivability against enemy torpedoes. When the end came on Aug. 12, 2000, it was ironic that the adversary that ultimately killed the submarine and its crew was the *Kursk* itself.

Something went horribly wrong. Seismic stations in the Baltic recorded two separate transient signals, thought to be explosions, approximately 135 seconds apart. The second transient was much larger than the first, leading investigators to surmise that a single onboard explosion ignited a fireball that detonated the boat's remaining munitions. It was reported that *Kursk* radioed for permission to fire ordnance just before the event, but details of the accident were shrouded in secrecy. What seems clear, however, is that the surviving crew, trapped aft, were unable to deploy a beacon or effect an evacuation. In the end, all 118 on board perished.

At the time of the accident the Russian military was experiencing severe budgetary shortages, significantly diminished expertise and low morale. That this was a submarine accident is incidental. Whatever caused the failure that claimed the *Kursk* — defective equipment, negligence, or more probably an inadvertent tragic sequence of events — could just as easily strike any warship. Among other lessons, the catastrophe stressed the ongoing need of a professional approach to safety in the materiel support of our own fleet.

Safety is not an absolute quantity. Even though our society is ill informed, if not fickle in its appreciation of what is "safe," it does expect that professional practitioners and regulators will prevent the manifestation of that which is "unsafe." We know this to be an impossible standard. Safety is probabilistic at best, often judgmental, and at worst, assumed. Nevertheless, it is becoming increasingly important that the considerations upon which safety is asserted be made visible.

"Our challenge is to develop a safety system that is an acceptable balance between effectiveness, diligence, efficiency and cost, notwithstanding that the cost of a single life is incalculable."

Not surprisingly, the media optic of recent disasters has moved various governments to enact safety legislation. In Europe, for example, a proposed chemical plant must now prepare both an environmental assessment and a safety case, and have them accepted by an independent regulatory body. These two steps must be completed before construction can be approved and before an operating licence can be issued. The safety case for such a complex system provides the definitive, or baseline assertion of safety, together with supporting evidence that the design, manufacture, operation and eventual disposal of the system will satisfy acceptable criteria at each stage in the program. Failure to maintain the physical integrity of the plant or the operating procedures as approved in the safety case can lead to a suspension of the operating licence.

Returning to the *Kursk* incident, what if anything should this tragedy compel us to do? My mandate as DGMEPM is to acquire and support naval materiel. Implicit in this mandate is the requirement to include safety as a primary consideration, albeit within a context of potential conflict that is uniquely military. Unlike our colleagues in the air materiel branch, we have no pertinent statute of parliament that compels a standard of diligence in consideration of safety. Until recently, we have treated safety management as a subset of system engineering and this has been considered sufficient to achieve "due diligence." Our record has been admirable, but not unblemished, so to improve things we have included distinct safety programs in our most recent ship acquisition projects. For the *Victoria*-class submarines we have adopted and modified the MoD(UK) Submarine Safety Document Register for the materiel certification of the submarine materiel state. Evolution continues. In all likelihood the DND/CF will adopt further systematic, coordinated, auditable approaches to safety management, much as regulators of commercial shipping and other navies are doing.

Other defence organizations adopting the civil model now require materiel certification as a demonstration that requisite levels of safety have been achieved and are being maintained. Certification is based on a documented, top-down, whole ship safety case which is often subjected to independent regulatory oversight to provide the objective basis for certification. Probabilistic safety assessments are performed using risk management techniques applied to key hazards. And while it is recognized that safety considerations must be applied to all equipment, the rigour of examination can be graduated based on the hazard identification.

Clearly this civilian approach is enormously challenged when applied to the diverse complexity of military technology and the environment in which it is used. Our challenge is to develop a safety system that is an acceptable balance between effectiveness, diligence, efficiency and cost, notwithstanding that the cost of a single life is incalculable.

Our approach to safety must always be examined in the light of the human condition. Extensive design and quality assurance procedures may reduce the likelihood of dangerous chains of events occurring in our ships, but can never really eliminate them. The "sum of all fears" hit us hard in 1995 when one of our leading seamen was fatally injured during a RAS exercise. The subsequent investigation revealed a number of deficiencies, which prompted fleet-wide corrective action. Deck fittings were repositioned, equipment was reinstalled, class drawings were updated and Chapter 9 of the Rigging and Seamanship Manual was rewritten. We hope that these measures will prevent further such tragedies, but we can't know for certain.

Could this accident, or the *Kursk* tragedy, have been prevented? The irony in this type of question is that it is only ever asked after the fact, implying that the answer escaped us at the time it was really relevant – when there was still time to prevent the mishap. The lesson is not new. How well we have learned it will be measured by how much we reduce the probability of our overlooking a "chain of events."

Farewell

Regrettably, this edition of the Commodore's Corner must be my last as DGMEPM. After almost six years at the helm of an absolutely first-class materiel support team, it is an honour and privilege to hand over responsibility for Maritime Equipment Program Management to my long-time colleague, Cmdre Roger Westwood.

It has been an interesting run. Having been associated with this division basically since 1986, I have experienced on many levels the immense challenges involved with fleet renewal and sustainment. Still, it was only when I began to direct the overall response to these challenges as Director General in 1997 that I fully appreciated the depth of commitment that people throughout the community were bringing to the overall effort on a day-to-day basis. It continues to be nothing short of remarkable.

I read once that we "live on the edge of time." For me that "edge" is now taking up a new slice of our business within the CMS organization. As I take up my appointment as Director General Maritime Personnel and Readiness, I offer you my sincere thanks for a job truly well done. It was you, after all, who made it all work!

Good luck and farewell.

Cmdre J.R. Sylvester

DGMEPM Change of Command

May 29, 2003

Cmdre J.R. Sylvester (left) relinquishes command of the Maritime Equipment Program Management division to Cmdre Roger Westwood.

Mr Alan Williams (Assistant Deputy Minister Materiel) and VAdm Ron Buck (Chief of the Maritime Staff) witness the handover. *(MEJ photos)*

(*Front row – left to right*) **Carole Ouellet** (SO/DGMEPM), **VAdm Ron Buck** (CMS), **Cmdre J.R. Sylvester** (new DG Maritime Personnel and Readiness)**, Mr. Alan Williams** (ADM Mat), **Cmdre Roger Westwood** (new DGMEPM), **Paul Hines** (PM Frigate Life Extension Project), and **Cdr S.R. Richardson-Prager** (COS DGMEPM).

(*Rear*) **Cdr Eric Bramwell** (PM Joint Support Ship Project), **Joe Muller** (Director Maritime Management and Support), **Cdr Joe Murphy** (Director Maritime Class Management Minor Warships/Auxiliaries), **Ray Gordon** (DMCM Iroquois Class and AORs), **Michel Brisebois** (DGMEPM Business Manager), **Capt(N) Mike Williamson** (PM Submarine Capability Life Extension Project) and **Cdr Rob Hovey** (DMCM Submarines).

Forum

Dear Editor:

As always, I am pleased to receive a copy of the MARE *Journal*, and enjoy reading it in my retirement. I was delighted to see the Forum article (Summer 2002) by Cdr Finn, LCdr Page and LCdr Comeau, entitled MARE 2020 – Models for the Future of the Maritime Engineering Occupation.

I expect this article will meet its objective and spark lively, healthy debate. It is the most exciting that I have read on the MOC. Should I have the pleasure of "serving the Queen" again, I would want to join a navy that provided me with a career model laid out in *Figure 3*: the Single Engineer Concept. I believe that this model could be termed the "Single Naval Officer Concept" since it allows officers developed under this structure to aspire to the most challenging responsibilities within the navy, including command at sea.

This article is reminiscent of one published in the Royal Navy's *Journal of Naval Engineering* in 1992, entitled "Should Engineers Wear Purple Hats?" (*JNE*, 33(3), 1992). At that time the two authors were asking some of the same questions posed by Cdr Finn and his colleagues; one of note: Why should officers recruited with splendid educational credentials be limited in their career progression simply because they are technical officers?

I have known many senior MARE officers in the past who I believe could have assumed the most responsible positions within the navy and CF had they been "raised" in a career model similar to that presented under the Single Engineer Concept in the article. Although I entered the navy just after the introduction of the General List concept in the early '60s, I do recall watching the careers of some of the electrical officers who cross-trained as weapons officers. Some did very well, including Vice-admiral J. ("Jock") Allan (B. Elec. Eng., Queens University) who served as the Maritime Commander and retired as Deputy Chief of the Defence Staff. Along the way, VAdm Allan commanded HMCS *Qu'-Appelle*; served as DMCS 7 as a commander; was project manager for the delivery of the four DDH-280 warships as a Capt(N); and served as DGMEM as a commodore. He even served as D1, the squadron commander of the four DDH-280s he had delivered as a project manager!

It is remarkable that Vice-admiral Allan, who started his career as a technical officer, commanded at sea, and served in the top CF operator's position as DCDS, and in the navy's top engineering position as DGMEM. Due to the circumstances of the time, VAdm Allan developed under a career model that allowed him to serve at sea in a command line and ashore as an engineer — put simply, a career model laid out in the Single Engineer Concept.

It seems to me that the Single Engineer Concept introduced by the authors of MARE 2020 would permit officers with ability to make a contribution to the navy beyond the limits of the existing personnel structures. I do hope this article leads to the serious examination and debate it deserves.

Bravo to Cdr Finn, LCdr Page and LCdr Comeau.

Yours Aye,

Thomas F. Brown
Captain(N) (ret.)

Dear Sir,

I read the article on MARE 2020, in the Summer 2002 issue of the *Maritime Engineering Journal*, with considerable interest as an example of history repeating itself. I served as an engineer officer in the Royal Navy from 1946 to 1957. When I joined, all the officer branches were separate with distinctive colours between their gold stripes to indicate their branch. The executive branch had no colours, engineering was purple, electrical was green, supply was white, and so on.

Engineering training was common for all engineer officers at Manadon. After a year at sea to get one's engineering watchkeeping certificate you were confirmed as a Lt. (E). About 10% of the Manadon graduating class were then selected for a two year Advanced Engineering Course in marine, ordnance or aeronautical engineering (the so called "Dagger" courses because of the little dagger [symbol] ahead of your name in the Navy List). The first two specializations were done at Greenwich and the aeronauticals went to Cranfield with the RAF.

In January 1956 the Admiralty promulgated (AF0 1/56) a "New Officer Structure" that created a General List and did away with the distinctions, and coloured stripes, of the (E), (L) and (S) branches. The purpose of this was to open up the non-seagoing command structure to all officers in these branches so that, for example, an engineer officer could be captain of a dockyard, formerly reserved for an executive officer. Although it met with fairly general approval from most of the officers in the technical branches, it was not too popular with junior executive officers, who saw many senior posts opened up to more officers. Many of the junior Dagger officers, who were proud of their specialization (graduation from Greenwich was the equivalent of a master's degree in engineering, with examinations set by London University) were not too happy to be lumped in with junior executive officers; many of whom we felt were none too bright!

This was certainly one factor in my taking early retirement in 1957 and emigrating to Canada where I pursued a very successful career as a consulting engineer for the next 30 years.

Alan Wyatt
Lt. RN & RCNR (ret.)

[**Ed. Note** — Lt. Wyatt graduated the Advanced Marine Engineering Course with first-class honours in 1955.]

Thank you for your patience…

In case you have been wondering what's happened to your *Journal* in the last while, a note of explanation is in order.

As some of you know I was injured in a car accident in June of 2002. Serious neck and wrist injuries left me unable to work for six months, and even at that it has taken me until the end of this summer to regain most of my previous (alleged) ability. It has been a long, stressful haul. A lot of people have had to put up with a less-than-stellar performance on my part over the past year, and for that I apologize.

The good news is that things are definitely on the upswing. We are ramping back up to full production schedule and working hard to get your articles into print as soon as possible.

Thank you all for your extraordinary patience and understanding.

Sincerely yours,

Brian McCullough
Production Editor

Article and Letter Submissions

The *Journal* welcomes **unclassified,** illustrated 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, DMSS, 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.

As a rule of thumb, major article submissions should not exceed about 1,800 words and should include photos or illustrations. Shorter articles are most welcome. The preferred format is MS Word, with the author's name, title, address, e-mail address if available, and telephone number on the first page.

Please submit photos and illustrations as separate pieces of artwork, or as individual *high-resolution*, uncompressed electronic files. Remember to include complete caption information. We encourage you to send large electronic files on 100mb Zip disks or CD-ROMs, and to contact us in advance if your illustrations have been prepared in a less common file format.

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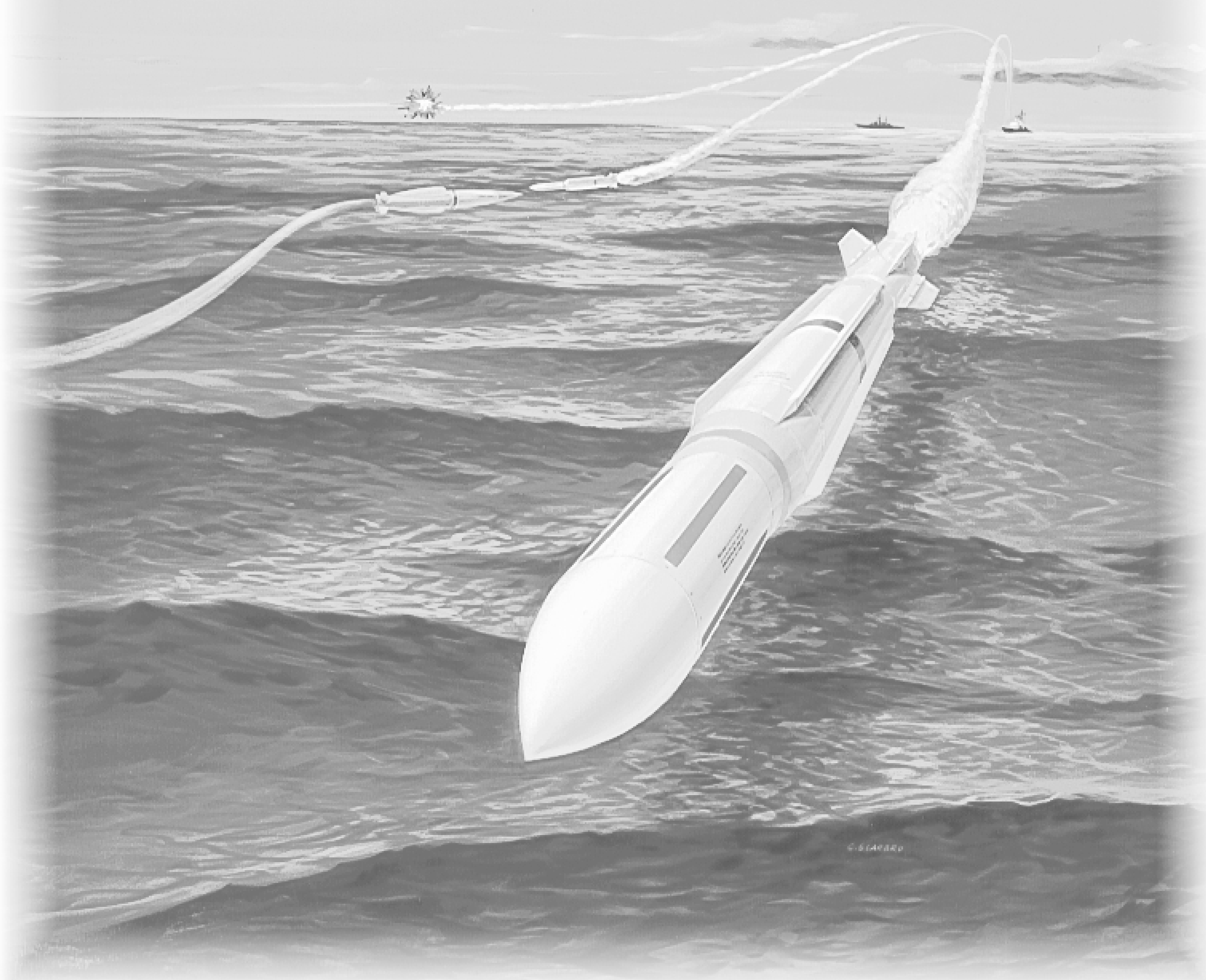
Missiles engage!
Canada’s 20 Years with the NATO Seasparrow Project

Two decades have passed since Canada first joined NATO’s premier missile development project as a full-fledged partner. As ***Cdr David G. MacDougall*** *writes, the navy’s ongoing partnership in the NATO Seasparrow Project continues to be characterized by commitment and innovation.*



Ever since its creation in 1949 the North Atlantic Treaty Organization has sought multilateral and multinational collaboration in various weapon development programs. So far, only the NATO Seasparrow Surface Missile System Project has achieved any true longevity. Its unprecedented success as an international consortium project has made it a model for multinational military co-operation, thanks mainly to its focused aim and the determination of the member nations to make it succeed.

Although the NATO Seasparrow Project has been in existence since 1968, its role and character have changed dramatically in its 35-year history, especially in the two decades since Canada joined the consortium on Oct. 14, 1982. (For an interesting account of Canada's earliest involvement with a Canadian Seasparrow initiative, see "Project Mermaid: The Canadian Sea Sparrow Missile Program," *Maritime Engineering Journal*, June 1997.) Over the years, Canada has played a major part in the evolution of the project, particularly in the development of a vertical launch (VL) capability. Today, the Canadian navy is a key partner in the Evolved Seasparrow Missile (ESSM) program, providing financial support and a significant contingent of personnel to the project's offices in Arlington, Virginia and Den Helder, the Netherlands.

A Brief History

The NATO Seasparrow Project can trace its beginnings to 1967 when Egyptian patrol boats sank the Israeli destroyer *Eilat* using three Styx anti-ship missiles. This incident in the Six Day War highlighted the need to immediately develop self-defence measures against the emerging threat that proliferating anti-ship missiles presented. The NATO Naval Armaments Group moved quickly to establish an acquisition program based on off-the-shelf technology and the existing Raytheon AIM-7 Sparrow air-to-air missile. The group later recommended establishing a co-operative self-defence missile development program, and what emerged was the NATO Seasparrow Project.

From 1967 to 1973 the NATO Seasparrow Project concentrated on developing and testing the new NATO Seasparrow Surface Missile System point defence missile system. What was perhaps more important, however, was that the missile project was being fielded by a multinational consortium of four NATO member countries (Denmark, Italy, Norway and the United States) — novel for the time. The establishment of the NATO Seasparrow Project Office (NSPO) and the development of a unique military-industrial partnership that exists to this day characterized these early years of the program. Equally significant was the fact that the industrial activity surrounding the missile was not limited to American defence contractors. A fundamental tenet of the project was (and still is) that commercial development, production activity (or work share) will be spread among all NATO Sea-

An early Seasparrow missile shoot from HMCS *Athabaskan*. (DND photo)

sparrow participating governments.

A period of deliberate, steady growth from 1973 to 1978 saw new members join the consortium as the NATO Seasparrow Surface Missile System was deployed operationally. The RIM-7 ship-launched Seasparrow missile experienced continuous evolution during this period as component modernization and combat experience with the AIM-7 air-to-air version of the missile in Vietnam drove further technological and tactical improvements. By 1982 the RIM-7 Seasparrow (now being produced by Raytheon and General Dynamics) was a tactically effective, functionally reliable missile. Improvements to the missile software, in particular the development and deployment of the RIM-7M upgrade and vertical launch capabilities, saw the full maturation of the program. It was in this period that Canada joined the consortium, spearheading the vertical launch era with successful firings of the VL version of the NATO Seasparrow from HMCS *Huron* (DDH-281) in 1983.

Still, it had become obvious to the navies involved that in the maturation of the Seasparrow the seeds were also being sown for its obsolescence. A final upgrade to the RIM-7P baseline was made in 1990, and in April 1991 the NATO Seasparrow Project Office approved a contract definition phase for the development of an Evolved Seasparrow Missile (ESSM). ESSM development continues to dominate the NATO Seasparrow Project to this day.

Mandate and Structure

The NATO Seasparrow Project is currently governed by five memoranda of understanding endorsed by all 12 consortium members. The MOUs provide comprehensive guidance to all nations and third parties as to how the project office will conduct business on the members' behalf. Each memorandum of understanding defines mutual obligations and benefits, and is generally the final recourse and authority should doubt or conflict arise.

The founding MOU established a NATO Seasparrow Project Steering Committee, composed of a senior liaison representative from each participating government. At present, the steering committee is chaired by the member from the United States, while the deputy chair is filled by the Netherlands. The steering committee convenes every six months in the various member countries in rotation, and all major decisions affecting the NATO Seasparrow Project are taken by majority vote. To date, more than 900 formal decisions are on the books.

The ESSM Evolved Seasparrow Missile launches from a USN Self-Defence Test Ship at Point Mugu, California. ***(Photo courtesy the author)***

The original MOUs also established the NATO Seasparrow Project Office in Arlington, Virginia as the executive arm of the steering committee. The project office has four distinct divisions, each reporting to the project manager, and each responsible for a unique technical area of concern:

- Project Operations Division (N-10) is responsible for finance, cost and schedule control, as well as US civilian personnel management;
- Standard Configuration Division (N-20) is responsible for acquisition and support of the original NATO Seasparrow Surface Missile System (Denmark, Norway and the United States only);
- Dutch Configuration/Vertical Launch Division (N-40) is responsible for acquisition and support of fire-control systems developed in the Netherlands by Thales (previously Signaal), and the Mk-48 Guided Missile Vertical Launch System (Belgium, Canada, Denmark, Germany, Greece, the Netherlands, Portugal and Turkey);
- Missile (ESSM) Division (N-50) is responsible for development, test, evaluation and acquisition of the Evolved Seasparrow Missile.

The NATO Seasparrow Project Office does not have technical or managerial control over the RIM-7 Seasparrow missile, which remains under the auspices of the USN's Naval Air Systems Command. Sales, repair and other support services for this missile are provided to consortium members via US Foreign Military Sales.

An international staff of approximately 85 personnel on permanent or temporary assignment to offices in Virginia and the Netherlands now run the NATO Seasparrow Project Office. Each participating government is required to furnish at least one staff member to the project office on a three-year rotating basis, and Canada has steadfastly lived up to its commitment.

Five Canadian nationals are currently on staff to the NSPO:

• Mr. R.A. Spittall — N-00B Deputy Project Manager (International);

• LCdr S. Collins — N-CA/N-401 National Deputy/Mk-48 ORDALT Manager;

• LCdr S. Midwood (Den Helder, Netherlands) — N-41 Radar/Fire Control Engineer;

• Mr. W. Hatcher — N-54 ESSM In-service Support Director; and

• Mr. P. Alie — N-536 ESSM Quality Assurance.

International positions in the NATO Seasparrow Project Office are not reserved for any particular country, and typically rotate on a three-year basis. About a year in advance of a rotation the project office will inform all member countries of the need to fill a position. (Canada's point of contact is DGMEPM/DMSS 6. Any engineer looking for a career change might find the NATO Seasparrow Project an interesting assignment.)

Equipment Check:
The Seasparrow Missile

The naval RIM-7 Seasparrow missile is directly descended from the AIM-7 radar-guided Sparrow air-to-air missile designed for the US Air Force in the 1950s. The supersonic RIM-7 is a medium-range guided missile, optimized for use against anti-ship missiles, aircraft and surface threats. Both ship- and air-launched versions continue to be upgraded to include improvements in guidance and fusing, countermeasure resistance, low-altitude capabilities and expanded engagement envelopes.

Consortium members currently deploy two basic versions of the Seasparrow missile — the RIM-7M and the RIM-7P (including the RIM-7P++). Unofficially, total production of the air-launched AIM-7 Sparrow numbers approximately 62,000 missiles, compared to only about 9,000 RIM-7 Seasparrow missiles. Although Raytheon has ceased production of the missile in the United States, licensed production of the Sparrow family continues in Japan.

An early test firing of the Mk-48 Mod 0 guided missile vertical launch system from a USN test ship. *(Photo courtesy the author)*

Equipment Check:
Vertical Launch Capability

Prior to 1983 the sole consortium-supported launcher for the RIM-7 was the Mk-29 Guided Missile Launching System (GMLS). The Mk-29 is an eight-cell trainable launcher having many moving parts and substantial space/weight requirements. This all changed when a vertical launch capability was introduced in 1983 with successful firings of the first GMVLS version of the NATO Seasparrow from HMCS *Huron*. In contrast, the VLS has no moving parts (and therefore inherently better reliability, maintainability and availability) and a much-reduced footprint for space and weight. (See "The DDH-280 Vertical Launching System Installation — An Engineering Feat," *Maritime Engineering Journal*, October 1995).

Initially, the Mk-48 GMVLS vertical launcher was not a consortium asset, but was developed by Raytheon under a direct commercial contract with Paramax Electronics Inc. of Montreal. Given the success of the Mk-48 project under this contract it was soon adopted by the NATO Seasparrow Project Office as an official ordnance alteration (ORDALT). Canada and the Netherlands were the first to proceed with a vertical launch capability. The Canadian version that was eventually deployed in the *Halifax*-class frigates was designated the Mk-48 Mod 0, while the Dutch variant for the M-class frigates became the Mk-48 Mod 1. Greece later developed an in-deck Mod 2 variant for their *Hydra*-class frigates, and in 1994 Denmark joined the Mk-48 user group with the acquisition of the Mod 3 launcher. Non-NATO users of the Mk-48 are Japan (Mod 0) and South Korea (Mod 2).

With more than 30 ships using the Mk-48 GMVLS, the NATO Seasparrow Project Office desperately

International Partners to the NATO Seasparrow Project

Belgium	Netherlands
Canada	Norway
Denmark	Portugal
Germany	Spain
Greece	Turkey
Italy	United States

needed an in-service support agency. The solution that was adopted by the participating governments was to have Canada establish a NATO Mk-48 In-Service Engineering Agency (ISEA) in Halifax, Nova Scotia. The ISEA, which opened in 1992, is staffed in a unique way by Canadian Forces and Peacock Engineering Ltd. personnel via the government-owned, contractor-operated Naval Engineering Test Establishment in Montreal. The ISEA is currently staffed by a total of five engineers and technicians.

Equipment Check:

The Dutch Fire-control Configuration

About the same time the Mk-48 ISEA was being established in Canada, the consortium adopted another ordnance alteration to the NATO Seasparrow Surface Missile System missile configuration. In 1988 a Dutch fire-control configuration was brought into the consortium's in-service support infrastructure. The so-called "Dutch Configuration" referred to the WM-25/STIR group of fire-control systems developed by Hollandse Signaalapparaten (now part of the Thales defence conglomerate) based in Hengelo. At that time, eight countries employed the Dutch Configuration: Belgium, Canada, Germany, Greece, the Netherlands, Portugal, Spain and Turkey (totalling some 70 warships). A Dutch Configuration Management Office (DCMO), still part of the NSPO organization, was established in Den Helder in 1989. In the NSPO's Arlington, Virginia offices, a new N-40 Dutch Configuration Division was created to oversee the new DCMO.

Looking Ahead

The NATO Seasparrow Project has been in existence since 1968, and for 21 of the last 35 years Canada has played a major part in the evolution of the project. Today the Canadian navy is a key player in the development of the Evolved Seasparrow Missile (ESSM), providing both financial support and a significant contingent of personnel to the project's offices. As we look ahead beyond the twentieth anniversary of Canada's membership in the NATO Seasparrow Project consortium, even greater changes are set to take place with the introduction into service of the ESSM.

Cdr David MacDougall served as the N-40 Dutch Configuration/Vertical Launch Division Director in the NATO Seasparrow Project Office in Arlington, Virginia from 1999 to 2003. He is currently a student at the Inter-American Defense College in Washington, DC.

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.

Impact of the “RMA” on Naval C4I Systems Acquisition

Article by Cdr S.W. Yankowich

The accelerating pace of technological change is creating an unprecedented explosion in military capability. Continuing advances in weapons, communications, surveillance and command management systems technology are giving rise to a “revolution in military affairs (RMA)” which will profoundly impact the conduct of future naval operations. In particular, radical advances in C4I command, control, computers, communications and intelligence systems are not only affecting the Canadian navy’s ability to participate in the RMA, but will necessitate a reassessment of our current naval concepts, doctrines and equipment requirements.

The Canadian defence strategy document, *Shaping the Future of Canadian Defence: A Strategy for 2020*, describes a vision of a modern, globally deployable and interoperable force structure. The potential implications of the RMA on the Canadian navy’s ability to achieve this strategic vision, however, particularly from the standpoint of naval C4I system procurement, warrants some discussion.

At the moment, commercial investment in research and development, particularly in the specialized fields of software, electronics and information technology, is estimated to be ten times greater than that of defence investment. The implications of this growing trend are profound. Not only will defence planners be unable to accurately predict where technical, tactical and strategic advances will lead in the medium-to-long-term future, but the initiative for such advances will lie increasingly with the commercial sector. Future naval systems will necessarily become heavily reliant on rapidly evolving commercial technology, creating certain challenges with respect to naval planning and equipment procurement.

Furthermore, since most commercial technology will be available to both allies and opponents for exploitation, the Canadian navy will be compelled to replace or upgrade C4I systems far more frequently than in the past to maintain interoperability with our allies and technical superiority over our opponents. The pace and associated cost of this technological revolution may hinder the Canadian navy’s ability to exploit all of the opportunities it affords. Within the context of a limited budget and the wide range of options available, hard choices will need to be made.

> ***“Not only will defence planners be unable to accurately predict where... advances will lead in the medium-to-long-term future, but the initiative for such advances will lie increasingly with the commercial sector.”***

Perhaps the greatest impact of the RMA will be on the interoperability of C4I. Continuing advances in information processing and communications technology will substantially improve battlespace situational awareness by enabling the collection, fusion and distribution of critical information to those who need it, when they need it. These developments will potentially enhance joint service and multination interoperability by creating a common “digital battlespace” in which platforms, sensors, weapons and command management systems are fully integrated. The capability to participate in these information networks will be fundamental to success on the battlefield of the future. Failure to develop the doctrine and equipment systems required to maintain this essential interoperability will limit the navy’s ability to participate in and influence the conduct of both civil and military operations.

For these reasons, *Strategy 2020* recognizes interoperability as a key strategic objective for the Canadian Forces. It follows, therefore, that the impact of the revolution in military affairs on the interoperability of C4I systems must be afforded primary consideration when determining future naval doctrine and equipment procurement priorities.

Importance of C4I in Joint and Coalition Force Operations

Joint force development is one of the key areas over which the Canadian navy is particularly well-suited to asserting its influence. Over the next 20 years the navy can expect to be called upon by the government to enagage in joint and multinational operations with forces that are variously equipped. To do so effectively, the navy must have credible C4I command, control, computers, communications and intelligence systems that are fully interoperable with those of our allies and other national/international government agencies, regardless of their technological capability. A comprehensive C4I strategy, developed in co-operation with the army, air force, other government agencies and allied forces is necessary to ensure this essential requirement is achieved. Elements of this strategy include operational and strategic level concepts, doctrine and requirements, as well as a joint DND policy for implementing and upgrading C4I technology.

A key C4I requirement for Canada will be the capability to deploy a shipborne joint force headquarters (JFHQ) that would allow joint Canadian forces to operate independently, or as part of a larger coalition force. With full access to the integrated digital battlespace, the JFHQ would promote substantial strategic and operational benefits to Canadian commanders, especially in terms of:

- unity of command over deployed national forces;
- increased access to "in the loop" information;
- greater influence over the objectives and conduct of coalition operations;
- access to the common operating picture (COP).

It is important that C4I interoperability not be geared strictly to U.S.-involved operations. Canada's involvement in East Timor is an excellent example of how the navy's influence and role in an international support operation depends on our capacity to function co-operatively with all participating nations, whether or not the U.S. is not part of the equation. While maximum interoperability with U.S. forces is desirable, Canada's C4I development must emphasize a balance of interoperability with all forces.

Given the fundamental importance of C4I to most future coalition operations, there is an opportunity for the Canadian navy to specialize in providing secure, multi-level ubiquitous connectivity to the integrated digital battlespace. By providing the necessary infrastructure to allow technologically less advanced coalition partners to achieve interoperability, the Canadian navy's role in future coalition operations could be substantially enhanced. Moreover, specialization in this field could help ensure that Canadian commanders maintain maximum access to vital strategic information.

C4I System Procurement

To sustain interoperabilty in an environment of rapidly changing technology, the Canadian navy will be required to update or acquire new C4I systems in tandem with our allies. Moreover, procurement processes will need to support the development and integration of new technologies into functional systems "faster, better and cheaper" than ever before. In recognition of this challenge, aggressive procurement reform has been initiated within the Canadian, UK and US defence communities.

"The impact of the revolution in military affairs on the interoperability of C4I systems must be afforded primary consideration when determining future naval doctrine and equipment procurement priorities."

A common core recommendation emerging from the various procurement reform initiatives calls for increased reliance on commercial off-the-shelf (COTS) solutions for achieving strategic and operational objectives. This recommendation is founded on the belief that COTS-based systems will:

- reduce equipment procurement costs through decreased overhead, and through leveraging advantages inherent in economies of scale and multiple supplier competition;
- reduce the risk and time required in exploiting new technologies; and
- improve overall system performance achievable within reduced budgets.

C4I systems procurement in particular is expected to benefit from the advantages of COTS technologies. Information collection, processing and distribution — the heart of C4I — are functional processes with compatible commercial/military application. And yet, despite the considerable potential for commercial internet and World Wide Web technologies to revolutionize current C4I system architectures, COTS-based solutions will not be the magic bullet that solves all of the challenges imposed by the revolution in military affairs. In the US Department of Defense and the UK Ministry of Defence there is a growing body of evidence to indicate that implementing COTS-based systems will not guarantee delivery of faster, better and cheaper capabilty. Research by the Carnegie Mellon University Software Engineering Institute has concluded that the envisioned benefits of COTS-based solutions can only be achieved through an accompanying large-scale paradigm shift in the procurement mindset. In particular, the process of defining operational requirements will need to become more responsive and adaptable to rapidly changing technology.

There is no doubt that COTS solutions will play a substantial role in future C4I system development. However, to exploit future commercial developments to their maximum potential, naval planning and procurement authorities must adapt their processes to accommodate the growing role of COTS in C4I systems. In the future, end-user processes used to specify system requirements will be determined primarily on the basis of product availability. Specific capability will be subject to simultaneous trade-off with the broader program interests of cost, risk and time to implement. This practical trade-off of requirements, which is currently being successfully implemented in such C4I projects as the Operations Room Team Trainer and the Naval Combat Operator Trainer, will become increasingly fundamental to the success of COTS-based system projects and will be a key component of the acquisition strategy.

Future C4I systems procurement will involve substantially increased up-front emphasis on systems integration and the design of robust, evolvable architectures capable of supporting rapid technology insertion. The use of simulation and technology demonstrators will become more common in the early stages of projects as users, contractors and program managers work to reconcile discrepancies between products and end-user operations. To minimize risk and ensure that the right capability is being provided, up to 30 percent of the total system cost may be spent during the project definition, preliminary design and validation activities. Design and implementation decisions will need to take into account implications on total system performance and cost, including through-life support. Similarly, lifecycle support processes will need to recognize and enable the continuous evolution of component technologies within a fielded system.

Establishing effective requirements definition and procurement processes that maximize the many opportunities of COTS, while at the same time minimizing the associated risks, will not happen overnight. Long-held beliefs about what does and what does not work will have to be challenged. Constant change and innovation will become the norm, and hard choices will have to be made. Nevertheless, commitment to the success of these initiatives will be vital to the navy's long-term goals of maintaining modern, interoperable forces.

Part of the answer may be to identify expertise already available in the international community, and to expand opportunities for mutually beneficial collaboration. The Royal Navy, for example, has accumulated considerable expertise in developing and implementing affordable COTS-based strategic and operational level C4I systems. The RN's Fleet Operational Command System Life Extension (FOCSLE), Joint Operational Command System (JOCS) and Command Support System (CSS) provide functionality compatible with the Canadian navy's strategic objectives. Collaboration with the RN in this area could offer significant benefits to both parties in the form of reduced cost, shared risk and commonality of operational requirements leading to improved interoperability.

"Long-held beliefs about what does and what does not work will have to be challenged."

Opportunities for collaboration should also be sought with industry and with government sponsored research activities. This objective can best be realized by harmonizing C4I technical priorities between DND, industry and academia. In addition to ensuring the continued development of the technology required to maintain technical superiority, this approach can also foster effective technology transfer to industry and diversification of the defence industrial base.

Impact of the RMA on Industry

Reduced defence budgets and upward spiralling C4I costs will require reorganization of the Canadian defence industry. On its own, the relatively small defence market in this country is not enough to sustain multiple competing Canadian defence contractors. While it is difficult to predict what form the Canadian defence industry will ultimately assume, advantages inherent in economies of scale suggest one of the following possible outcomes:

• consolidation of the industry into one large, competitive Canadian-based conglomerate (similar to BAE in the UK) capable of competing in the international defence market;

• consolidation of the industry into two or three Canadian-based companies, each having an established strategic alliance with a foreign-based company;

• consolidation of the industry into two or three subsidiaries of powerful foreign-based companies; or,

• devolution toward multiple suppliers of niche solutions to both the domestic and international defence markets.

Regardless of the specific outcome, reorganization of the defence industry will result in fewer Canadian suppliers competing for the available equipment and support contracts. While the navy has always relied on foreign suppliers for solutions to specific capability requirements, defence industry rationalization may increase this reliance with potentially undesirable consequences to sovereignty. Increased dependence on foreign suppliers might well decrease the navy's ability to influence future system developments and support requirements. Intellectual property issues may also inhibit the navy's ability to procure the best available solutions. Moreover, a smaller domestic defence industrial base that lacks specialized expertise in core technical fields may also lack the capability to respond to changing national defence priorities.

To minimize the potential adverse consequences of defence industry consolidation, the Canadian navy should assume a proactive position in ensuring that its interests are properly represented. By taking appropriate measures to identify and support essential technological proficiencies within Canadian industry, the navy can take an aggressive role in determining the outcome of any defence industry rationalization.

To ensure that a minimum core defence capability is maintained within Canadian industry, there will need to be an environment of increased co-operation and partnership between industry and the Department of National Defence (including the navy). Long-term strategic goals will need to be aligned with specific emphasis on opportunities for defence diversification through shared development and technology transfer. For high-priority projects, it may even be more cost-effective in the long term to favour contractual relationships based on joint responsibility and cost/risk sharing, over open competition and delegation of total system responsibility. Similarly, there may be substantial advantages to implementing preferred supplier policies for areas where it is not economically viable to support multiple centres of specialized expertise within Canadian industry.

Conclusion

The revolution in military affairs will have a profound impact on the future of C4I procurement in the Canadian navy. The accelerating pace of technological development, coupled with the associated explosion of military capability that it enables, will require that more effective processes be found for procuring C4I systems faster, better and cheaper than ever before. In the context of limited budgets, opportunities for innovation will need to be identified and exploited, while hard choices will have to be made. Traditional relationships with industry will be challenged, with increased emphasis on partnership and shared development over delegated total system responsibility. Integration of COTS-based systems will become the normal approach to procurement, necessitating a complete reassessment of current naval concepts, doctrines and equipment requirements.

Along with the many challenges, there will come considerable opportunity. Fully interoperable joint forces participating in multinational operations will characterize the battlefield of the future. By establishing a firm commitment to developing and maintaining a state-of-the-art C4I capability, the Canadian navy can secure its role as an active and influential member of these future operations.

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Cdr Yankowich is Project Director for the Enterprise Documents Record Management System Project in Ottawa.

Humour:

"The Night Before Implementation"

— Anonymous

'Twas the night before implementation and all through the house
not a program was working not even a browse.
The programmers hung 'round their screens in despair,
with hopes that a miracle soon would be there.

The users were nestled all snug in their beds,
while visions of inquiries danced in their heads.
When out of DATSS there arose such a clatter
I sprang from my desk to see what was the matter.

And what to my wondering eyes should appear
but a super programmer — with a six-pack of beer!
His resumé glowed with experience so rare
he turned out great code with a bit-pusher's flair.

More rapid than eagles, his programs they came
and he whistled and shouted and called them by name:
On, Update! On, Add! On, Inquire! On, Delete!
On, Batch Jobs! On, Closing! On, Functions Complete!

His eyes were glazed over, fingers nimble and lean
from weekends and nights spent in front of a screen.
A wink of his eye and a twist of his head
soon gave me to know I had nothing to dread.

He spoke not a word, but went straight to his work
turning specs into code, then he turned with a jerk,
and laying his finger upon the ENTER key,
the system came up, and it worked perfectly!

Flight Deck Load Diagrams

Structural load diagrams can offer a simple way to increase flight-deck flexibility and improve a ship's overall operational capability.

Article by LCdr David B. Peer, CD

The current emphasis on joint force operations means that Canadian naval vessels could be called upon to operate or transport a variety of helicopters. Under these circumstances, flight-deck structural guidelines would be an important element in determining a warship's ability to handle various aircraft under a broad range of operational and environmental conditions.

Flight-deck load diagrams are a simple form of flight-deck structural guidance that provide operators a clear way to determine safe flight-deck limits for helicopter operations. Lloyd's Register of Shipping's new *Rules and Regulations for the Classification of Naval Ships* (also known as the *Naval Ship Rules*) not only recommends including flight-deck load diagrams as part of a ship's documentation, but contains all the information necessary to assess the capability of a flight deck.

Flight-deck load diagrams indicate a graduated load capability for specific helicopter types under various sea state conditions. The load limits are based on the all-up mass (AUM) of a helicopter in relation to the footprint area of one tire of the main undercarriage on the deck.

A helicopter whose specifications fall inside the "Unrestricted" area of the diagram (*Fig. 1*) can use the flight deck even in "extreme" sea states without exceeding the flight deck's structural capability. On the other hand, helicopters that fall inside the "Restricted" area can only use the flight deck in less severe conditions corresponding to a lower sea state. A helicopter that falls inside the "Prohibited" area of the diagram could not be carried, as it would load the flight deck beyond its structural capability even at lower sea states. The sea states bounding the "Unrestricted" and "Restricted" areas can be chosen to suit the ship, but for open-ocean capable vessels the "Unrestricted" limit is sea state 6. The "Restricted" limit is typically sea state 2.

Separate "landing load" and "parking load" diagrams (*Figs. 1* and *2*, respectively) are prepared to provide tailored guidance, depending whether the operational plan calls for take-offs and landings, or simply for the long-term transport or storage of various types of helicopters, or both. Characteristic of all load diagrams, however, is a gradual increase in permissible all-up mass to a maximum value as tire area increases. Deck-plating considerations drive the relationship between the tire area and all-up mass on the sloped portion of the limits. The flat area of the diagram represents the maximum capability of the ship's primary support members. Their ability to carry the all-up mass of a helicopter is independent of tire area.

"The concept is applicable to any aircraft type or any deck structure, whether or not the deck was originally intended for aircraft use."

The Landing Load Diagram

Figure 1 is a typical landing load diagram for a frigate operating a single-rotor helicopter using an oleo-pneumatic (oil/air) system of impact absorption on the main undercarriage. A flight deck used to land any helicopter that falls within the "Unrestricted" area would meet the *Naval Ship Rules* criteria for emergency landing in sea state 6. (It is a design requirement for marine helicopters that they be able to operate from the deck, even under emergency landing load condition, in up to sea state 6. Beyond sea state 6 the helicopter itself might or might not sustain structural damage, but this is never a factor when determining the landing load diagram.) As the diagram indicates, restrictions on the operational use of a helicopter increase as the all-up mass of the aircraft rises.

Development of a landing load diagram takes into account landing energy and is dominated by the relative vertical velocity of a helicopter landing on a potentially moving flight deck. The landing load diagram was developed using statistical information on helicopter landings on many warships, and extends helicopter operations on the flight deck to heavier helicopters during calmer seas. Allowable helicopter all-up mass can increase with the softer landings and decreased landing velocities expected at lower sea states without exceeding the ultimate design load of the flight deck.

The allowable AUM depends on factors relating the dynamic landing load to the static load. Each sea state affects the relationship between the maximum dynamic load and the allowable AUM. A sea state 2 limit effectively doubles the helicopter mass capability of the flight deck.

Designers can develop landing load diagrams for any type of aircraft, but each diagram is applicable only to aircraft with similar undercarriage designs. The relationship between the undercarriage ultimate load and the aircraft AUM is different for fixed-wing, vertical take-off and landing (VTOL), single-rotor and twin-rotor aircraft. A different landing load diagram would be required for each type.

The load diagram method extends the capability of in-service ships when newer, heavier helicopters impose loads that exceed design criteria. Applying the design standard rigorously ignores the capability available at lower operational limits, and may force unnecessary review and change of flight-deck structure. Operational restrictions may be an acceptable, cost-effective alternative to replacing or strengthening flight decks, giving in-service ships the operational effectiveness of a heavier helicopter in all but extreme sea conditions.

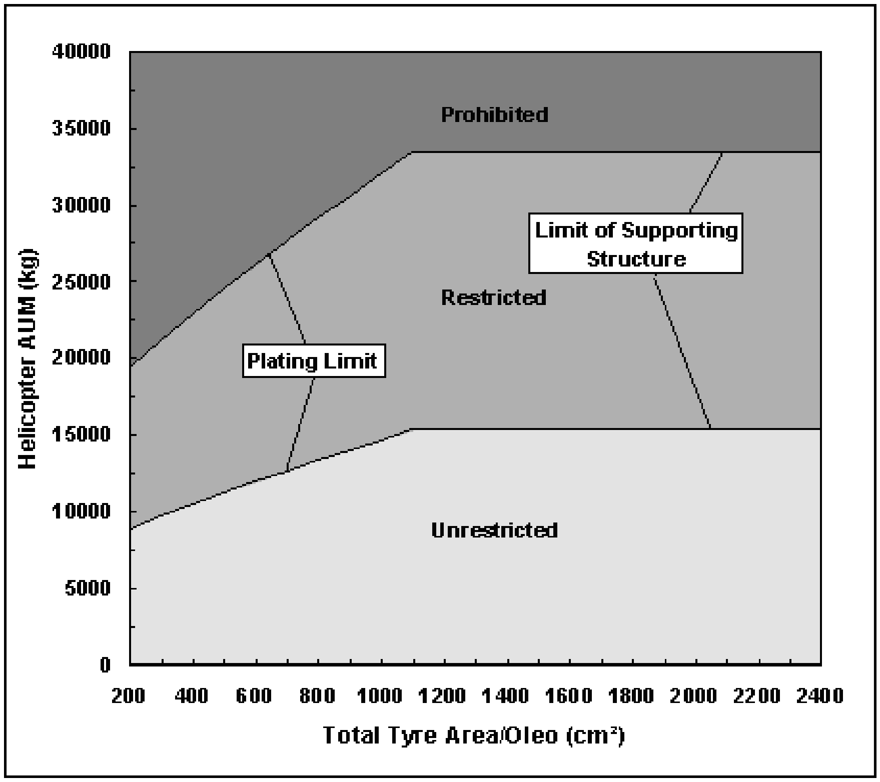

Figure 1. Typical landing load diagram for a frigate operating a single-rotor helicopter using oleo-pneumatic impact absorption on the main undercarriage.

The Parking Load Diagram

Figure 2 is the parking load diagram for the same typical frigate's flight-deck scantlings, and provides a similar graduated capability. The "Unrestricted" area of the diagram describes all helicopters that the flight deck can support without restriction. Flight decks supporting these helicopters would meet the Lloyd's *Rules and Regulations* parking load condition when the operational limit is established as unrestricted seagoing service.

The "Restricted" area consists of two parts. Flight decks can support helicopters that fall within the "Restricted – Coastal" area of the diagram in the less severe conditions expected in coastal areas. The "Restricted – Harbour" area of the diagram uses the dynamic load associated with vehicles in harbour to determine the flight-deck parking capability for the heaviest helicopters. Helicopters outside this area of the diagram would cause the load on the flight deck to exceed the *Rules*

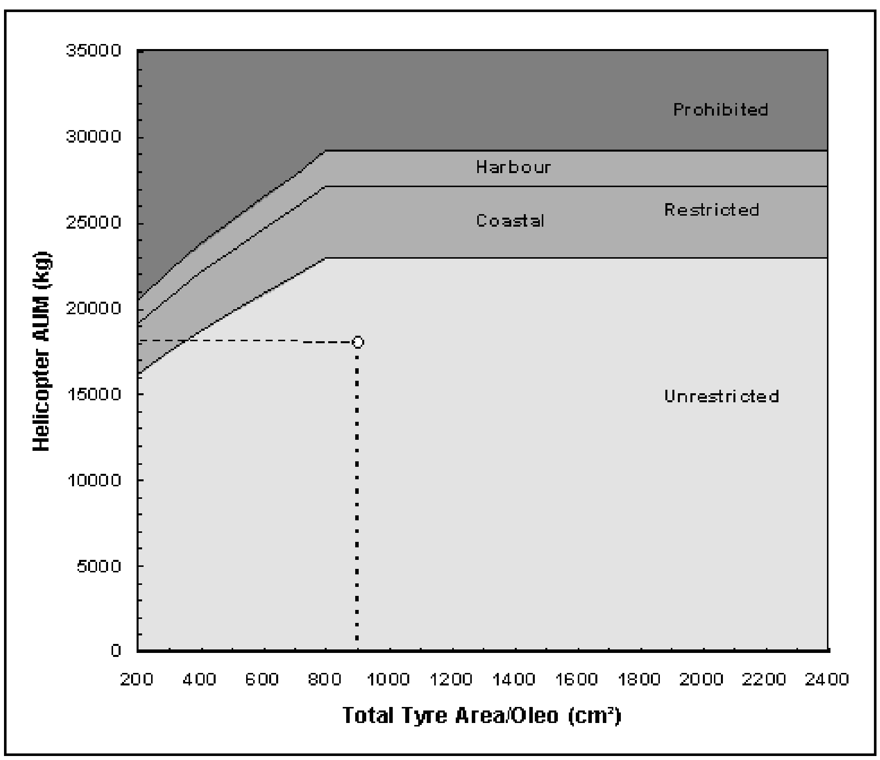

Figure 2. Parking load diagram for the same typical frigate.

and Regulations requirement at all times and should not park on the flight deck.

The parking load diagram uses absolute vertical accelerations on the flight deck (defined by the *Naval Ship Rules*) to predict structural loads. The allowable all-up mass varies because the expected acceleration on the flight deck changes with the intended service. The maximum parking load never varies, but as accelerations decrease, the allowable mass may increase. The diagram extends the capability of the flight deck to park heavier helicopters by taking advantage of the reduced ship motion and flight-deck acceleration expected in coastal areas and in harbour.

The parking load diagram does not use sea state. Instead, the designer conducts a direct calculation for acceleration and maximum dynamic load using expected extreme sea conditions and vessel characteristics. The "Restricted – Harbour" limit was determined using a dynamic magnification factor for vehicle decks in harbour. Acceleration values on the flight deck will vary depending on the operational limit and vessel characteristics. Values could come from measurement, from simulation using appropriate wave spectra, or from standards such as Lloyd's *Rules and Regulations*.

Incidentally, the parking load diagram concept can apply to any wheeled or tracked vehicle carried on board a ship provided the structural capability and load cases are consistent with the expected service of the vessel. The diagram may need to be amended to ensure that the appropriate vehicle parameters are used. For example, all-up mass figures would be replaced by axle-weight numbers when determining load data for an armoured vehicle rather than a helicopter. And because the relationship between static and dynamic loads varies with tire type, ships would have to create separate diagrams for vehicles with pneumatic, rubber or steel tires, as well as for tracked vehicles.

Flight-deck structural load guidance can significantly increase the flexibility of helicopter operations from ships and improve flight-deck safety during joint air operations. ***(DND photo)***

An Example Using the Diagrams

In the main, load diagrams provide a quick reference on the suitability of a flight deck for helicopter use. For example, assume a frigate is called upon to transport an 18,000-kg helicopter from a harbour to a distant beachhead. Operational authorities intend to crane the aircraft aboard the frigate in harbour and leave it parked for the voyage. However, they need to know whether crane services will be required at the other end, or if the bird can be flown off to the beachhead at some point.

The helicopter has a tire area/oleo of 900 cm². Using *Fig. 2*, it is evident that operating authorities can permit unlimited transport since the helicopter clearly falls within the "Unrestricted" area of the parking load diagram. Yet, since the same helicopter falls into the "Restricted" area on the appropriate *landing* load diagram (*Fig. 1*), the ship may safely operate the helicopter from the flight deck to the beachhead under restricted sea state conditions. Good to know.

Conclusion

Load guidance significantly increases the flexibility of helicopter operations from ships and improves flight-deck safety during joint air operations. Although the diagrams developed in this article come from calculations for single-rotor helicopters with oleo-pneumatic undercarriages, the concept is applicable to any aircraft type or any deck structure, whether or not the deck was originally intended for aircraft use.

The number of load diagrams required to provide full flexibility for a flight deck depends on the number of landing and parking positions and the type of aircraft the deck is called upon to support. Where a frigate may need only one landing load diagram and one parking load diagram, an aircraft carrier could conceivably need diagrams for each landing and parking area for single-rotor helicopters, twin-rotor helicopters, VTOL and fixed-wing aircraft.

Landing and parking load diagrams offer a simple way to evaluate the structural capability of a flight deck and provide important guidance for helicopter operations. Load diagrams are an easy way to increase flight-deck flexibility and improve operational capability, important considerations as the focus of Canadian naval operations moves toward littoral waters and joint force operations.

LCdr Peer is the Submarine Naval Architecture Officer in DMSS 2. This article summarizes his work on flight-deck structural guidance conducted while on exchange in the United Kingdom.

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3. *DEFSTAN 00-970, Vol. 2, Ch. 304.* Ministry of Defence, Reissued Sept. 1989 (Amendment 7).
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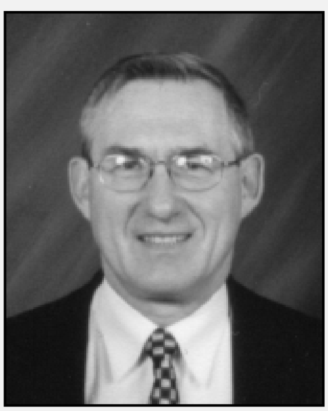
Editor's Note —

LCdr Peer was the Deputy Project Manager for the Naval Ship Rules Project when he developed the landing load diagram methodology. The Naval Ship Rules Project was the vanguard initiative that led to the introduction of Classification Rules for warships. His work on landing load diagrams was adopted by Lloyd's Register and incorporated into their Rules and Regulations for the Classification of Naval Ships. The Royal Navy now provides landing load diagrams as standard guidance to commanding officers of ships and fleet auxiliaries.

— Bravo Zulu!

In Memoriam • Ronald J. Rhodenizer



Ron Rhodenizer

1949-2003

The naval support community lost a good friend with the sudden passing of Ron "Rhodie" Rhodenizer in Ottawa on Oct. 13 following surgery the previous week. He was 54.

More than 300 friends, colleagues and former navy associates including VAdm Ron Buck, Chief of the Maritime Staff, joined Elaine Rhodenizer, children Kelly and Derek, and other family members in an emotional farewell to Ron at Orleans United Church on Oct. 16.

Ron trained as a Marine Systems Engineer (B. Mech. Eng., RMC, 1971; M. Marine Eng., Manadon, 1977) before joining SNC-Lavalin Inc. in 1989. At the time of his death he was Vice-President of SNC-Lavalin Defence Programs. Ron was a founding member of the *Maritime Engineering Journal*.

Those who knew Rhodie well knew him as a man of strong family values, uncompromising ethics and enormous physical energy. His legacy as a highly motivated leader and positive role model can be supported through donations to: **Rhodie's Athletic Leadership Fund, c/o SNC-Lavalin Defence Programs, 1100-170 Laurier Avenue West, Ottawa, Ontario K1P 5V5**.

MARE Awards

2002 MARE Award Presentations

Report courtesy Lt(N) Ryan Kennedy, MS Eng. Instructor, CFNES

With the completion of each training year, a MARE Awards Board is convened to identify officers who have distinguished themselves from their peers in the pursuit of engineering excellence and leadership. The April 10, 2003 East Coast MARE mess dinner provided the occasion for the presentation of most of these prestigious awards.

CAE Award

The CAE Award is presented to the candidate who displays a high level of engineering excellence, academic standing and officer-like qualities on the MARE 44B Applications Course. Mr. A. Deacon, CAE Inc., presented this year's award to SLt Jack MacDonald.

Lockheed Martin Award

The Lockheed Martin Award is presented to the best overall CSE candidate having received the 44C qualification during the previous training year. Cdr (ret.) F. Jardine, on behalf of Lockheed Martin Canada, presented the award to Lt(N) Travis Blanchett. Runners-up were SLt Decker, SLt Reid and SLt Schauerte.

Mack Lynch Memorial Award

The Mack Lynch Memorial Award is presented annually to the Marine Systems or Combat Systems engineering candidate who in the opinion of his peers and instructors best exemplifies the qualities of a naval engineering officer. The award was won by SLt Dave Vander Byl, who could not attend the presentation because he was at sea.

Northrop Grumman Award

The Northrop Grumman Award is presented annually to the best overall Combat Systems Engineering graduate to complete the MARE 44C Applications Course. The award was won by SLt Tim Gibel, who could not attend the presentation because he was at sea.

MacDonald DettwilerAward

The MacDonald Dettwiler Award is presented to the best overall MARE officer having completed the Head of Department qualification in the previous training year. The award was presented to Lt(N) Gordon Szczepski by Mr. J. Moloney of MacDonald Dettwiler Canada. Runners-up included Lt(N) Campbell, Lt(N) Rettman and Lt(N) Sauvé.

Peacock Award

The Peacock Award is presented to the best overall MSE who received the 44B qualification during the previous training year. Cdr (ret.) M. Bouchard, Peacock Inc., presented the award to Lt(N) Andrew Masschelein. Runners-up were SLt Hughes, SLt Lougheed and SLt Pellichero.

Naval Officer's Association of Canada Award

The NOAC Award is presented to the candidate displaying the highest standing of professional achievement and officer-like qualities on completion of the 44A qualification. This year's award was presented by Cmdre (ret.) M. Cooper to NCdt Richard Fifield.

Mexican Navy Award

The Mexican Navy Award was presented to SLt Jack MacDonald by Capt(N) F. Ortiz.

Bravo Zulu!

The Good Doctor's Signature

A chance meeting with a retired navy veteran leads to an interesting encounter with an odd bit of RCN history

Article by Brian McCullough

Retired navy electrical artificer CPO2 Bill Bovey unfolds the single-page document and passes it over to me. I can barely control my anticipation. After all, it's not every day I get to lay hands on an honest-to-goodness forgery.

We are in Bovey's home in Kanata, Ontario. The neat, open-style bungalow backs onto a treed lot where even now deer are browsing. As I scan the document, the pastoral scene outside the living room window quickly gives way to another image. A vision of salt water, weather-beaten ships and square-rig uniforms — the Royal Canadian Navy of the 1950s.

Bovey served in the RCN from 1946 to 1971, and completed a career in the RCMP after that. I had met the 76-year-old veteran by chance in a restaurant a few weeks earlier. We chatted, one thing led to another, and now here I was warming myself in front of his fireplace, holding an interesting piece of memorabilia in my hands.

The document is the RCN re-engagement medical certificate of P2EA4 William I. Bovey, dated May 15, 1951 on board HMCS *Magnificent* (at sea). Nothing too out-of-the-ordinary there. In all truth it would be entirely nondescript if it weren't for the minor detail of the forged signature of the examining medical officer at the bottom of the certificate — the open scrawl of one JC Cyr, Surg. Lieut. RCN....

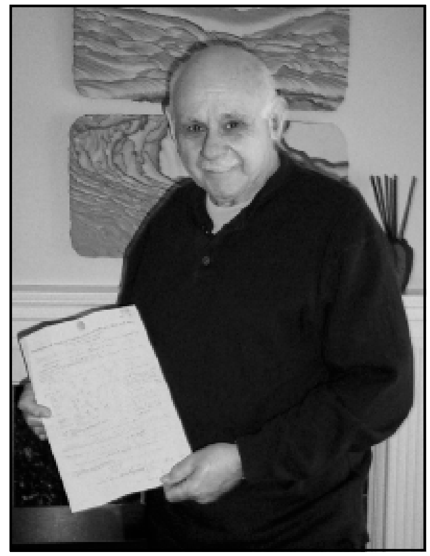
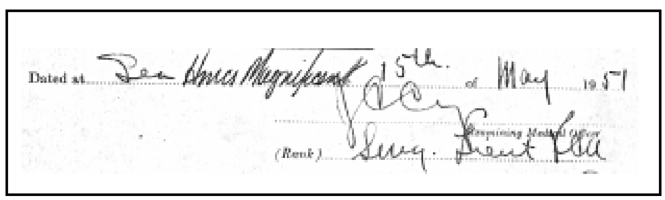


Photo by Brian McCullough

Retired CPO2 Bill Bovey of Kanata, Ontario shows off his 1951 RCN medical certificate.

Great Scott! The Great Impostor.

Cyr's real name was Ferdinand Waldo Demara. An American from Lawrence, Mass., "Fred" Demara had a long history of role-playing. At various times he was a psychologist, a prison warden, a college lecturer, a deputy sheriff and even a novitiate monk. His life as an impostor became the subject of a 1959 Robert Crichton book, "*The Great Impostor,*" and a 1960 movie of the same title starring Tony Curtis.



Demara pulled the wool over the RCN's eyes when he signed on as a Canadian navy surgical officer in March 1951. The Korean War was on the go and the navy was desperate for medical officers. By all accounts Demara played his surgeon's role well, gaining a reputation as a competent if unqualified ship's doctor. He was just a bit too good, though. When news of his heroic medical exploits in Korea reached the real (civilian) Dr. Joseph Cyr in Grand Falls, NB the jig was up. Demara moved on to other interests, and eventually died a bona fide clergyman in 1982 at the age of 60.

(Cont'd next page)

Share Your Photos!

The *Maritime Engineering Journal* is always on the lookout for good quality photos with captions to use as stand-alone items or as illustrations for articles appearing in the magazine. Photos of people at work are of special interest. Please keep us in mind as an outlet for your photographic efforts.

Pretty amazing stuff.

"When did you realize it was Demara who did your medical?" I ask.

"I didn't know anything at the time," Bovey explains. "It was just a 'by chance' thing. I had a medical done around that time and checked later to see if he happened to be the medical officer who signed my certificate. I didn't know he was going to be someone famous."

The suspense is killing me. "So how was he as a doctor?"

"Well," says Bovey, "I went down to the messdeck later and told the guys that it was one of the best medicals I ever had."

Go figure.

Thanks, Bill. Great story.

To learn more about the Great Impostor's RCN exploits, visit CFB Esquimalt's museum website at www.navaland militarymuseum.org ...and read Les Peate's short article, "The Case of the Spurious Sawbones," at www.kvacanada.com/stories_lpimposter.

NETE News

NETE marks a golden anniversary...and a change of command in '03

Photos by Brian McCullough

ADM (Mat) Alan Williams and VAdm Ron Buck, Chief of the Maritime Staff, seem to be enjoying the occasion of NETE's 50th anniversary, much to the amusement of NETE's former CO Cdr Francis Pelletier and Peacock Site Manager Michel Bouchard.

The Naval Engineering Test Establishment in LaSalle, Quebec is celebrating 50 years as the navy's principal test and evaluation agency. Established in the days of naval steam, the government-owned, contractor-operated ADM(Mat) field unit continues to wear its age well. NETE's dedicated and skilled workforce of 138 based across the country makes full use of state-of-the-art labs, computer rooms and equipment test bays to backstop the full range of Canadian shipboard technology.

On May 22 the **Hon. John McCallum**, Minister of National Defence, along with Assistant Deputy Minister for Materiel **Alan Williams** and **VAdm R. Buck**, Chief of the Maritime Staff, led a group of dignitaries in celebrating NETE's 50th anniversary with Commanding Officer **Cdr Francis Pelletier**, Peacock Inc. President **Stephen Simone**, Peacock NETE Site Manager **Michel Bouchard**, and NETE staff from across the years. The occasion was one of the last official functions attended by **Cmdre J.R. Sylvester** at the end of his appointment as DGMEPM.

The minister praised NETE as a unique centre of expertise, "instru-

Veteran fitters Duncan MacGregor and Robert Leslie carried on with a pump installation even as the minister's tour passed through.

Shop floor supervisor Mike Bergin (left) chats with former commanding officers Bill Durnin and Ron May.

mental in maintaining the fleet at a high state of technical readiness." Mr. McCallum also pointed to NETE's ability to change with the times as a big part of the unit's continued success. LaSalle borough president **Manon Barbe** described NETE and Peacock Inc. as a partner well-rooted in the local industrial fabric — "LaSalle's best-kept secret."

July 18 was Change of Command day at NETE as Cdr Pelletier handed off to **Cdr Rob Hudson** after five years at the helm of the test establishment. **Cmdre Roger Westwood**, witnessing the event in his first official duty since taking up his appointment as DGMEPM earlier in the month, acknowledged Cdr Pelletier's exceptional leadership as a commanding officer. He noted in particular the integral role Cdr Pelletier played in transitioning NETE through a new competitive contractual process, and welcomed him as a new fleet policy manager within the DGMEPM organization in Ottawa.

Cdr Pelletier: "We did a lot of work bringing new processes in place and improving those processes."

Cdr Hudson: "I want to work with all of you and…continue to build the institution."

For his part, Cdr Hudson comes to NETE with a masters degree in electrical engineering, as well as strong engineering and technical experience gained from tours in HMC ships *Fredericton* and *Athabaskan*, and with project management and quality assurance skills from previous duties in Ottawa. Cdr Hudson was also a key player in supporting the *Kingston* class while in MARLANT. Cmdre Westwood described the new CO as a "focused, dedicated officer, ready to meet any challenge."

Cmdre Westwood directed his closing comments to the staff of NETE. "Today is not only about two commanders," he said. "It is also the day to celebrate all of the people of NETE and the excellent work that you do in support of the navy. The change of command provides us the opportunity to reflect back on your accomplishments and to look ahead to the establishment's future opportunities."

Photos by Brian McCullough

Cmdre Sylvester shares a word with Al Kennedy and Heather Gordon.

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News

CANADIAN NAVAL TECHNICAL HISTORY ASSOCIATION

Special Issue:

The Navy's Technical Apprentices

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The Navy's Technical Apprentice Training Plan

It has been more than 50 years since the first entry of naval technical apprentices enrolled in the Royal Canadian Navy. Now, as the last serving graduate of the plan nears retirement (CPO1 Jim Reece, MMM, CD is the formation general safety officer for Maritime Forces Pacific) it seems appropriate to look back at an apprentice training program that served the navy's post-wartime technical needs.

The navy's Technical Apprentice Training Plan was created during the economic boom following the Second World War. At the time civilian-trained tradesmen were difficult to recruit, so in 1951 the Naval Board approved the establishment of an RCN trades school with an apprenticeship training scheme for young men. Of the nearly 650 men who commenced apprentice training, roughly half went on to complete the program.

After new entry training at HMCS *Cornwallis* and two years of basic trades training, apprentices were selected for the branches for which they showed aptitude. Thus would begin two years of branch training at naval schools, at sea and at a trades training centre. A permanent Naval Trades Training Centre would eventually be built at HMCS *Naden* in Esquimalt in 1958, but in the meantime the 10,000-ton maintenance ship HMS *Flamborough Head* was re-commissioned as HMCS *Cape Breton* and secured at HMC Dockyard Halifax to provide living quarters, workshops and classrooms.

A target entry of 100 apprentices was set for the first two years. By May 1952 a program was running to recruit men 16 to 19 years of age who had completed Grade 10, and who had passed both a mechanical aptitude test and an interview board. That fall, limited space in the scheme was offered to men already enlisted in any branch who could meet the requirements. Apprentices who successfully completed training would be qualified to trade group level three and hold the rank of petty officer second class. The length of their initial engagement was seven years.

The first entry of 66 ordinary seaman apprentices (OSAPs) commenced training in *Cape Breton* on Feb. 2, 1953 in five trades: engineering, shipwright, air, ordnance and electrical. By mid-1955 it was found that training 50 students as one group overwhelmed the facilities, so for 1956 and 1957 there were two intakes of 30 candidates each.

In 1958 a decision was made to move the training to the West Coast and to discontinue the program in trades other than engineering and shipwright. The last apprentices of the other trades joined in January 1959 and graduated in April 1962.

(Cont'd on p. 4)

Naval Apprentices:

Then...

Duffle bag and hammock — basic kit for an apprentice. *(DND photo 46086)*

Able seamen Doug Harding, Cliff Chamberlain, Dick Newman and Earl Dawson enjoy shore leave in Tijuana, Mexico in early 1960.

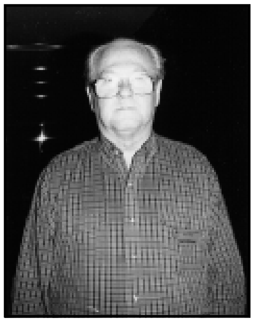
Naval apprentices on board the fleet maintenance ship HMCS *Cape Breton* in the mid-1950s. *(DND photo 0-5328)*

"Measure twice…"* CPO Perry instructs an apprentice on board HMCS *Cape Scott*. *(DND photo 68104)

...and *Now*

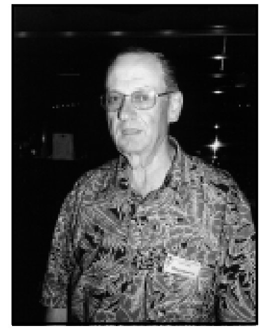
Third Naval Technical Apprentice Reunion

Ottawa September 2002

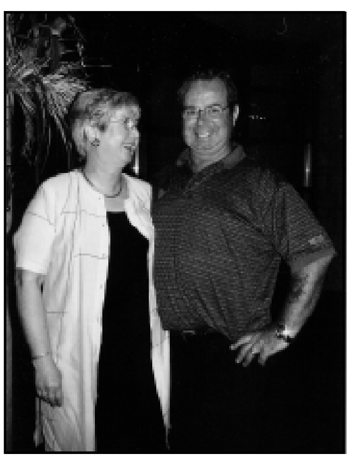


Hugh Millman (Entry 2, autumn 1954), co-chair of the reunion committee; 27 years of naval service – 45 including civilian service with the CPF Project. Longest serving member of PMO CPF as Quality Assurance and Trials Manager, 1978-1998.

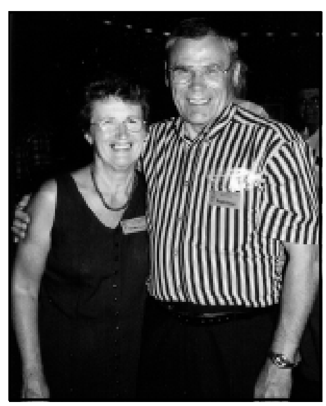
Vic Chan (Entry 17, fleet entry July 1963, 35 years' service, oldest apprentice inductee three days shy of his 22nd birthday) with Laura Ozimek.



Doug Harding (Entry 9, summer 1958) Chairman of the 2002 Apprentice Reunion Committee: 450 letters went out, 191 responses said 'yes,' 110 actually paid. "The guys really did good work" getting things ready.

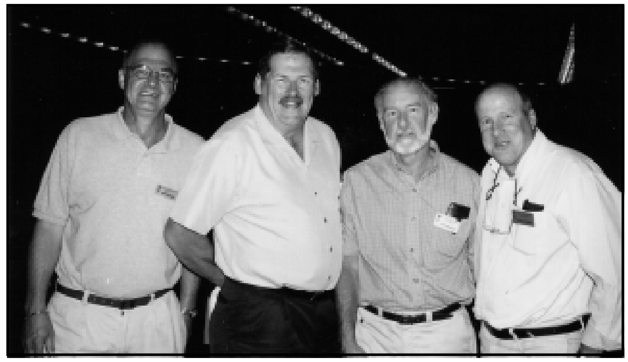


Rick Cappell (Entry 17, 1963) and wife Carole. In charge of the reunion database. Back in Rick's trainee days Carole helped transcribe Rick's notes, causing his instructor to comment, "Do I detect feminine handwriting?" ***Busted! (Photo by Laura Ozimek)***

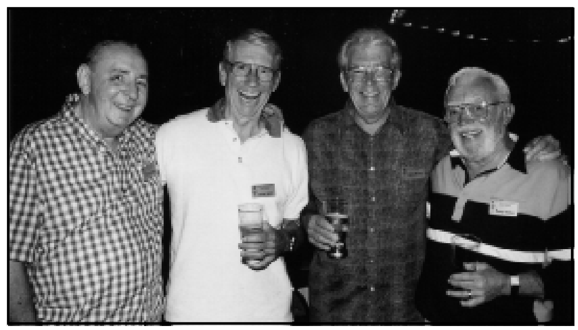


A life of service – Fred Keizer (Entry 12, 1960, 36 years of service) and wife Doreen. Active these days visiting the poor, the imprisoned and the sick on Vancouver Island.

(2002 photos by Brian McCullough unless otherwise noted)



(Entry 22, August 1965): Bob Smith joined at age 16, the youngest seaman in the RCN; David Valentine is the superintendent of the BC Ambulance Service; CPO1 Jim Reece is the MARPAC Formation General Safety Officer – the navy's last serving technical apprentice, now in his 39th year of service; Larry Clark got out of the navy after his 1969 graduation and joined BC Rail — "After a few years in the naval apprentice program I knew this wasn't for me."



***Years and years of service:* Bronte (Spook) Spanik (Entry 1 – 39 years in the navy), Clive Pattison (Entry 1 – 35 years), Jerry Perron (Entry 1 – 28 years) and Denny Gordon (Entry 2 – 32 years of service).**

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

For the Record

In our last issue we forgot to credit CANDIB member and former MIL Systems Engineering Inc. President Jim Williams for his sidebar information relating to the DDH-280 TRUMP conversion program. MIL was the TRUMP Design Contractor first to Litton Systems, then later to the Department of Supply and Services when the project was reorganized. Our apologies.

In the CANDIB article on page four, our reference to "Defence Design Production" should have read, "the Department of Defence Production." Thanks to Pat Barnhouse for the correction.

(Cont'd from p. 1)

In 1960 the apprenticeship program reverted to single annual entries limited to 34 candidates who would graduate as leading seamen rather than petty officers second class. The last apprentices to graduate as PO2s completed training in April 1963.

The summer of 1963 saw the plan move to biannual intakes, this time consisting of a civilian entry beginning in January and a fleet entry commencing in July. The 39-month course was made up of six terms of 22 weeks each, including a sea phase and a final term of 15 weeks. Candidates graduated either as Leading Seaman Engineering Technician Trade Group 3 with a machinist subspecialty, or as Leading Seaman Hull Technician Trade Group 3. The last apprenticeship entry, number 24, began in January 1967 and graduated in April 1970.

Most graduates who made the navy a career went on to become chief petty officers or commissioned officers. Most prominent when the DDH-280s were introduced in the mid-1970s, the naval technical apprentices formed the nucleus of the technicians who led the transition from steam to a gas turbine fleet.

— Luc Tetrault
(Entry 22, January 1966)

[Note: Information for the period 1952 to 1964 was extracted in large part from an article by Lt. D.W. Wilson, RCN, in the September 1964 issue of *The Crowsnest*.]