National Defence | Défense nationale

Maritime Engineering Journal

110
Since 1982

Winter
2024-2025

Canada's Naval Technical Forum

Featured Content

NETE's UxV Centre of Excellence — Supporting RCN Objectives for Autonomous Uncrewed Vehicles

CNTHA News Inside!

Canada

Ernest Apps was a young Canadian radar officer aboard HMS *Valiant* during the 1941 Battle of Cape Matapan.

See page 15

Director General Maritime Equipment Program Management

Commodore Keith Coffen, CD

***Maritime Engineering Journal* on Canada.ca:**
https://www.canada.ca/en/department-national-defence/corporate/reports-publications/maritime-engineering-journal.html

Our complete back catalogue is maintained at:
https://publications.gc.ca/site/eng/9.507873/publication.html

…and by the Canadian Naval Technical History Association at:
http://www.cntha.ca/publications/m-e-j/

Maritime Engineering Journal

(Established 1982)
Winter 2024-2025

Commodore's Corner

Forum

Feature Articles

Titles of Interest

News Briefs

CNTHA NEWS

NETE's L3 Harris C-CAT3 Autonomous Surface Vehicle during testing in Halifax.

Photo courtesy NETE

The *Maritime Engineering Journal* (ISSN 0713-0058) is a **NATO UNCLASSIFIED** publication of the Canadian Armed Forces, published by the Director General Maritime Equipment Program Management, 101 Colonel By Drive, Ottawa, Ontario, Canada, K1A 0K2. Views expressed are those of the writers and do not necessarily reflect official opinion or policy.

To request a **free subscription**, **change a delivery address**, or **cancel a subscription**, please contact: MEJ.Submissions@gmail.com

COMMODORE'S CORNER

Canada's Naval Technical Community – Leveraging Positivity and Resourcefulness

By Commodore Keith Coffen, CD

Year's end is traditionally a time of reflection, and as I look back on 2024, I find myself buoyed not only by what we accomplished as a community, but by how well this bodes for a successful year ahead. Whatever the challenges that await us in 2025, I am confident we will have the people, the skills, and the tools to complete our tasks in a professional manner.

I'm not saying things will always be easy, especially in the current funding climate, but we have resourcefulness on our side. For example, even as we carefully managed our travel budgets in support of larger DND and CAF objectives over the past 12 months, we continued to find ways to get the work done, leveraging every available opportunity to maximize our collective expertise and resources. This was leadership and adaptability at its best, and the Naval Technical support community can take pride in the efforts that were made on behalf of the Commander RCN and ADM(Mat).

During what was an extremely busy fall season, I had the opportunity to speak with a broad cross-section of technical personnel who are serving with the fleet. In September, while on a personal trip to Halifax, I met with crews aboard HMCS *Fredericton*, *St. John's*, *William Hall* and *Windsor*, and toured HMCS *Halifax* in dry dock at Irving Shipbuilding. In November, I leveraged my presence on the West Coast to visit HMCS *Regina* and *Max Bernays*, and tour one of our new Naval Large Tugs — the impressive *Barkerville*. At the Seaspan facility across Esquimalt Harbour from the naval dockyard, I was given a walk-through of HMCS *Calgary* in DWP.

The situational awareness and insights these informal visits generated were invaluable. Speaking candidly with sailors and officers in their own messes and work spaces, I was struck by their passion, and by their uncompromising determination to overcome any obstacles to ensure that RCN ships and submarines are safe and operationally relevant, irrespective of whether their platforms are old or new.

The *Regina* visit was particularly noteworthy. The ship — still relatively fresh out of its most recent docking work period, and under the command of **Cdr Jeremy Samson** — had just returned from a successful Joint Littoral Targeting Exercise (JOLTEX) to validate tactics, techniques and procedures for littoral targeting using the Harpoon weapon system. Ahead of my visit I'd met with **Cmdre David Mazur**, Commander Canadian Fleet Pacific, who was embarked for the exercise, and I knew how pleased he was with the performance of the ship and crew.

Photo by Brian McCullough

Later that week, following a meeting of the Naval Engineering Council, **Cmdre Michel Thibault**, PM River Class Destroyer Project, and I spoke to the West Coast technical team in a town hall associated with the annual MARPAC Naval Technical Seminar. As we had found during the MARLANT seminar earlier in June, there was a wonderfully positive mindset going on with the people present, made all the more remarkable in that they were already thinking ahead to when the River-class destroyers will be delivered into service.

Part of the discussion on both coasts with various ships' teams, and during the seminar town halls, centred on the availability of spare parts. What's interesting is that if you go back to the February 1998 issue of the *Maritime Engineering Journal*, there is an article on naval logistics support that seems as fresh today as it was then. Written shortly after the last of the *Halifax*-class frigates was delivered, it describes the complexities and vagaries of the Canadian Forces Supply System, noting that it is less automated than we might like, and is layered with overlapping responsibilities. It can be difficult to navigate, so it is important for technicians in the Navy to understand both

the system and the people within it to ensure their requirements can be actioned in a timely way.

While much of the work we do is conducted without fanfare, it's our collective effort that contributes to our overall effectiveness as a community. Whether it is a senior manager developing a rapid repair plan for a deployed ship, or a trainee learning the ins and outs of a high-voltage electrical system, I can assure you that each one of us has a part to play in the ongoing technical support of the Royal Canadian Navy. You should be proud of the work you do in support of the current fleet, and toward delivering the future force.

To that end, I wish you all the best of the season, and a safe, happy, and productive New Year.

FORUM

Chief Petty Officer 1st Class Pascal Harel, MMM, CD
Command Chief Petty Officer, Royal Canadian Navy

(Courtesy Royal Canadian Navy News)

On July 11, 2024 **CPO1 Pascal Harel** was appointed the RCN's 22nd Command Chief Petty Officer. He relieved fellow Marine Technician, **CPO1 Thomas Lizotte**, at a Change of Appointment ceremony at National Defence Headquarters in Ottawa.

CPO1 Pascal Harel was born in Baie-Comeau, Québec, and is the youngest of three siblings. In 1996, at the age of 19 and following college, he joined the Navy as a Marine Electrician. Throughout his 28-year career he has completed seven deployments and multiple postings, including being the first Regular Force coxswain aboard a maritime coastal defence vessel on the West Coast (HMCS *Yellowknife,* MM-706), and serving as HMCS *Winnipeg*'s (FFH-338) coxswain for Op Projection/Op Neon in 2020.

CPO1 Harel most recently served as Director General Military Careers / Director Senior Appointments Chief Warrant Officers, and as Command Chief Petty Officer for Chief Professional Conduct and culture (PCC).

As a recruit, Chief Harel underwent basic training at CFB Saint Jean, after which he was sent to Halifax for language training. He was later sent to Victoria to complete his QL3 Marine Electrician training and environmental training. He completed his courses early so that he could sail for a six-month deployment in the Persian Gulf aboard HMCS *Regina* (FFH-334).

During his career he has sailed on multiple RIMPAC exercises, Westploys, and Op Caribbes, and served ashore on the West Coast as a Fleet School instructor and Unit CPO, as well as with the Fleet Maintenance Facility organization, Maritime Operations Group 4, Sea Training,

Photo courtesy Formation Imaging Services

and as Unit CPO with Base Administration and PCC(P). In the National Capital Region, he also served as the career manager for the new Marine Technician trade.

CPO1 Harel is a Member of the Order of Military Merit, and a recipient of a Chief of the Defence Staff Commendation. He has twin stepchildren and a daughter, and keeps fit through biking, running, and playing sports. At home, he always has a work project on the go, which consumes most of his free time.

FORUM

In-Service Support and the National Shipbuilding Strategy

By RAdm (Ret'd) Ian Mack, CMM, CD

Recent content in the *Maritime Engineering Journal* has made me reflect on what may have been shortfalls under my watch, and by me personally, in establishing in-service support for the ships being delivered to the Royal Canadian Navy under the National Shipbuilding Strategy (NSS). By way of explanation, allow me to offer my perspectives, strictly from memory, regarding some of the challenges that were encountered in setting the in-service support (ISS) requirements for the three shipbuilding projects currently underway for the RCN: namely, the Arctic and Offshore Patrol Ship (AOPS), the Joint Support Ship (JSS), and the Canadian Surface Combatant (CSC), which was recently renamed the River Class Destroyer Project.

DND photo

Context

There was always a sense of urgency surrounding these major shipbuilding projects. Like many military procurements, there were inevitable delays that placed time pressures on the various project teams. AOPS, for example, was delayed awaiting the implementation of the National Shipbuilding Procurement Strategy (NSPS, forerunner to the NSS); JSS was initially to be in contract in 2008-2009, but the project was returned to the drawing board when the initial procurement process was terminated; and CSC really did not start to gain traction until around 2013. Moreover, from 2002 through 2015, the Chief of the Maritime Staff and the Director General Maritime Equipment Program Management (DGMEPM) organizations were largely focused on delivering the Halifax Class Modernization / Frigate Life Extension (HCM/FELEX) Project.

Appropriately, shipbuilding under NSS relied on support from DGMEPM, and as we stood up the new division for Director General Major Project Delivery (Land and Sea), we developed something akin to a service-level agreement (SLA) between DGMEPM and DGMPD(LS). While this paved the way for technical guidance and approvals from DGMEPM for all three shipbuilding projects, it represented a huge new workload for the MEPM team. Concurrently, and after four years of dedicated effort, the NSPS reached implementation in February 2012, following which the shipyards had to undergo significant facility infrastructure, equipment, process and workforce renewal in parallel to developing new relationships in support of the strategic and long-term NSS program. It was all very novel.

Against this backdrop, the focus was initially on the design of AOPS with Irving Shipbuilding Inc in Halifax, and on the West Coast, the design and delivery of three Offshore Fisheries Science Vessels (OFSVs) for the Canadian Coast Guard in Seaspan's Vancouver Shipyard. Simultaneously the JSS Project Management Office finalized the selection of the German Navy's *Berlin*-class auxiliary ship as the parent design for JSS.

It was in this context that the three projects shouldered their responsibility to address in-service support requirements, working in close collaboration with DGMEPM's broad strategy guidance and detailed input.

Personnel

Having not designed a new major ship class since the 1990s, there was a steep learning curve for the project offices and for Public Services and Procurement Canada (PSPC). The situation became much more difficult in the late 1990s in the wake of sweeping military and DND civilian personnel cutbacks. The sudden loss of many of DGMEPM's most experienced people created a significant mismatch between the burgeoning workload and the number of remaining skilled hands on deck. Although the agreement with DGMEPM on involvement in shipbuilding

project activities was assumed to enable due attention to such things as the detailed requirements for effective ILS, hindsight would suggest that personnel resource challenges detrimentally impacted the results, despite the best efforts of everyone involved.

A foundational strategic analysis indicated that, as had been done for minor warships and auxiliary vessels (MWAVs), the effective transfer under contract of technical in-service support for AOPS and JSS was the preferred strategy. I believe a major factor in this approach was similar to the offloading of DGMEPM work effort (not responsibility) under MWAV contracts for approximately 100 vessels from roughly 25 different classes. As a result, a Project Charter was created in 2012 for AJISS — the Arctic and Offshore Patrol Ship/Joint Support Ship In-Service Support contract. A director from DGMEPM was seconded to DGMPD(LS) to develop the request for proposals (RFP), and lead the competitive sourcing activity under the guidance of a steering committee tri-chaired with DGMPS(LS), DGMEPM and PSPC. Following a competitive procurement, Thales Canada won the maintenance contract in 2017 to act as the technical support agent. Once the contract to select the parent design for our new CSC warships was competed, the winning consortium was announced in February 2019 around the British Type 26 destroyer. By 2023, the government's intent to award one or more CSC in-service support contracts was announced.

Challenges

The good news was that all three shipbuilding projects had in-service support in their sights starting fairly early in the design process to ensure what DGMEPM personnel would see as the required standard for maintainability, i.e:

- during ship design spirals, optimization of physical access routes for subsequent removal of equipment for maintenance/replacement;
- flow-down of maintainability requirements to the selected equipment suppliers where feasible;
- generation of a logistics support analysis (LSA) to inform reliability analysis, sparing, drawings, special tests and tools, maintenance instructions and maintenance training arrangements; and
- support navigation of intellectual property rights, digital data requirements, security protocols, and other issues.

Addressing Maintainability

In a perfect product development scenario, designers will do many design spirals to facilitate maintenance, as was the case for the Type 26. An alternative approach is to improve maintainability in follow-on ships of class, something the German Navy did with the *Berlin* class, allowing Canada to benefit by selecting the modified parent design for the third ship of the class (*Bonn*). AOPS was an entirely new design, and therefore did not offer this advantage.

Photo by Brian McCullough

Robert Hampton Gray (AOPV-435), the sixth *Harry DeWolf*-class Arctic/offshore patrol vessel for the RCN.

The reality is that when urgency is required, maintainability too often gets left behind. In the case of AOPS, my own guidance may have encouraged just such a result. My experience with expensive LSAs was that they ended up on the shelf until mid-life or later, and only then were they found to be out of date. Therefore, my guidance for AOPS was to deliver an "LSA Lite," with guidance being short on content. In hindsight, once the intention was clear to hire an ISS agent under AJISS, this was a significant oversight, as the contractor likely could have made significant use of, and conducted ongoing updating of, a comprehensive LSA for AOPS. To avoid short-changing maintainability in future shipbuilding projects, the combination of NSS with the ADM(Mat) proposal to put in place a continuous capability sustainment initiative could enable maintainability to get the attention it requires.

Digital Challenges

Something else that was not included with the RFP was direction on the digital software package to be employed by both NSS shipyards for ship design and construction, as well as for in-service support data delivery and digital drawings. Once the two shipyards were selected, the time had passed to attempt to pursue a common digital solution — a missed opportunity to establish a digital set of standards going forward.

(Continues next page...)

Photo by Kelvin Szeto, courtesy PMO JSS

JSS 2 – The future HMCS *Preserver* under construction at Seaspan Shipyards in Vancouver.

The competing desires of OEMs wanting to restrict access to their intellectual property (IP), and Canada wanting mandatory disclosure of IP is a conundrum we struggled with under the NSS. The fact of the matter is, including fulsome demands for IP during the RFP process may cause some companies to choose not to bid at all. Since Canada buys very few products, we have little leverage available to overcome the reluctance of OEMs who might otherwise be interested in supplying leading-edge products to the RCN. My personal experience is that delaying the pursuit of IP until contracts have been awarded — when real money is on the table, and once working relationships have been established — can avoid some of the shortfalls of IP discord during equipment acquisition. While this might be seen by many to have been misguided, I believe that, when combined with contractually binding and structured collaboration, it can work for all RCN major platforms.

Role of the Fleet Maintenance Facilities (FMFs)

For decades, the RCN has relied on the coastal FMFs for pier-side, second- and third-line maintenance support, and for foreign port assistance during operations. The FMFs' ability to respond to emergency requirements has time and again proven to be of inestimable value over the years. With the decision to contract for maintenance agent support under AJISS, significant concerns arose concerning the future role of the FMFs in the maintenance support for these vessels. There was significant discussion over many months regarding this point, before a maintenance task framework was agreed upon, thus enabling the AOPS and JSS to arrange for the related maintenance training and support documentation and tools. I suspect that similar challenges could occur regarding FMF support for the new fleet of River-class destroyers.

Timeliness of Availability of Maintenance Information

For as long as I can remember, the schedule for commissioning crews to accept their ships has been problematic due to missing spares, maintenance tools and training. I have seen such delays as fallout from contractor sea trials where issues are expected, and potentially require significant changes to various tools and documents. Delays have also occurred in CAF acquisitions where maintenance responsibilities were awarded to an in-service support agent separate from the prime contractor for the acquired platform. These delays are mostly due to reluctance on the part of the prime contractor to prioritize such deliverables. During my time as DGMPD, I advocated setting the availability of training and related materials as the sole priority "at-risk penalty milestone" in contracts. Again, in hindsight, similar penalties should have been contractually established for all technical documentation and IP.

Need for Sustained Collaboration

Given the time it takes to run complex Canadian ship acquisition competitive processes, and the need to be ready to support the first ship when delivered, challenging RFPs must be released very early. Otherwise, bidders are in effect "flying blind," as they deal with what at best might be considered an opaque set of requirements because ship production designs are not yet complete. In many cases, bidders are able to offer little more than costing estimates based on labour rates and management overhead.

Too often when people face challenges like this, cooperation is replaced with animosity. Whether working with internal partners, or with shipbuilders and OEMs, collaborative relationships are critical to dealing with challenges in every aspect of the life cycle of ships, from conception to disposal. More than once, I have witnessed the damage caused when collaboration was replaced by immoveable adversarial positions. ISO 44001 is the foundation document for the methods required to minimize the probability of such breakdowns in communications, and AJISS is perhaps the first ISS contract where structured and sustained collaboration was built-in from the start. Experience tells me that a structured collaboration approach should be mandatory to maximize the probability of success, both with the shipyards and with the ISS agents.

This is hardly a complete treatise on the subject of in-service maintenance support, but every one of these issues taxed my thinking for the three major shipbuilding projects. Technical data challenges will always be a difficult puzzle to solve, but going forward one can hope that both

(Continues next page...)

(cont'd from previous page...)

shipbuilders and government officials might address critical in-service support matters through a collaborative process that offers incentives both ways — exactly as the NSPS/NSS strategic relationship was conceived.

RAdm (Ret'd) Ian Mack joined the RCN in 1969, and served as a Marine Systems Engineer at sea and ashore. Among his senior appointments he served as Chief of Staff (Materiel), and following his retirement from the Navy in 2007 served 10 years as a civilian Director General for Major Project Delivery. In 2022, Ian Mack was awarded the Admirals' Medal "for his unequalled contribution to Canada in the naval ship procurement sphere."

Submissions to the *Journal*

The *Journal* welcomes unclassified submissions in English or French. To avoid duplication of effort and ensure suitability of subject matter, contributors are asked to first contact the production editor at MEJ.Submissions@gmail.com.

FEATURE ARTICLE

NETE's Centre of Excellence for Uncrewed Vehicles

By Mae Seto, Corey Venturini, and Siegfried Richardson-Prager

For over a decade, the Department of National Defence's Naval Engineering Test Establishment (NETE) has worked to build a centre of excellence (CoE) for the testing, operation, and support of uncrewed vehicles and systems (UxVs) for the Royal Canadian Navy (see *MEJ* issues 89 and 94) [1-4]. Currently centralized in Dartmouth, NS, the CoE's core team of 10 personnel is supported by other subject matter experts mostly from NETE's Combat and Control sections in Ottawa, Montreal, and Victoria.

In the fast-developing arena of UxV development and operations, the CoE plays a critical role in providing much-needed continuity of knowledge and expertise. The UxV CoE's highly skilled team of technical managers, engineers, designers, technologists, pilots and programmers draw on their years of experience in defence, industry and academia to provide direct support to UxV programs sponsored by the RCN and the Assistant Deputy Minister Materiel (ADM(Mat)). In addition, a technologist and an engineer are permanently embedded with the RCN's Fleet Diving Unit Atlantic (FDUA) at Shearwater, NS to provide independent validation and verification (IV&V) on the unit's UxVs.

As a field unit of ADM(Mat), the Maritime Equipment Program Management division (MEPM) also tasks NETE to develop and maintain operational and technical subject matter expertise for uncrewed systems in all naval and marine environments. These remotely piloted and autonomous UxVs can operate underwater, on the water's surface, and above water (i.e. aerial). As a consequence of RCN and MEPM sponsorship, the NETE UxV CoE provides essential UxV support to Canadian Armed Forces units including the Fleet Maintenance Facility, Canadian Forces Maritime Warfare Centre, Fleet Diving Unit, and Naval Force Readiness on the East Coast, as well as the Advanced Naval Capabilities Unit on the West Coast.

To support the Royal Canadian Navy and MEPM, the UxV CoE consolidates expertise in uncrewed systems to competently:

- assess concepts and technical developments;
- test and evaluate new systems and related technologies and capabilities, and

Images courtesy NETE

NETE's subject matter experts test and evaluate new UxV systems and related technologies on behalf of the RCN and ADM(Mat).

- provide material support, IV&V, and associated services as required.

What began as a handful of test and evaluation (T&E) trials with the Teledyne SeaBotix underwater remotely operated vehicle (ROV) has grown into a full-fledged support effort that encompasses prototyping, configuration management, standards, and contributions to NATO. RCN and MEPM support with NETE's current inventory of autonomous and remotely operated UxV T&E platforms [see sidebar on page 11] keeps NETE's cadre of subject matter experts (SMEs) relevant with the transformational and latest UxV technologies and capabilities.

A Centre of Excellence for UxVs – What does it take?

UxVs designed for use in all domains are complex and rapidly evolving. As such, the NETE team of project managers, operators, maintainers and developers must:

1. remain current with new developments;
2. appreciate the capabilities and limitations of the various vehicles;
3. be able to address the full scope of UxV T&E, and IV&V requirements;
4. maintain and provide continuity for an ever-growing knowledge base, given the turnover in RCN operators; and

5. support RCN and materiel organizations with knowledge, expertise, and capabilities to optimize UxV utilization, and comply with operational certifications and regulations.

NETE's UxV CoE is a unit of dedicated SMEs who are leading the way in exploring, evaluating, leveraging, and adopting new technologies, tools, techniques or practices on behalf of the RCN. Through informed guidance and direction from RCN and MEPM, the UxV CoE establishes standards, promotes best practices, investigates and develops timely requirements and recommendations for the naval community. The UxV CoE team members have the required knowledge and specialized skills to satisfy the RCN and MEPM UxV demands and can optimize UxV operational use and maintenance, as well as identify and reduce duplication of effort.

Given the CoE's specialized knowledge and expertise, it can be the first point of contact when a UxV in the fleet experiences problems. Working with the original equipment manufacturers (OEMs), the team can evaluate whether a solution can be applied on-site, or if the vehicle must be shipped to the OEM for further investigation and repair. In either case, the CoE will conduct acceptance tests before returning the UxV to service. Since all NETE-held UxVs are regularly maintained in-house, the CoE's expertise ensures improved readiness of RCN UxVs for operations and T&E support.

Development of UxV Requirements, Testing and Configuration Management

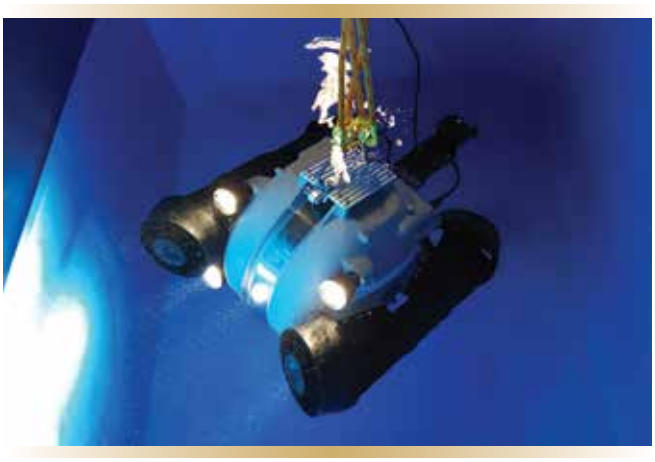
Test and evaluation traditionally involves OEMs on new acquisitions or upgrades to UxV sensors and capabilities. Given high-level requirements, the CoE develops detailed specifications, then defines tests to determine whether requirements have been met. Examples of this include the T&E and IV&V work conducted for several RCN initiatives, i.e. UAS ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance); NOMAD (Naval Offboard Anti-Missile Active Decoy); and RMDS (Remote Mine-Hunting and Disposal System).

As part of NETE's on-going configuration management effort on behalf of the materiel authorities, the UxV CoE:

1. ensures UxVs are safe and fit-for-purpose, and can interoperate with other RCN, MEPM, and designated NATO allied systems;
2. manages the configurations for a fleet of UxVs by defining which standards apply and ensuring compliance;

(Continues next page...)

Tools like Teledyne's SeaBotix ROV (above) and Deep Trekker Inc.'s DTG2 ROV (below) allow technicians to easily survey the condition of a ship's underwater hull.



3. provides support such as basic OEM software/firmware updates and adjustments to UxVs or their subsystems (e.g., acoustic modems, bathymetric sonars);
4. integrates new payload sensors that do not require support from the UxV OEM; and
5. conducts T&E across the life cycle of new capabilities acquired under RCN capital programs like the ISTAR project.

Over the years, NETE has matured its expertise through direct engagement on several engineering and T&E activities to the point where the team provides the RCN and MEPM with solid configuration management support for the Teledyne SeaBotix ROV and REMUS 100 AUV, based on well-documented configuration profiles as per MEPM standards and procedures. NETE's task is to oversee the UxV systems engineering and conduct T&E on any new payload sensors, communication systems, embedded processors, or tactics that might be under consideration for these vehicles.

Test and Evaluation in Support of Operations

The NETE UxV CoE is well positioned to establish and manage contracts in support of operations, secure DND and civilian training sites, and access marine craft and jetty-side support. Furthermore, NETE's UxV pilots and operators have acquired knowledge and developed expertise through extensive UxV OEM training and numerous RCN in-air/in-water trials. Pilots and operators observe Transport Canada regulations for their certifications and for the operation of UxVs, and as such are able to provide guidance to incoming NETE team members and RCN operators. NETE ensures that UAV pilots are knowledgeable about airworthiness, and with the operation of all remotely piloted/autonomous uncrewed vehicles prior to any testing, field operations, or deployments.

NETE personnel prepare a Teledyne FLIR SkyRanger R70 UAV for a test flight.

Recently, the NETE UxV CoE supported a trial on behalf of the Directorate of Naval Platform Systems (DNPS 2-5) to test the effectiveness of using NETE's IVER3 AUV and Teledyne SeaBotix ROV to provide an accurate survey of the fixed location of Fleet Maintenance Facility (FMF) Cape Scott's underwater acoustic and magnetic signature range assets at Fergusons Cove (Halifax). NETE conducted the UUV survey operations to gather an approximate location of the underwater assets, then reacquired the assets in a separate operation using the ROV. NETE also provided FMF Cape Scott range staff with video imagery of their underwater range assets.

Other examples of UxV operations that NETE has conducted include: IVER3 AUV trials to evaluate their efficacy as portable magnetic ranges; Skydio X10 UAV photogrammetric hull surveys of *Halifax*-class frigates; SeaBotix and Deep Trekker ROV underwater hull surveys for ships; and C-CAT3 ASV surveillance surveys.

In 2022, NETE supported a portable ranging trial jointly sponsored by Defence Research and Development Canada and MEPM. During this trial, which evaluated using a UxV to range a ship rather than have the ship pass over a fixed range, NETE integrated an Ocean Floor Geophysics (OFG) magnetometer into its IVER3 AUV and conducted portable magnetic ranging operations of a Glen-class tug. NETE collected valuable acoustic data as the AUV made a series of complex passes underneath the tug at various speeds.

Early in 2024, a NETE UxV technologist and engineer embedded with FDUA were tasked on short notice to assist the USS *Delbert D Black* (DDG-119), an *Arleigh Burke*-class destroyer experiencing an engineering issue. The NETE UxV team members used their Teledyne SeaBotix ROV to assess and remedy the problem, which allowed the destroyer to rejoin its support to Operation Nanook. The performance of **Brandon Fox** and **Terrell Giorgis-Jeffrey** was commended by the Commander United States Second Fleet **Vice Admiral Douglas G. Perry, USN**, as well as by **Rear-Admiral Josée Kurtz** (Commander Maritime Forces Atlantic), Commander Canadian Fleet Atlantic **Commodore Jake French**, and Fleet Diving Unit Atlantic Commanding Officer, **LCdr Mike St-Pierre**.

Support for UxV Development

The NETE CoE performs market surveys and technology watches, identifies UxV support systems like communications networks and launch and recovery methods, establishes, maintains and uses UxV test laboratories, and supports capabilities like compact deployable C2 ship/ground control stations. In the process, NETE has provided knowledge and expertise to the larger naval community.

NETE contributes to NATO and national working groups that develop new standards and UxV technology solutions. Since 2017, NETE has represented Canada on NATO's STANAG 4817 working group for Interoperable Command and Control of Multi-Domain Unmanned Platform Control Systems, which aligns with Canadian objectives for its Maritime Multi-Domain Control System (MMDCS) project. This includes participation in the annual NATO REPMUS (Robotic Experimentation and Prototyping for Maritime Unmanned Systems) exercise in Portugal.

Since 2018, NETE has supported the RCN with development on projects like the MMDCS. This endeavour works toward a single ground control station for UxVs for all naval domains (underwater, surface and air). NETE is currently tasked to develop a C3 solution for maritime UxV interoperability for the River Class Destroyer Project.

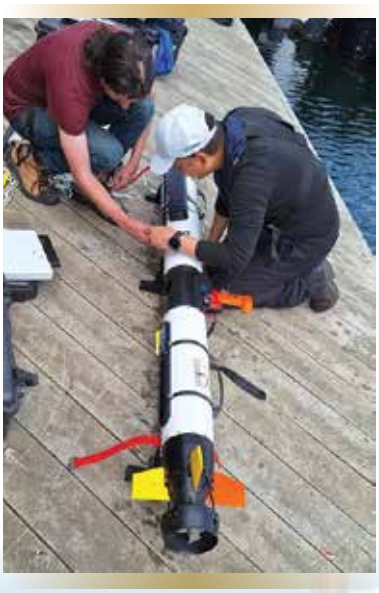
Drivers to Maintain a DND UxV Centre of Excellence

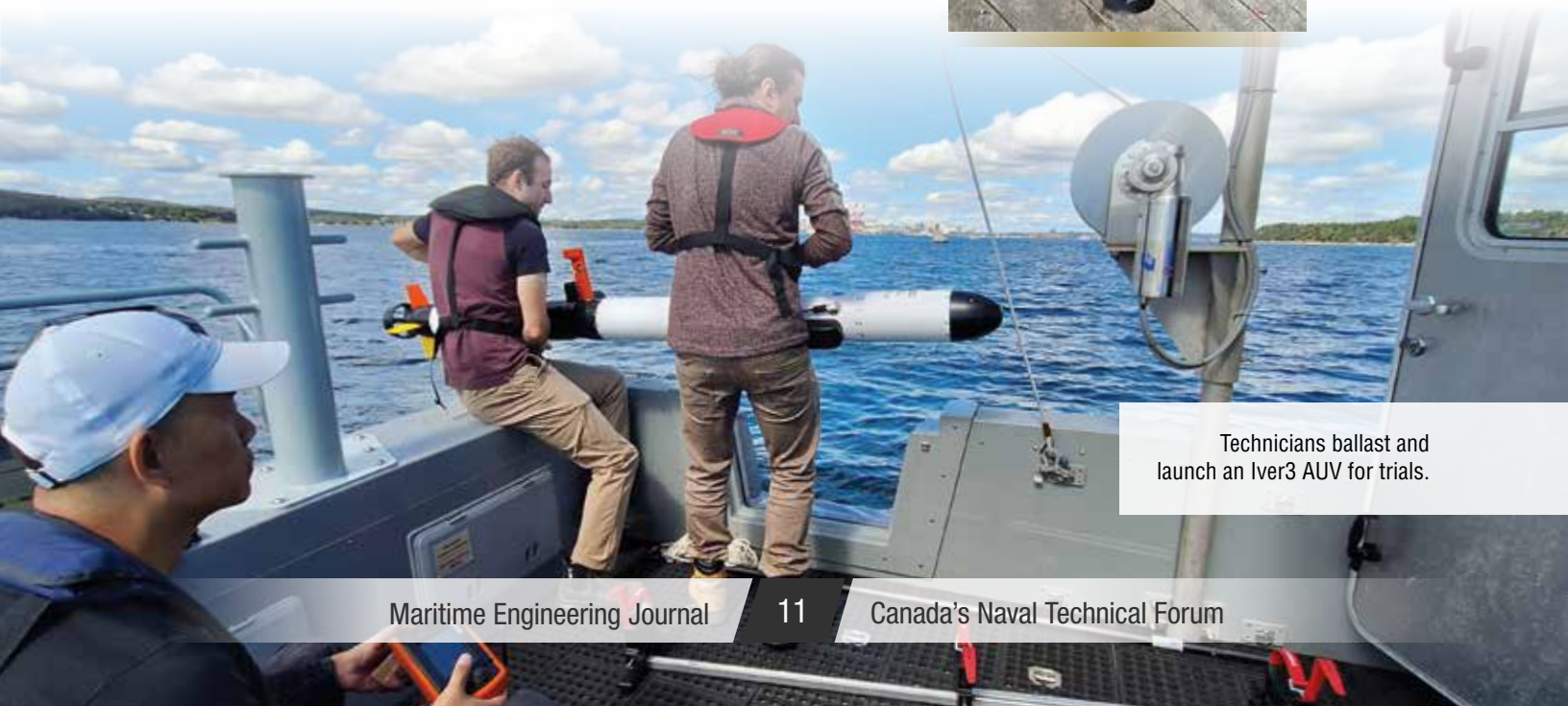
Modern autonomous systems are no longer deterministic systems, and their validation and verification must acknowledge this at all stages, from cradle to grave [5]. Advances in high-energy-density sources, low-power (but powerful)

(Continues next page...)

NETE Centre of Excellence Main UxV Inventory

- 1x L3 Harris C-CAT3 (Autonomous Surface Vehicle)
- 1x L3 OceanServer IVER3 (Autonomous Underwater Vehicle)
- 1x Teledyne SeaBotix vLBV950 (Underwater Remotely Operated Vehicle)
- 1x Deep Trekker DTG2 (Underwater Remotely Operated Vehicle)
- 2x Teledyne Flir SkyRanger R70 (Uncrewed Aerial Vehicle)
- 1x Skydio X2D (Uncrewed Aerial Vehicle)
- 2x Skydio X10 (Uncrewed Aerial Vehicle)
- 1x Teal 2 (small Uncrewed Aerial Vehicle)





Technicians ballast and launch an Iver3 AUV for trials.

embedded processors, and the internet-of-things (IOT) have transformed autonomous UxV capabilities and operations. Fuel cells integrated into UUVs can confer extraordinary endurance and on-board computations [6], while the IOT makes it possible to easily integrate electronics, software, actuators, and sensors to create smart sensors designed to work on embedded UxV systems.

Today, UxVs, their payload sensors, and on-board deliberation are so complex, dynamic and adaptive that they drive new concepts of operations, employment and doctrine [5]. In short, they can create emerging behaviours that were "not in the requirements." UxVs in all domains are no longer restricted to executing scripted missions, as payload autonomy now allows them to analyze their on-board sensor data, then replan a new mission on the fly to produce a better outcome. At the same time these systems have new vulnerabilities from cyber, adversarial AI, counter-autonomy, and emerging threat behaviours that will require self-monitoring systems during their missions.

These new imperatives will present the RCN and MEPM considerable T&E and IV&V challenges for missions that deploy such autonomous UxVs. Addressing these challenges as its mandate and core functions, NETE's UxV CoE is therefore well positioned to perform validation of a UxV's capability requirements, along with any industry generated solutions and deliverables. Additionally, the NETE team is suited to verifying these capabilities using DND or commercially available resources, while developing T&E procedures for acceptance of new autonomous UxV capabilities.

NETE's vision for the future is centred on further developing the UxV CoE, and expanding the program of work involving uncrewed vehicles. By building on our competencies in T&E, IV&V, engineering support, and innovation initiatives, NETE can progress and evolve to allow Canada to keep pace in the rapidly evolving field of autonomous uncrewed vehicles.

Dr. Mae Seto is an Uncrewed Vehicles Technologies Specialist with the MMDCS Project. Corey Venturini is the Team Leader for Applications Engineering for Combat and Control Systems. Cdr (Ret'd) Siegfried Richardson-Prager is the DGMEPM Team Group Leader for Combat and Control Systems (CCS). All are with the DND Naval Engineering Test Establishment Detachment in Halifax, NS.

References

1. Pasnani, P., Seto, M.L., "Autonomous Underwater Vehicles – Untapped Operational Capability," *Maritime Engineering Journal*, No. 89, Spring 2019, pp. 8-12.
2. Richardson-Prager, S., Seto, M.L., "DND NETE Unmanned Systems Centre of Excellence," *Maritime Engineering Journal*, No. 94, Fall 2020, p. 22.
3. Seto, M.L., Richardson-Prager, S., "Maritime Multi-Domain Control System for Marine Unmanned Systems – Advanced Development Model," *Maritime Engineering Journal*, No. 94, Fall 2020, pp. 23-25.
4. Venturini, C., Seto, M.L., "DND NETE Acquires Unmanned Systems for its Maritime Multi-Domain Control Systems Project," *Maritime Engineering Journal*, No. 94, Fall 2020, pp. 26-27.
5. Zacharias, G., "*Autonomous System: Test and Evaluation Implications*," Office of the US Air Force Chief Scientist, September 2020.
6. Nichols, J., Woodroffe, A., Jackson, E. Johnson, A., and Morgan, M., "Subsea Environmental Acoustic Monitoring using Long Range Autonomous Underwater Vehicles," Proc. Int. MTS/IEEE OCEAN 2022.

FEATURE ARTICLE

Fleet Maintenance Facilities Lead the Way with Laser Ablation Technology in DND

By Rory Theriault, with files from FMF Cape Scott staff

The Royal Canadian Navy's two Fleet Maintenance Facilities (FMFs) are always looking for ways to improve work processes and keep crews safe. They were excited, recently, to share news of their initiation into laser ablation technology — an advanced tool that's set to change the way they handle surface preparation and maintenance.

The technology, commonly known for its use in the medical field and in tattoo removal, has been adapted for industrial applications, offering a safer, more efficient, and environmentally friendly method for removing surface coatings from various materials. To date, this technology has been put to the test by staff at FMF Cape Breton in Esquimalt, BC, and FMF Cape Scott in Halifax, NS, with promising results.

What is laser ablation?

Laser ablation involves the removal of material from a solid surface by irradiating it with a laser beam. This focused pulse energy creates rapid heating at the surface level, separating and removing material. This precise process allows for the removal of coatings without physical contact, minimizing the wear and tear on the underlying material, and reducing waste.

At FMF Cape Breton, this technology was recently applied to HMCS *Max Bernays* (AOPV-432) using a 100-watt laser system. Specifically, laser ablation was used on deck tie-down points to reveal deck surfaces for inspection and painting. The results were impressive, demonstrating the potential of laser ablation to complement traditional methods like sanding or grinding, or using chemical strippers. The technology is not only more efficient, but also offers significant advantages in terms of safety and environmental impact.

The journey to adopting laser ablation has been thorough and meticulous. Recognizing its potential, the FMF Cape Breton team embarked on an extensive process of learning, testing, and refining. Project leader, **Alan McNaul**, Group Manager 1, played an integral role in implementing this technology, supported by trials conducted by Work Centre supervisors and trained scalers and cleaners.

Photo courtesy Irving Shipbuilding Inc.

FMF Cape Scott's Work Centre Manager Rodney Organ tries out Irving Shipbuilding's 330-watt laser unit under the watchful eye of ISI's Mack Purdy.

"This learning phase involved understanding the technology's capabilities, assessing potential threats, and evaluating safety protocols," McNaul said.

Once the technology's effectiveness was confirmed, the real work began to design critical health and safety procedures. Given the power of the laser, it was essential to ensure that operators, nearby co-workers, and the environment were fully protected. This involved implementing several key safety protocols for operating the laser ablation system at FMFCB, and equipping operators with specialized personal protective equipment (PPE), including laser safety goggles.

One of the biggest challenges with laser ablation is managing the potentially harmful fumes, vapours and gases and (i.e. heavy metals from paint) that are released into the atmosphere by the process. To tackle this issue, FMF Cape Breton conducted extensive testing, and came up with a high-power ventilation system that draws by-products through a high-efficiency particulate air (HEPA) system, which traps even the smallest particles. This ensures that the air released back into the environment is clean and free from harmful contaminants, significantly reducing the environmental impact.

(Continues next page...)

Pioneering Achievement for DND

At FMF Cape Scott on the East Coast, production support staff have leveraged the experience and insights gained by FMF Cape Breton in preparation for implementing laser ablation into their own operations using a 1000-watt P-Laser. **Cameron Ross**, Group Manager 2, and Work Centre Manager **Rodney Organ** explained that they have benefitted from the West Coast's experience, and are currently updating their standard operating procedures, piggybacking on FMF Cape Breton's groundwork with the technology.

Traditionally, operators would physically scrape material from surfaces or use chemical stripping agents to remove unwanted materials or coatings. "Laser ablation is much more efficient than the paste we traditionally use," Organ said. "The paste has to cure for 24 hours before we scrape it off, so if the surface requires additional cleaning, it means waiting another 24 hours for the paste to do its work. With laser ablation, there is no curing time."

FMF Cape Scott has also benefitted from a demonstration of the 300-watt laser ablation unit being used on HMCS *Halifax* (FFH-330) at Irving Shipbuilding. At Irving's invitation, some of the FMF staff were able to try it for themselves when paint was being removed from the inside of the mast. The results were impressive, and furthered the team's resolve to make laser ablation technology a standard part of their tool kit.

FMF Cape Breton's successful implementation of laser ablation technology on the West Coast was not just a milestone for the facility, but a pioneering achievement for the Department of National Defence. The trials and the data collected have been instrumental in introducing this innovative technology to other stakeholders inside the Department, as well as external stakeholders. Specifically, the Canadian Coast Guard has shown interest, recognizing its potential as a less abrasive and more effective alternative to traditional methods for removing surface coatings.

The FMFs are proud to be leading the way on laser ablation technology for DND. As they continue to refine and expand the use of this technology, they are setting the stage for a safer, more efficient, and environmentally responsible approach to conducting maintenance across the fleet.

Rory Theriault is the Strategic Communications Officer for FMF Cape Breton in Esquimalt, BC, and FMF Cape Scott in Halifax, NS.

Key Advantages of Laser Ablation

- **Industrial Hygiene:** Laser ablation offers a safer, less intrusive method for removing surface coatings, significantly reducing the physical strain on workers.
- **Efficiency:** The precision and speed of laser ablation make it a more efficient tool for surface preparation, increasing productivity.
- **Environmental Safety:** The filtration systems and containment measures ensure that laser ablation has minimal environmental impact, aligning with DND's commitment to sustainability.

Photos courtesy FMF Cape Breton, Esquimalt.

A worker from FMF Cape Breton uses a laser ablation unit to remove surface coatings from a deck-fitting aboard HMCS *Max Bernays*.

The focused, pulse laser beam quickly exposes the underlying bare metal for inspection or resurfacing.

FEATURE ARTICLE

Looking Back: Ernest Apps and the Radar of Matapan

By Stanley Burke

[The following text is an edited and updated version of an article that was published in the *Amherst Island Beacon* in December 2014. It appears here with permission. The subject of the piece, **Ernest James Apps**, died February 1, 2003 at the age of 86. – **Editor**]

Remembrance Day is a good time to draw attention to a strange oversight in recognizing outstanding service in the Second World War. I refer to the action of Kingston-area resident **Ernest Apps**, the younger brother of NHL hockey star Syl Apps, who was the key man in one of the critical battles of the war. In the Battle of Cape Matapan in 1941 in the eastern Mediterranean northwest of Crete, he was the radar officer who detected three Italian cruisers, which were sunk in the principal action of the battle.

Apps was a 24-year-old RCNVR sub-lieutenant radar officer aboard the battleship HMS *Valiant* when he provided the range and bearing of the enemy ships, permitting the British fleet to move in to gunnery range. Then, as Apps noted in his diary at the time, Royal Navy battleships fired six broadsides with 15-inch guns and, as he said, it was "all over in five minutes. They never knew what hit them."

This was the key action in a battle in which one battleship was put out of action and four cruisers and 10 destroyers sunk. The battle changed the balance of power in the Mediterranean because, prior to Matapan, the large Italian fleet had to be presumed a potent fighting force and the freedom of action of the Royal Navy accordingly limited. The victory proved British superiority and freed significant forces for essential action such as the support of the beleaguered base in Malta and the subsequent offensive against Rommel in North Africa.

Matapan was historic in another sense, because it was the first naval battle in which radar was used for gunnery. Apps, as radar officer, proved the effectiveness of the new invention. During the battle, in addition to detecting the opposing fleet, Apps' radar (which he refers to as the 'cake mixer' in his diary) provided range and bearing to the British guns so that, when the ships arrived in firing position, virtually all that remained was to order Open Fire.

Images courtesy Apps family archives

Radar officer Ernest Apps survived the war to go on to distinguished naval and civilian engineering careers.

Following the victory, decorations went to Apps' commanding officer, to the ship's gunnery officer, to the officer in charge of the gunnery control system and to many others throughout the fleet. One went, interestingly, to another junior officer who played a relatively insignificant role, simply ordering searchlights to be trained on the bearing indicated by Apps' radar. He was a certain Prince Philip of Greece, nephew to Admiral Lord Mountbatten, later to marry Princess Elizabeth.

But why was the key man overlooked? Because he was a Canadian? Because the navy did not want to publicize radar? Perhaps, but a medal could have been issued without mentioning radar. There is one other possible explanation that's intriguing.

(Continues next page...)

The *Queen Elizabeth*-class battleship HMS *Valiant* in Alexandria, Egypt, 1941.

Valiant's 4.5-inch guns in action, Alexandria, 1941.

Paulette and Ernest's wedding photo, Alexandria, Feb. 29, 1942.

Apps had drawn the ire of his commanding officer because he was in love with a French girl, Paulette Dumortier, whom he intended to marry. His captain, pacing in his cabin, had angrily said that no British officer should marry a foreigner. Apps replied that he was not British and refused to break off the relationship. The captain then made preparations to have him returned to Britain.

Through a Canadian in the British consular service in Alexandria, the couple managed to arrange a civil service. With the marriage being a fait accompli, the captain relented and allowed Apps to remain with the fleet, where he continued a career filled with drama. For example, his ship, HMS *Valiant,* was next to the battleship HMS *Barham* when it was sent to the bottom by a German submarine with a loss of 800 men, one of the worst losses of the war.

As Apps said, "It could have just as easily been us."

Apps was one of close to 100 Canadians who served as radar officers in the Royal Navy, and who received little recognition for their services. The Royal Air Force had recruited virtually all the young electronic engineers in the U.K., so the Royal Navy looked to Canada. In the early years of the war, virtually all RN radar officers were Canadians. Four were killed, one was captured by the Japanese, some had ships sunk under them, and many were engaged in vitally important operations including the sinking of the German battleships *Bismarck* and *Scharnhorst*.

Along with Apps, another Kingston-area man who served as an RN radar officer was Able Trousdale of Sydenham, who agreed that not all Canadians received the credit they deserved for their naval service.

Ernest went on to serve distinguished naval and civilian engineering careers. A modest man, he never asked why his conspicuous service was overlooked.

Edited Notes from the Diary of SLt E.J. Apps

March 27, 1941:

Reported enemy fleet of 3 battle ships, cruisers and destroyers coming towards us.

March 28, 1941:

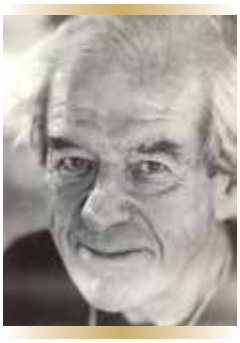
Reported enemy fleet 50 miles to west of us about 1130, still coming towards us with our cruisers leading them on. They turned off and made away at full speed. In (radar) shack at 2230 when spotted 2 cruisers 8 miles away, gave report to T.S. (transmitting station). Our cruiser on port beam opened fire, direct hits. Both (enemy) cruisers put out of action. We fired 5 broadsides, directed, blew one cruiser right out of water. That was all there was to it, over in 5 minutes. They never knew what hit them. Couldn't find the damaged battleship; figure she wasn't slowed down quite as much as was reported.

Attacked by 20 JU-88s in the afternoon. Two very near misses. I thought we had been hit, we shook so much. The whole ship actually rose up in the air about a foot and shook like a piece of jelly, then dropped down again. It was so close a person standing on the quarter-deck could have touched the bomb as it went by.

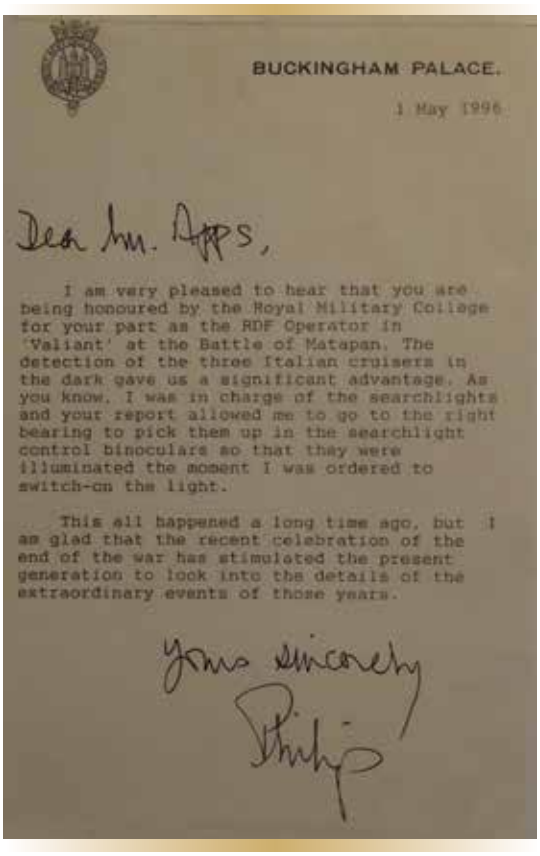
March 31, 1941:

I am to be mentioned in dispatches for my little part in the battle of Matapan. [No record of this honour actually being bestowed has been found. – Editor]

[**Editor's postscript:** Ernest James Apps retired as a commander (Electrical) and principal naval overseer for Ontario on Aug. 8, 1966. In 1996, he was recognized for his significant wartime contribution with an honorary Doctorate of Military Science from the Royal Military College of Canada. To mark the occasion, HRH Prince Philip sent a congratulatory note to his former shipmate, acknowledging the roles each of them played in that decisive night action during the 1941 Battle of Cape Matapan. Ernest's bride, Paulette Dumortier, died June 29, 1998 at the age of 76.]



Stanley Burke, a wartime naval veteran and former Amherst Island, Ontario resident, was a prominent Canadian television journalist. He died in Kingston, ON, May 28, 2016, aged 93.



BUCKINGHAM PALACE.

1 May 1996

Dear Mr. Apps,

I am very pleased to hear that you are being honoured by the Royal Military College for your part as the RDF Operator in 'Valiant' at the Battle of Matapan. The detection of the three Italian cruisers in the dark gave us a significant advantage. As you know, I was in charge of the searchlights and your report allowed me to go to the right bearing to pick them up in the searchlight control binoculars so that they were illuminated the moment I was ordered to switch-on the light.

This all happened a long time ago, but I am glad that the recent celebration of the end of the war has stimulated the present generation to look into the details of the extraordinary events of those years.

Yours sincerely

Philip

SECRETS OF RADAR MUSEUM

Secrets of Radar Museum, London, ON

Thousands of Canadian men and women who served in radar during the Second World War took an oath of secrecy that lasted for fifty years, keeping the truth even from family and friends. Some took the information to their grave. They were radar mechanics, operators, teachers, trainers, physicists, and researchers, whose actions, deeds, and experiences went largely unknown and unrecorded as many of the most important histories of the war were being written. Through physical exhibits, a substantial research archive, and oral histories recounted by the veterans themselves, the Secrets of Radar Museum in London, ON preserves their history.

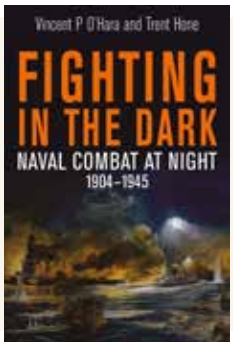
LFP_1945-08-22, Archives and Special Collections, Western Libraries, Western University.

Dr. Elizabeth R. Laird in the Physics lab at University of Western Ontario, 1945. The scientist came out of retirement to join the team conducting intensive radar research and its applications for defence on behalf of the National Research Council.

Credit: Collection of the Secrets of Radar Museum.

Coastal defence radar at an undisclosed site on Canada's east coast, c.1943.

Title of Interest



Fighting in the Dark: Naval Combat at Night, 1904-1945

Edited by Vincent P. O'Hara and Trent Hone

Published (2023) by Seaforth Publishing
www.pen-and-sword.co.uk/Seaforth-Publishing
ISBN: 9781399030519 (hardcover); ISBN: 9781399030526 (e-pub edition)
352 pages
Reviewed by LCdr (Ret'd) Ann Mech

While researching our feature article on Second World War **Radar Officer Ernest Apps** for this edition of the *Maritime Engineering Journal* (see p.15), we became aware of a 2023 Seaforth Publishing release called *Fighting in the Dark: Naval Combat at Night from 1904 to 1945*, a compilation of articles written by various naval historians.

What made this volume a title of particular interest to us was twofold. Not only does the book's overarching theme of mastering technological change during war include specific reference to the emergence of radar and the Battle of Cape Matapan — the focus of our Looking Back feature — the author of the final chapter is none other than **Michael Whitby**, former senior naval historian for the Canadian Department of National Defence, and co-author of the two-volume official history of the Royal Canadian Navy in the Second World War, *No Higher Purpose* and *A Blue Water Navy* (Vanwell Publishing, 2002 and 2007).

All seven authors in this compendium start with the proposition that it is hard to hit an invisible target, particularly one in motion. In the 19th century, when ships relied upon visual signalling, night battles at sea were rare and largely accidental. By the beginning of the 20th century, however, three inventions had completely transformed naval warfare by making combat in the dark not only feasible, but in some cases even desirable. These were the torpedo, the searchlight, and radio.

The process by which navies used the dark and adapted it into a medium for effective combat was long and difficult, more so for some than others. This book is about that process, and how Russian, British, Canadian, German, Italian, Japanese and US navies confronted the specific new challenges associated with emerging technologies for naval warfare.

The book's seven chapters are in fact a compilation of separate articles written by various respected historians. Presented in chronological order, the chapters illuminate how different navies and cultures approached common problems. The fierce nighttime battles that are described serve as a metaphor for the larger issues, and the reader is led along a fascinating journey of naval warfare from the Russo-Japanese War, through the First World War, to the Second World War, and from the Pacific to the English Channel. Of interest to radar enthusiasts and naval strategists, the Battle of Cape Matapan is discussed in detail in Chapter 4, "Forced to Fight: Italy, 1940–1943."

In the final chapter, "Controlling the Chops: Destroyer Night Action and the Battle of Ile de Bats, October 1943-June 1944," Michael Whitby describes the activities of the 10th Destroyer Flotilla (10 DF) that included RCN Tribal-class destroyers during operations in "the Chops," the narrow western entrance to the English Channel. Since planners for the invasion of northwest France required that the area between Plymouth and the north coast of Brittany remain under Allied control, 10 DF received the latest radar technology and training. The new Action Information Centre featuring the ARL plotting table (see *MEJ* 108 p. 23) provided a better picture of the tactical situation, along with improved protocols for sharing information between ships. Experienced captains such as HMCS *Haida*'s Cdr Harry DeWolf, who played a pivotal leadership role in 10 DF, made the most of the emerging night-fighting technology.

Fighting in the Dark is a fascinating read that uses historical context surrounding one aspect of combat at sea to highlight the necessities for success when embracing any new information technology: training, experience, confidence, and employing the best means of sharing the new capability's information. It is a message that never grows old.

Title of Interest

Ships of the Royal Navy: The Complete Record of all Fighting Ships of the Royal Navy from the 15th Century to the Present [Fully Updated and Expanded]

By Steve Bush, J J Colledge, Ben Warlow

Published (2021) by Seaforth Publishing; Re-released 2024
ISBN: 9781526793270 (hardcover); ISBN: 9781526793287 (e-pub edition)
520 pages
Reviewed by LCdr (Ret'd) Ann Mech

Self-described as the "ABC" of the fighting ships of the Royal Navy, this fifth fully revised edition was published in February 2021 and re-released in January 2024. "Colledge," as it is universally known, is considered the ultimate reference book for information on any British warship from the fifteenth century to the present day with its conventions and spellings of names used by museums, libraries and archivists. The first edition, published in 1970, was written by the late J. J. Colledge (1908-1997), and has been subsequently updated, corrected and expanded with a similar enthusiasm and attention to detail by Ben Warlow, a well-seasoned naval officer, author, as well as former editor and contributor to the magazine, *Warship World*.

Following an easy-to-use format, each warship is listed in both alphabetical and chronological order to track down the right ship, despite the Royal Navy's tradition of reusing the same names. Each entry provides concise details of dimensions, armament, and dates of service. The introduction states that it is hoped that most of the ships that have served at any time in the British Commonwealth navies are included, which in turn, means that Canadian warships are listed. This comprehensive reference book also includes ships that were captured by the British, such as Spanish and French vessels, along with their previous and currently known names.

The earlier fourth edition was last updated in 2010, so this new fifth edition contains more than 200 new entries along with many revisions to previous entries. This includes the many post-cold war ships that have now been decommissioned such as the Type 42 destroyers, Type 22 frigates, and the *Illustrious*-class carriers. There are also new additions with the introduction of the *Queen Elizabeth*-class carriers, the Type 45 destroyers, Type 36 frigates, and new patrol ships that will take on more global policing roles. Submarines are also featured with the cold war S and T classes being replaced by the *Astute*-class submarines, and the *Vanguard* class being replaced by the *Dreadnought*-class submarines. This new edition also includes Royal Fleet Auxiliary (RFA) vessels, which provide logistical support to the Royal Navy, and are now often deployed with front-line vessels. The commonwealth navies of Australia, Canada and New Zealand are also updated to reflect their new programs of destroyers, Arctic and offshore patrol vessels, submarines and support vessels.

Ships of the Royal Navy: The Complete Record of all Fighting Ships of the Royal Navy from the 15th Century to the Present, is an essential reference book for naval historians. With its handsome cover, and reasonable price, it would make a lovely gift for a fan of naval history.

Ships of the Royal Navy includes listings for modern RCN ships such as HMCS *Margaret Brooke* (AOPV-431), seen here entering St. John's Harbour in October 2024.

Photo by Brian McCullough

Awards

"Bravo Zulus" from Commodore Keith Coffen, DGMEPM, during the 2024 MARPAC Naval Technical Seminar.

Photo by Brian McCullough

Lt(N) Andy Lee

Lt(N) Lee has been serving as Naval Fleet School Pacific's Acting Marine Systems Engineering Division Commander for more than a year, allowing the division commander to focus on critical development projects. Lt(N) Lee professionally, effectively and compassionately runs a large unit with diverse and complex challenges, ensuring that training delivery is executed smoothly, and that Division personnel are well cared for.

Photo by Ann Mech

Lt(N) Jing Gao

Lt(N) Gao's professional curiosity led him to present a complex and well-researched seminar topic on the concepts of military deterrence espoused by the Royal Navy and the United States Navy, and how these relate to future Canadian strategy. His initiative in investigating a subject beyond his direct technical background gave our technical community a better understanding of allied naval methodologies.

Photo by Ann Mech

Lt(N) Yaro Savenko

In addition to planning the Naval Technical mess dinner, Lt(N) Savenko developed and delivered the two risk examples used for the Fleet Technical Authority (FTA) professional development session on Risk Assessment at the NT Seminar. Among his duties at FTA, he supports the unit as the divisional officer for personnel awaiting training, displaying excellent mentorship and administrative support.

Photo by Brian McCullough

Cdr Craig Piccolo

During the MARPAC NT Seminar, Cmdre Keith Coffen, DGMEPM, used the occasion to present Cdr Craig Piccolo (CO CFMETR) with a certificate and pin recognizing back-to-back Platinum Awards for demonstrated physical fitness in the Canadian Armed Forces. The rare achievement sets a high bar for what NT personnel in the community can attain through sheer will and dedication of effort.

News Briefs

Laser-focused Support

In October, Deputy Commanding Officer of FMF Cape Scott **Cdr Jesleine Baker** presented HMCS *Kootenay* (DDE-258) veteran and survivor **Allan "Dinger" Bell** with a small token of appreciation symbolizing the ongoing support of the Halifax fleet maintenance facility for the *Kootenay* family.

A laser cutout of the ship was manufactured using a new capability in the FMF's Sheet Metal shop. The metal laser cutter, which can handle sheets up to 5x10 ft, has proved to be a valuable asset for producing everything from large items to the most intricate of parts in support of RCN ship and submarine repairs. — **Submitted by Cdr Jesleine Baker**

Photo courtesy Jennifer Beauchamp

Welcome Home *Haro* and *Barkerville*!

(Courtesy Our Navy Today)

In August, two brand-new Naval Large Tugs, *Haro* and *Barkerville*, made their debut at CFB Esquimalt after an 8,500-nautical-mile journey from Québec.

Haro, named after the Haro Strait in British Columbia, will be a familiar sight as it navigates waters frequently traversed by RCN vessels. *Barkerville* carries the name of a Second World War Ville-class tug that sank in 1945 near Bedwell Harbour, British Columbia.

These modern tugs are equipped with the latest technology and will play a key role in supporting naval operations for the RCN's future fleet for many years to come. Their arrival marks an exciting enhancement to the Pacific fleet's operational capabilities.

The RCN's first two Naval Large Tugs were delivered in Esquimalt in late August.

Photo by Brian McCullough

News Briefs

Engineers Hoist a Glass for Charity

Photo by Christina Ferzli

Each autumn, in the lead-up to Remembrance Day, the members of the Canadian Naval Engineers Quart Club donate generously on behalf of Perley Health, an Ottawa retirement community supporting independent living and long-term care for more than 600 seniors, including military veterans. Since 1995, $80,605 has been raised for much-needed equipment and specialist services designed to promote the health and well-being of the veterans who call Perley Health's Rideau Veterans Residence "home."

The "Quartists," as the members refer to themselves, are a community of retired and serving Naval Technical Officers, Combat/Marine Systems Engineers, and Naval Architects who meet at various local Ottawa pubs and eateries about every six weeks, from September to June, to enjoy an evening of social comradeship over a glass and a meal. While the CNEQC has been in existence since 1992, the social club's roots go back to 1930 at the Royal Naval Engineering College in Plymouth, UK (see *MEJ* 61).

True to their legacy, the Canadian members gather to share experiences, provide mentorship, and show their respect to those who have gone before. The atmosphere is always warm, and very welcoming. Engineers young and old who are interested in joining the CNEQC are asked to contact **Peter MacGillivray** at pmacgillivray19@rogers.com for details.

Peter Ward Crosses the Bar

(Courtesy Our Navy Today)

The RCN lost a great friend, and Canada a great Canadian, with the passing of retired **Lieutenant (Navy) Peter Ward** on September 14 at the age of 93.

Ward was the last surviving member of the group that saved HMCS *Haida*, the Second World War Tribal-class destroyer known as Canada's "fightingest ship." Ward's father was one of 128 sailors killed the night of April 29, 1944 when HMCS *Athabaskan* was sunk by an enemy torpedo boat, with sister ship *Haida* fighting off the attacking vessel and rescuing many of *Athabaskan*'s survivors (see *MEJ* 60 and 107).

When *Haida* was due to be scrapped in 1963, Ward and four friends formed a non-profit organization to save the ship, risking their houses as collateral. In addition, when

His Royal Highness Prince Philip was on a visit to Canada, Ward took the opportunity to secure the Prince as *Haida*'s patron.

Thanks to Ward's efforts HMCS *Haida* is now moored in Hamilton, Ontario as a National Historic Site, where it also serves as the ceremonial flagship of the RCN.

To pay our respects, *Haida* flew its ship's flags and pennants to spell "Peter Ward 1930-2024" from September 27 to 29.

CNTHA NEWS (WINTER 2024-2025)

Canadian Naval Technical History Association

CNTHA News
Est. 1997

CNTHA Chairman
Pat Barnhouse

CNTHA Executive Director
Tony Thatcher

Directorate of History and Heritage Liaison
Lt(N) Jason Delaney

Maritime Engineering Journal Liaison
Brian McCullough

Webmaster
Peter MacGillivray

Webmaster Emeritus
Don Wilson

CNTHA News is the unofficial newsletter of the Canadian Naval Technical History Association. Please address all correspondence to the publisher, attention Lt(N) Jason Delaney, Directorate of History and Heritage, NDHQ
101 Colonel By Dr
Ottawa, ON K1A 0K2
Tel. (613) 998-7045
Fax (613) 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.

www.cntha.ca

DELEX – The Destroyer Life Extension Program

By Ken Bowering

The Destroyer Life Extension (DELEX) program of the 1980s was the first of the RCN's true post-war ship life-extensions programs. Similar to what today's Navy is dealing with to maintain the current fleet of *Halifax*-class frigates until the new River-class destroyers come on line, DELEX was necessary to keep the RCN's post-war steam destroyer fleet operational until the new frigates could be brought into service.

In the 1970s, Phase One of the Navy's Ship Replacement Project (SRP 1), later to become known as the Canadian Patrol Frigate (CPF) Project, was originally envisioned as a build program for a batch of six ships to replace the aging *St. Laurent*-class DDHs, and was to be followed by SRP 2 (CPF batch two of six hulls), and SRP 3 (six surface ships or submarines). At the time, the only certain aspect of SRP 1 was that it would be for six DDH helicopter-carrying surface warships, but getting several federal departments on board, getting past various review boards within DND and Treasury Board, and then finally getting Cabinet approval turned out to be an extremely slow and arduous process.

In the meantime, the Navy continued to operate its 20 Canadian designed and built "steamers" that were commissioned into service between 1950 and1964, along with four gas-turbine Tribal-class DDH-280 destroyers that were constructed in the early 1970s. The new Tribals were obviously still fully supportable at that time, but the *St. Laurent*, *Restigouche*, *Mackenzie*, and *Annapolis* classes comprising nine DDH and 11 DDE destroyer escorts, would reach the end of their expected service lives before any new ships would be delivered. This included even those ships that had already been converted and modernized as DDHs or Improved *Restigouche*-class IREs.

To see what might be required to bridge the gap to the next generation of surface warships, the Navy undertook to identify the incremental Operations and Maintenance (O&M) costs of operating and maintaining the steamers beyond their design lifetime. The idea was to use this information to convince government to minimize overall expenditure by approving SRP 1 and getting on with ship construction. This was done under a project called Destroyer Life-Cycle Cost Analysis (DELCA). The systems/equipment directorates within Director General Maritime Engineering and Maintenance (DGMEM) division at National Defence Headquarters in Ottawa duly assigned focal points to coordinate gathering information related to extending the capability of their respective systems/equipment.

RCN photo

HMCS *Assiniboine*: With DELEX, the RCN aimed to maintain its current capability for an additional 15 years.

Staffed as a cost analysis study only, DELCA asked the various design and maintenance authorities in DGMEM to come up with cost and timeline estimates of what would be required to maintain the capability of the steamer fleet for an extended period of about 15 years. Despite the basic rule that estimates were to reflect maintaining current capability only, without upgrades, certain same technologies were simply no longer available. The Gunar/Mk-69 surface and air gun fire-control system, for example, could only be replaced with the new (and more capable) solid-state design from the manufacturer Dynel, and vacuum tubes required for the electronic warfare (EW) equipment could now only be procured from within the USSR, obviously an undesirable situation. The situation with the EW gear led to the Canadian Navy developing its own new capability with the successful Canadian Naval Electronic Warfare System (CANEWS).

In the end, the design and maintenance authorities were able to produce costs and timelines to extend

(Continues next page...)

the service lives of the steamers. The information was going to be used for its intended purpose of trying to expedite approval for SRP 1, but before that could happen, DGMEM staff sought *and received* approval to allocate the funds identified by the DELCA study toward life-extension refits for the Navy's venerable steam-driven DDEs and DDHs. With that, the Destroyer Life Extension Project — DELEX — was born.

Under DELEX, the ships received new electronics, along with machinery and weapon upgrades, and hull repairs. Equipment and system modernization went from procuring a lifetime supply of spare parts, to replacing entire systems. CANEWS was one example of this that resulted in significantly greater operational capability not just for the steamers, but as a "fleet fit," with various configurations eventually being installed in all of the Navy's combatants, including the DDH-280s and, later, the CPFs. I believe this made it one of few "fighting systems" to be fitted so broadly.

When the DELEX refits were taking place, the Navy was also ready to install the new Automatic Data Link Plotting System (ADLIPS) in most of the DDE/DDH steam fleet, so some ships received this new naval tactical data system as part of their refit. The Navy was also developing its "SHIN" series of systems for the CPF Project, one of which was SHINCOM, the Shipboard Integrated Interior Communication System. Since some of the older communications systems in the steam destroyers were in need of replacement under DELEX, the Navy came up with REMSEVS, a by-product of SHINCOM that was brought about by DELEX. The newest ships, *Annapolis* and *Nipigon*, were also fitted with the Canadian Towed Array System (CANTASS) for improved anti-submarine sonar operations.

The last of the DELEX refits was completed in 1986. When coalition forces began preparing for deployment to the Persian Gulf in 1990, HMCS *Terra Nova* (IRE-259) was deemed the most capable of Canada's steam-powered destroyers for deployment to an active war zone, but the ship still required better sensors and weapons for self-defence and offensive operations. Fortunately, with the CPF Project well in progress, the Navy had already procured a number of additional combat systems, such as Phalanx close-in weapon systems (CIWS) and Harpoon surface-to-surface missile systems. To the credit of the entire naval support community, and the work of the Halifax Naval Dockyard, these and other systems were able to be quickly "strap-installed" aboard *Terra Nova* in a matter of weeks.

WANTED: New Members for CNTHA

Do you have a passion for naval history, and a yearning to preserve the legacy of the RCN technical community's great innovations? The Canadian Naval Technical History Association has a place for you!

Since 1996, a small group of CNTHA volunteers has been gathering information on a wide range of naval technical subjects, both in support of DND's Directorate of History and Heritage, and in support of our own web-based archive at www.cntha.ca. Oral histories, online group discussions, independent research — we do it all to ensure that the Navy's technical challenges and accomplishments of the past are not forgotten.

Most of our members are RCN retirees, and if this grand project is to remain a vital activity for years to come, it will take new generations of like-minded enthusiasts to step forward as "knowledge keepers" of Canada's naval technical history. Whether your experience is based in marine or combat systems, naval architecture, technical project management, or the infrastructure that supports naval platforms and equipment, your input would be most welcome. We look forward to hearing from you.

Tony Thatcher
CNTHA Executive Director
jathat@rogers.com

In some ways DELEX can be viewed as the project that was never supposed to actually happen, but without it the Canadian Navy would likely not have been able to contribute as well to the operations in the Persian Gulf. The most important impact of DELEX, of course, was that it enabled the steam-driven DDEs and DDHs to remain operationally useful until the 12 patrol frigates began to be commissioned into service in 1992. It also sent a strong message to the design and maintenance authorities that planning for life-extension projects is an integral part of a ship's life-cycle materiel management. Finally, DELEX laid the path for future fleet modernization and life-extension projects that have ensured our fleet's capabilities are maintained until the next generations of ships and submarines can be procured.

Thanks to DELEX, HMC ships *Terra Nova* and *Restigouche* (seen here) were in good shape for quick weapon upgrades before deployment to the Persian Gulf in the early 1990s.

CAF photo