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Maritime Engineering Journal

76
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Canada's Naval Technical Forum

Spring 2015

"Airgun technology" – The Naval Engineering Test Establishment's heavyweight shock test trial of the Maritime Helicopter Project crane

CNTHA News Inside!

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Canada

Journal Issue No. 75 Launch

HMCS Bytown Naval Mess, Ottawa

Nov. 26, 2014

The special launch of the *Journal*'s issue no. 75 brought together five of the Navy's current and former "engineers-in-chief," along with some other distinguished guests: (Left to right) RCN commander Vice-Admiral Mark Norman, former associate editor Bridget Madill, Commodore (Ret.) Bill Broughton (DGMEM 1988-90), production editor Brian McCullough, Commodore Marcel Hallé (DGMEPM), Rear Admiral Patrick Finn (COS Materiel; DGMEPM 2010-13), Rear Admiral (Ret.) Bill Christie (DGMS 1970-72), and Commodore (Ret.) Jim Sylvester (DGMEPM 1997-2003).

Photo by Cpl Heather Tiffney, CFSU(O) Imaging Services Ottawa

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The Maritime Helicopter Project crane's heavyweight shock test trials were a success.

Photo courtesy: Naval Engineering Test Establishment

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Commodore's Corner

By Commodore Marcel Hallé, OMM, CD

Focusing on competency today is the key to future success

The conclusion of 2014 saw the delivery of significant operational capability to the RCN. Four modernized frigates from the $4.3 billion Halifax Class Modernization and Frigate Life Extension (HCM/FELEX) program were delivered to the Navy earlier than the scheduled Initial Operational Capability date, the submarine program achieved steady state with three submarines at sea, and the *Kingston*-class fleet was force-generated back to full strength. That we were able to achieve this is due to considerable effort from a defence team encompassing those in uniform, public servants and industry. You can all take great pride in these significant accomplishments.

The work we do to ensure our fleet units remain fit for purpose, safe and environmentally compliant is complex and needs to be carefully executed within a prioritized and risk-based framework. What underpins our ability to do this is the professionalism and unique competency of each individual on the defence team. As we prepare to cut steel this fall in building the first of our new fleets after a long shipbuilding hiatus, it is through projects such as HCM/FELEX and the submarine program that we have developed and honed our skills in a manner that will greatly reduce risk to the National Shipbuilding Procurement Strategy's fleet renewal program – projects that are referred to as *NSPS 0*.

In some cases the skills and competencies have been recently grown, as was cognized when several recipients were awarded the ADM(Mat) Project Management Competency Development certification at the latest Professional Development seminar in Ottawa. I offer them my hearty congratulations, and encourage others to pursue this certification that adds to the growing body of knowledge that will contribute to the sound management and support of the Navy's complex projects in the coming years.

A key initiative in this direction is the Future of In-Service Support (FISS), where efforts are in play to increase the collaborative approach between DND and industry. Establishing Integrated Project Teams (IPTs) within NDHQ, or mixed teams in our dockyards that include industry representatives, will further optimize support to the fleet by allowing the various team members to learn from one another and so develop new skills and competencies through these collaborative means. The Treasury Board Secretariat's Interchange Canada program is one way in establishing IPTs as successfully piloted by DGMPD(L&S).

Experience at sea is also important. As Commodore Luc Cassivi so correctly points out in his guest editorial beginning on the next page, the unique skills and experience gained by the Navy's technical officers and non-commissioned members during their time at sea offer a critical bit of context to the overall competency development of the military members of the defence team. But so do the specialized experience and skill sets of the public servants and industry professionals who round out the rest of this team.

One thing is clear. As the technological, programmatic and legislative complexities of supporting our current and future fleets continue to grow, so too must the knowledge, skill and competency levels required of each one of us. As we have done throughout the RCN's 105-year history, we must continue to be innovative in creating opportunities to do things smarter through professional collaboration and personal education – tenets we must hold dear as we deal with the issues of today in preparing for the challenges of tomorrow.

FORUM

Guest Editorial – Building Context for the Value of Sea-going Experience

By Commodore Luc Cassivi, OMM, CD, MBA, BSc
Director General Naval Strategic Readiness, NDHQ Ottawa

Photo by MARPAC Imaging Services Esquimalt

> *"Too often we see examples of officers who seem to suffer an instant purge of their memory upon being posted ashore. Canadians have invested too much in you for it to be wasted so quickly."*

It was with great pleasure that I accepted the invitation of editor Capt(N) Simon Page and production editor Brian McCullough to write for this edition of the *Maritime Engineering Journal*. In the spirit of full disclosure, I have read the *Journal* before with great interest – particularly with regards to submarine issues (*Quelle surprise!*) and major project stories. The *Journal* is a unique communication tool for your professional community and I understand that readership is widespread across the whole of the naval technical support family.

A chance encounter with Brian last year at the *Bytown* naval mess was when he first broached the subject of writing for the *Journal*. He referred me to Capt(N) (ret.) Dave Kyle's 1995 article, "A Commanding Officer's Expectations of the MARE Department Heads" (MEJ no. 34), as a good example of a well-received seaman officer's contribution to the *Journal*. It is indeed a great piece that is as valid today as it was then. Capt(N) Simon Page also wrote a great Forum piece last year about his personal sea-going experience and the impact it had on him as a professional engineer ("The Value of Sea Time," MEJ no. 73). My goal is to add to this body of knowledge and build a context that I hope will put in perspective the importance of a naval technical officer's early sea-going years as it relates to the varied tasks he or she will accomplish later in what can be a very exciting career.

I use the word "context" because I think it is crucial to everything we do and is particularly important when you think of your career. The Royal Canadian Navy is a fighting service, yes, but it is also a knowledge-based institution. We are all engaged in a career-long adventure in adult education, some of it formal and some of it very much less so. It is the latter I intend to focus on here. We attempt to learn what the right thing looks like in everything we do and we learn considerably more from our mistakes if we dare to admit to them and analyze them. Furthermore, this is a team sport. Everything we do has an impact on a part or the whole of the institution of the RCN – maybe not right

away nor in a very visible way, but perhaps on a decision-making process down the road. From an adult education perspective, you will learn much more from an experience if you have some context as to what you are supposed to get out of that experience. This will help create an "aha" moment that makes learning more fruitful.

Okay, back to your early days at sea – the most important time of your career.

The opportunity to gain a deep understanding of how a warship works in all of its aspects is invaluable and its importance cannot be overstated. You will be working hard to qualify at each level on the path to becoming a head of department. You will participate with pride in the unit's assigned mission and contribute to international security and the strategic objectives of Canada. It is hoped that in the process you will be having loads of fun. That being said, everything you do after these exciting years will be anchored by your understanding of what makes a ship work. For example:

- What can you expect a department of a certain size to accomplish?
- What is the effect of watchkeeping on productivity?
- How do the "elements" affect performance?
- How do the ship's routine and mission affect the performance of planned maintenance?
- What is the scale of effort required to prepare a ship or submarine for deployment?

These are a few of the questions for which you should have some comprehension of the answers so that you can function later in the interest of our most important mission – producing combat-capable units from the fleet-in-being and developing the future fleet to do just that.

A ship or submarine as a system is remarkable enough, but just add the complexities the crew brings to it and you have a system of systems as amazing to observe and understand as the human body in many ways. For technical officers, seeing a ship progress through a tiered readiness program is likely the greatest of learning opportunities. While it is relatively easy to get from point A to point B when all of the RCN's resources are focused on making your unit a high-readiness asset, ensuring the highest possible level of preparedness in units at lower readiness levels can prove to be extremely challenging. That point is not lost on our leaders. I would also offer that workups is the best tool available to you in order to fully understand the potential of your unit. Workups is hard work, but the experience is most rewarding.

A few things you should put in your bag of knowledge before you finish your sea-going years: technical competence (obviously); a deep respect and appreciation for those who do the work in often very difficult conditions (your sailors will spend more of their career at sea than you will); strong communication skills (briefing your department regularly and briefing your CO about defects should generate that); and humility (you will not have all the answers, but that's okay; no one expects you to… at first). Ultimately, you have a duty to remember those years and keep the knowledge you have amassed alive. Too often we see examples of officers who seem to suffer an instant purge of their memory upon being posted ashore. Canadians have invested too much in you for it to be wasted so quickly. But above all, your sea-going experience will assist you in developing your leadership to a level you could not imagine.

"The opportunity to gain a deep understanding of how a warship works in all of its aspects is invaluable and its importance cannot be overstated."

Leadership is the cornerstone of everything you do as a professional in uniform. Dealing with the good, the bad, and the ugly will be difficult. Your team will challenge you significantly at times with technical and personal problems that require your undivided attention. The decisions and recommendations you make to assist a shipmate at a troubled time, or to keep a ship or submarine on station despite technical adversity, will have to be weighed against the impact on equipment survivability and personnel safety. It is challenging and satisfying work. You will be able to test what you are made of, what level of stress you can operate in, how your personal style affects the team you are leading, and how best to get the most out of your team. More importantly, the perseverance you display throughout your training, coupled with the tenacity with which you execute your duty at sea, will earn you the respect of your sailors and will frame your reputation with the naval leadership for years to come.

At sea is where you, very early on, establish your professional reputation. Treat your time as head of department as your own command. You could easily receive a command

recommendation out of it from your captain and fleet commander; the RCN has plenty of non-seagoing commands that are extremely rewarding and accessible to you.

Equally important is what you will learn in the management of your department and the workings of it. From a contextual perspective, think of it like this: everything you do is a project that needs to be managed. Technical readiness, planned maintenance routines, work periods, leave periods, training requirements, and ship-wide activities are just a few elements of the grand project that is the life of a ship or submarine. These make you understand early on the complexity of the human activities happening on board and the need for a coordinated effort across a wide spectrum of specialties, timely and open communications, strategic awareness, detailed planning, and so on.

As you progress in your career you will be called upon to manage larger and larger projects. Each of these will have its own challenges in both time and space, but if you think back to your time at sea you will see that you have already developed the confidence to tackle any challenge. Project management is basically the application of logic to a complex problem to create a coordinated approach to solving it. It is fundamentally rooted in experience that must be hard-won. If you need more help in that field, don't be shy to ask your commanding officer for some flexibility to get the project management training or certification you need. It will be a wise investment of your time.

There will be life after your sea days and all roads lead to Ottawa. You have all heard the "I'm from NDHQ and I'm here to help" cry – and the predictable reaction of the target audience. The sarcasm is rooted in two very important elements: the perception that this person will likely make the problem more complicated by applying the multi-layered processes that thrive in our bureaucracy, and the impression that this person is so removed from the reality of life in a ship or submarine that it is somewhat improbable, if not impossible, for him/her to be of great help. All the more important that you take your sea-going experience ashore with you, and get whatever additional professional skills you require.

I remember the early days of the *Victoria*-class submarines when a great group of technicians and engineers at DGMEPM inherited design authority responsibility for the class. The experienced submariners saw first-hand the effect that certain staff members who did not have experience in this class of submarines had on the ability to move forward with confidence and manage risk in a balanced way. This is not an attack or an attribution of blame on anyone involved in the project in that era, but a statement of the reality we faced. It took time for the team to gain a full understanding of the systems they were responsible for, how they interrelated, and how the crew operated them. Opportunities were created for life-cycle materiel managers and other staff to get out for visits and sea rides to help them gain the experience they needed to manage their systems with confidence. A very worthwhile investment indeed.

I have been blessed in my career with many opportunities to command at sea and to mentor and coach future generations of leaders, particularly seaman officers and technical officers. I can state with confidence that their success both in and out of uniform can be directly linked to the lessons they learned at sea – the value of comradeship, teamwork, sacrifice, and hard work. They learned what it means to be part of something bigger than themselves, and felt the reward of a job well done with shipmates. More importantly, they continued to carry these "sea lessons" forward throughout their careers.

By applying our hard-earned sea experience to the challenges we face on a daily basis as we look after the needs of the current fleet and prepare to deliver the fleet of tomorrow, we understand the context of what it is we are doing. In the process we make life better for ourselves and for those who follow.

Isn't this the best job ever? I wish you all much success.

Commodore Luc Cassivi joined the RCN in 1983 and went on to command three Victoria*-class submarines, the frigate HMCS* Ville de Québec*, and CFB Esquimalt. He took up his current appointment as Director General Naval Strategic Readiness last August.*

Courtesy the author

A young Luc Cassivi at sea in HMAS *Onslow*.

FORUM

Maintenance Reporting through DRMIS at the Deckplate Level – Present and Future

By LCdr Roberto De Marco, MSEO and LCdr Jeffery Vanderploeg, CSEO

Photo by MS Peter Reed, Formation Imaging Services Halifax

An electrician aboard Her Majesty's Canadian Ship *Toronto* checks the circuit board as part of regular maintenance on October 6, 2014 during Operation Reassurance while patrolling in the Mediterranean Sea.

[The authors deployed as the Marine Systems and Combat Systems engineering officers, respectively, aboard HMCS *Toronto* on Operation Reassurance in the Mediterranean and Black seas from July 2014 to January 2015. – Ed.]

As engineering officers returning to the fleet aboard HMCS *Toronto* (FFH-333), one of the most noticeable changes we found on board ship was the impact that DRMIS – the Defence Resource Management Information System – has had on the daily operation of our departments and the readiness of the ship: Formation commanders and engineering authorities have more oversight on the conduct of planned and corrective maintenance, while monitoring the status of ship's systems and the impact on operations.

The following is a deckplate level snapshot of the present state of DRMIS use on a high-readiness ship. In it we identify some deficiencies in how DRMIS is used at present, and offer some recommendations for improvement.

Training and Mentorship

By 2012, DRMIS training was incorporated into most formal courses for officers and non-commissioned members (NCMs) of the MSE and CSE departments, as well as for supply technicians and naval communicators. Although these courses laid a good foundation, training provided in a block early into a six-to-18-month training period ashore is sometimes forgotten by the time it is needed on board. For officers with an oversight role, a sub-lieutenant may receive a five-day DRMIS course early

in his training, but then not get a chance to use DRMIS until his tour as assistant head of department (AHOD) two or three years later.

More timely and tailored training is required for officers and junior NCMs. It needs to be provided at the right time, so that on-the-job experience builds upon the lessons learned during the formal training. To mentor our team, Andrias Riihimaki from the DRMIS Centre of Excellence came to sea for four days and validated shipboard practices with different audiences: junior technicians, supervisors, chiefs and officers, followed by a brief to the command. Coaching received at sea with problems of immediate practical importance focused technicians' attention on DRMIS over a period of several days and allowed them to have questions addressed as they arose in their work environment. Assistance of this kind should be available to the fleet whenever possible.

> *"The more accurate the information in DRMIS, the better the picture that command will have of the readiness of the fleet."*

Communication of Expectations

Although it was evident that maintenance was being done and being recorded in DRMIS, information was not leaving the ship in the most efficient or timely manner. Use of the program was imbalanced, and some who ought to have been regular users by virtue of their position were unsure even of their ability to log in, let alone make regular entries. This was partly because expectations for the use of DRMIS had not been well communicated, i.e., there were few formal directions on how and when DRMIS was to be used. Such institutional directions that exist[1] are very high level and do not give guidance at a ship level, let alone to a technician. Among the petty officers there were a few resident subject matter experts who conducted the majority of DRMIS transactions for their section or department. While this allowed maintenance to be recorded, data accuracy and reporting frequency suffered when key personnel were posted or on leave.

To improve this situation, we met with our supervisors to set clear expectations for use: that a plan be made for completing planned maintenance each month, that maintenance be signed off as it was completed, that defective parts be returned with corrective maintenance orders attached, that counter readings be verified and entered, that the completion of these tasks be reviewed monthly by supervisors, and so on. Future practice should be to have Phase VI and AHOD trainees employed as maintenance sub-managers for tracking maintenance in DRMIS. This will ensure that officer trainees get used to working with DRMIS early in their career.

Interdepartmental Liaison

At the departmental level there were obvious differences in how DRMIS is used. All departments have at least some users. The deck and air departments record their own maintenance activity, and DRMIS is essential to the daily work of the supply section of the logistics department. Naval communicators in the combat department manage the server and accounts. Some stovepipes were evident. For instance, the engineering departments compared neither tracking data nor progress toward the completion of planned maintenance. When a large number of outstanding corrective maintenance routines was noticed in DRMIS, it became clear that the difficulty of the logistics department to even return defective parts while the ship was deployed was behind the backlog and the ostensibly "negative" statistics in DRMIS.

These challenges are easily overcome with better communication between departments, but require clear direction and regular examination of what is really an all-ship resource. The benefits are obvious but not yet fully realized. Where the state of spares for a given system is known and correlated with the maintenance state of the system, a more detailed picture of not just system status is created, but also of the likelihood that the system can be sustained for a prolonged period.

Computer Access

There are practical realities of computer access that impede their use, as availability in each department varies. The supply section shares six computers among nine supply technicians. The CSE department has one computer for every three people. The deck and MSE departments have only one computer for every six people, and when one

1. The Treasury Board of Canada Standard on Enterprise Resource Planning (ERP) Systems mandates a requirement to have a system such as DRMIS in DND, but the guidance in it and related documents are policy statements not sets of expectations for users (http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=25687&section=text). The Naval Materiel Management System Manual (NaMMS) mandates DRMIS as the ERP System for the RCN.

realizes that the officers, chiefs, and petty officers use the bulk of these full time, the technicians actually doing the maintenance must often queue for a computer. The reality is that planned maintenance is often signed off in blocks by supervisors relying on memory of what has been done recently.

More computers are required on board if sailors are expected to use DRMIS regularly. Without them it is too easy to fail to record maintenance as it is completed – or at all. Similarly, with more computers available to generate detailed orders for corrective maintenance, time can be saved for the Fleet Maintenance Facility technician or planner who must interpret what the ship wants done.

Operational Readiness

Maintenance reporting through statistics pulled from DRMIS has only recently appeared on the radar of senior officers outside of the engineering community. Studies and experience of the past decades have clearly identified a need for validation of planned maintenance routines and a better coordination of the engineering, logistics, and financial spheres as intended through DRMIS. A major equipment failure will always get a lot of attention ashore – but the full maintenance picture of outstanding planned and corrective maintenance, and the state of onboard stores may say much more about the readiness of a ship to sustain operations.

Ultimately the proper reporting of the technical and materiel state of the ship is an operational capability; the more accurate the information in DRMIS, the better the picture that command will have of the readiness of the fleet. Better information will enable commanders to make decisions when determining how long it will take to prepare a ship for deployment, how long a ship can deploy before her technical state may require her to return home, or what the operations and maintenance and national procurement budgets must be. These perennial concerns speak directly to the readiness of the fleet. By instilling a DRMIS culture on board, we are maintaining a current record of our technical readiness, and helping to sustain the fleet in its operations.

Photo by LS Dan Bard, Formation Imaging Services Halifax

Information captured through the engineering, logistics, and financial spheres of the Defence Resource Management Information System (DRMIS) can say much about the readiness of a ship to sustain operations.

FEATURE ARTICLE

NETE Test Report: Maritime Helicopter Project Crane – Heavyweight Shock Test Trial

By Chris Richter CD, PEng
Images courtesy Naval Engineering Test Establishment

Introduction

The Naval Engineering Test Establishment (NETE) was tasked by the Directorate of Naval Platform Systems (DNPS 2-5)to conduct a series of heavyweight shock test (HWST) trials on the Maritime Helicopter Project (MHP) crane that was originally fitted on board HMCS *Montréal* (FFH-336). The crane would be removed from the ship and secured aboard a special NETE floating shock test platform in Halifax Harbour before being subjected to a series of explosive underwater shocks. In lieu of using traditional explosives to create the shocks, *airgun* technology would be used for the first time on a commissioned HWST equipment trial for DND.

Initial Action and Preparations

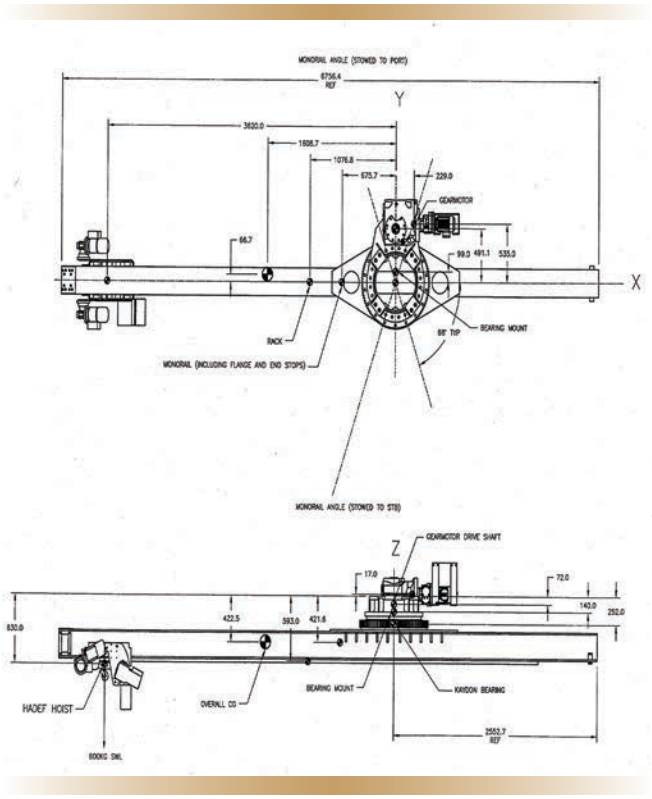
A notification was raised by DNPS 2-5 to Fleet Maintenance Facility Cape Scott (FMFCS) in Halifax concerning the removal of the MHP crane (Figure 1) and its associated support assembly from HMCS *Montréal*. Scheduling the FMFCS activities and prioritizing the use of resources to allow the crane to be removed at the beginning of an intensive maintenance work period for the ship was made possible through the tremendous support of Maritime Forces Atlantic engineering operations (MARLANT N-37), FMF's Mid-Life Refit Project Manager (PM3), and HMCS *Montréal*'s project leader team.

Figure 1. The MHP crane as fitted in HMCS *Montréal*'s hangar. The ship was the designated frigate for the Maritime Helicopter Project acceptance trials.

Concurrently, NETE's naval architect designed a test fixture based on the support structure arrangement for the crane while it was fitted in *Montréal*. The result was a simple, robust structure comprised of two main assemblies: The *crane support* suspended the MHP crane by the pedestal mount, and the *latch support* replicated the port bulkhead structure that secured the latch in the stowed position. Once the test fixture fabrication was complete it was coupled with the MHP crane on the heavy steel platform of the Deck Simulator Fixture II (DSF II) that would be placed aboard NETE's floating shock platform barge (Figure 2).

The DSF II supports the unit under test and transmits the desired frequency response by varying the arrangement of supporting pins, and counter-ballasting if necessary, prior to the platform being shocked with the airguns. The fixture was aligned and welded to the deck of the DSF II in order to properly orient it for the shock test. Representatives from Rolls-Royce Canada (the original equipment manufacturer), General Dynamics Canada and Fleetway Inc. witnessed the installation prior to testing.

An extensive amount of coordination was critical between the various stakeholders at Shearwater Jetty NA, off of which the platform was moored and where the trials were conducted August 19 and 20, 2014, to allow the airgun operation without impacting Fleet Diving Unit (Atlantic) operations and training. Key stakeholders, primarily the diving unit, the Queen's Harbour Master and MARLANT N-37 were tremendously supportive, and without their flexibility, agile response and solid support these trials would not have been possible.



Technical drawing courtesy Brooke Ocean Technology Ltd.

Figure 2. The MHP crane was coupled to a specially fabricated test fixture that was attached to an instrumented deck before being installed aboard NETE's floating shock test platform.

Jetty NA was staged with the HWST equipment required to meet the test criteria, namely a 20-airgun planar array, complete with athwartships component (Figure 3). Due to some extensive annual maintenance that was carried out on the array over the winter months, a series of integrity trials was conducted under NETE's maintenance tasking. The airguns performed flawlessly, largely as a result of the rigorous maintenance program and ideal environmental and ambient conditions.

Figure 3. The airgun array assembly staged on the jetty at Shearwater at the south end of Halifax Harbour. While the use of airgun technology in lieu of traditional explosives was a first for DND on a commissioned heavyweight shock test equipment trial, the technology itself had been trialled in 2009 using a retired submarine as a test subject.

MHP Crane HWST Trials

The actual MHP crane heavyweight shock test trials (Figure 4) were carried out over two days, with one test shot conducted each day – the lower pressure test shot (750 psi) occurring August 19, and the higher pressure test shot (1,000 psi) on August 20. The airguns are rated to operate at pressures up to 3,000 psi. Following standard preliminary checks of the equipment, low-pressure underwater "free-field" shots were fired away from the test platform just ahead of the trials to

warm the system through and prove airgun performance without disrupting the test platform. The free-field shots also acted as warning shots required under the standing environmental assessment for marine mammal mitigation.

Over the course of the two days, pre-test preparations and checks were carried out including setting the torque on the fixture assembly. Instrumentation on the test rig consisted of three accelerometers (Figure 5) – two mounted atop the crane support top plate (one vertical and one athwartships), and one mounted vertically at the centerline/midships position of the DSF II. Observations during the post-shot inspections revealed two minor oil leaks and a deformed mounting bracket for a control/electrical box. No major parts fell off, parted or dislodged from the MHP crane during the testing.

Figure 4. The floating platform carrying the MHP crane and support fixture reacts to a test shot from the submerged airgun array.

Conclusion

Execution of the heavyweight shock test trials of the Maritime Helicopter Project crane in accordance with the test instructions was deemed successful. Following the trials the floating shock platform with the MHP crane still coupled to the fixture on the DSF II was cold moved by tug back to Jetty NL at the Dartmouth Dockyard Annex using Queen's Harbour Master support. Coordination of the MHP crane removal and return to Rolls-Royce Canada for a detailed strip-down and inspection is presently underway. The crane will be overhauled and returned to HMCS *Montréal* so the ship can continue with its MHP program.

Through the tremendous support from coastal agencies, most notably N-37, the Queen's Harbour Master and Fleet Diving Unit (Atlantic), these trials were a success. The NETE HWST coastal team is anxiously anticipating and planning for future equipment tests.

Christopher Richter is a senior engineer with the Marine Systems Division at the Naval Engineering Test Establishment in Halifax, NS.

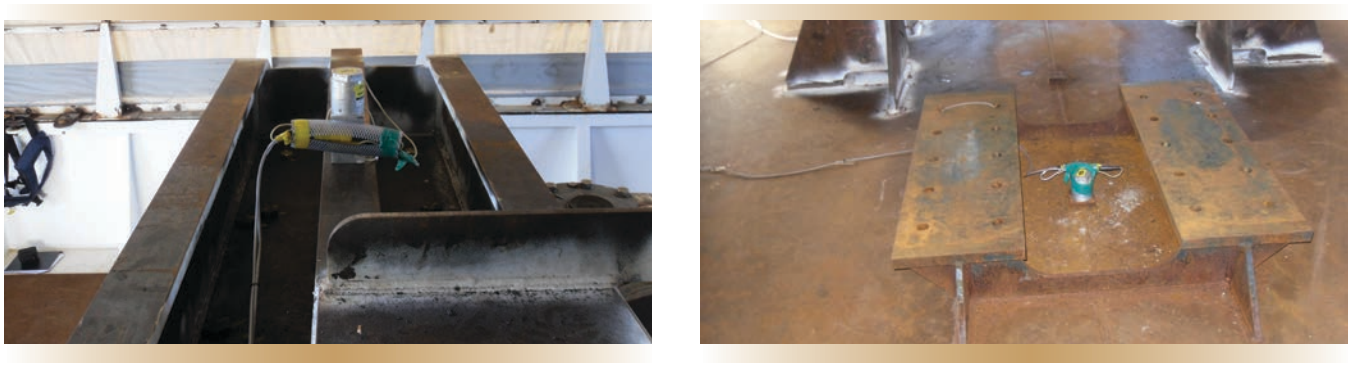


Figure 5. Accelerometers attached to the crane support (left) and to the heavy steel platform of the DSF II deck simulator fixture returned data that verified the proper execution of the heavyweight shock test trials, which were deemed a success.

FEATURE ARTICLE

Deeply Complicated: Canadian Submarine Procurement Options • Part One – Design Options •

By Cdr A.J. March

Photo by MCpl Daniel Mallette, MARPAC Imaging Services Esquimalt

HMCS *Corner Brook* (SSK-878), one of four Canadian *Victoria*-class submarines.

[Editor's Note: The author presented a fully referenced version of this paper as part of his staff college course requirements at the Canadian Forces College in Toronto in 2014. The paper sets out the most likely submarine procurement options available to the Royal Canadian Navy in the coming years. In this first of two parts, condensed slightly due to space restrictions, Cdr March offers an overview of the various submarine **design** options available in the marketplace. The RCN's **build** options – and the author's rationale for a course of action he recommends – will appear in the *Journal*'s Summer 2015 issue.]

Canada has operated submarines for almost a century, with the *Victoria* class (ex-*Upholder* class) being the current platform. These submarines have a complicated history, having entered service in the Royal Navy in the early 1990s, being taken out of service in 1994, sold to Canada in 1998, and re-entering service between 2002 and 2004. The original service life was 26 years, with the potential for an extension of perhaps five to 10 years, making the mid-2020s to mid-2030s the timeframe for a replacement Canadian submarine capability. There are potential risks associated with the various possible replacement options and it can be argued that the optimum solution for Canada is to procure a minimally modified, military off-the-shelf (MOTS) design, built off shore, but supported in Canada.

This conjecture, occurring within the context of the contemporary resource-constrained Canadian military procurement environment, requires the establishment of two key assumptions: First, that a follow-on submarine capability is something Canada will proceed with. This is currently not clear and it is acknowledged that neither the Canada First Defence Strategy (CFDS) nor the National Shipbuilding Procurement Strategy (NSPS) refer to replacement submarines. However, since the mid-1960s Canada has consistently invested in a submarine capability, mainly with the *Oberon* class, which was updated in the early 1980s, and then with the replacement *Victoria* class in the late 1990s. The ongoing investment in the *Victoria* class illustrates the contemporary place submarines have in what the CFDS describes as "a fully integrated, flexible, multi-role, and combat-capable military." The 1994 White Paper on Defence provided qualified support for submarine acquisition and identified their unique surveillance capabilities and utility in the joint environment. While there is ongoing debate about the future, let's assume that Canada will continue to invest in a submarine capability within existing resource means.

The second assumption is that the focus will be on only conventionally propelled submarines. The principal rationale behind this is the significantly greater acquisition and support costs associated with nuclear propulsion.

Historically, the unit production cost is approximately three times more expensive, with an American *Virginia* class costing USD 2.7 billion in 2013 and a French *Barracuda* costing USD 2.1 billion in 2011. For comparison, a large modern SSK has a unit cost of approximately USD 650 to USD 800 million. Furthermore, additional sustainment costs to safely maintain a nuclear propulsion plant, along with larger crew sizes, drive resource requirements higher. Also, the Canadian public has a largely negative reaction to the word *nuclear* that poses an additional political challenge. While offering a significantly greater operational capability, the cost argument alone is sufficient justification to exclude the nuclear option from further analysis.

Solution Space

The options for the design and build of a submarine span a range from a completely indigenous solution to one that is a pure MOTS design built overseas. It is important to note that currently only eight countries have a complete, proven submarine design and build capability: the United States, United Kingdom, Japan, Sweden, China, Russia, France, and Germany. Only the last four offer conventional MOTS submarines for export. The marketplace is evolving, with Spain offering an export version of its indigenous S-80A design under development, Sweden having recently repatriated its submarine capability back to national control from German ownership, and Japan exploring the limited export of defence technology. The absence of the US from this list is of particular note. While the US and the UK have the capability, neither offers a production-ready conventional design. The result is a limited market where, excluding Russia and China for practical concerns, there are a maximum of four international submarine design-and-build options.

From a build perspective, a range of options exists. In addition to the full-spectrum constructors noted above, there are a number of countries that have licence-produced submarines in the last decade, including: South Korea, Italy, Australia, Turkey, and Pakistan. There is a range of build competencies, and in some of these cases extensive materiel kits, and sometimes even complete or partially complete sections, were supplied by the original equipment manufacturer (OEM) with varying degrees of assistance provided to the local shipyards. Domestic production is a feasible option for Canada.

The marketplace for western MOTS submarines is limited, with only France and Germany currently offering new-build export submarines. French shipbuilder DCNS currently offers several variants of the *Scorpène*, with displacements ranging from 1,790 to 2,010 tonnes. Currently in service in Chile and Malaysia, it has been selected by India and Brazil with a total of 14 built or planned. Germany's Howaldtswerke-Deutsche Werft (HDW) is the prominent Western conventional submarine builder and offers four MOTS options. The legacy Type 209 dates from the late 1960s but continues to be built for export. Since 2005 the German Navy has operated the more modern 1,830 tonne Type 212A, 10 of which are in service or planned (including four for Italy). The improved Batch II versions that entered service in 2014 are the most modern conventional submarines in any NATO navy. The export Type 214 does not offer the same level of technology as the Type 212A, but does offer greater range and endurance. It has been successful in the market, with 21 built or planned. HDW also builds the Type 800 *Dolphin* class for Israel, with the last of six planned to enter service in 2017. The details of this design are sparse, although the second batch is the largest submarine made by HDW, displacing over 2,300 tonnes. DCNS and HDW both offer smaller coastal submarine designs, but these have not yet been proven in service.

"The options for the design and build of a submarine span a range from a completely indigenous solution to one that is a pure MOTS design built overseas."

When considering MOTS options, it is important to differentiate between a complete, proven design and a concept. For example, Sweden has the A26 design, similar in size and concept to the Type 212A, but the earliest it will enter service is 2019. Spain has offered a variant of the 2,426-tonne S-80A for export to Australia. This is slightly larger than the existing designs, offering greater endurance and range. However, the S-80A program has been troubled with design, cost, and funding difficulties. These collectively have delayed the in-service date from 2012 to 2017 and the design remains unproven. Similarly, HDW offers the larger, long-endurance 4,000-tonne Type 216 design, targeted at Australia, but this exists as a concept and is not yet ready for production. The modern Japanese *Souryu* class is a large (4,100 tonnes) and capable platform. However, Japan has not historically exported military hardware, and while recent policy changes have slightly opened this door the export of sensitive national submarine technologies, let alone complete submarines, is far from a given.

How Canada's potential requirements align with the MOTS solution space is an important consideration. Historically, Canada's navy has favoured submarines with the range and capability for expeditionary operations long distances from home port, rather than those designed for a coastal-defence concept of operations. The capabilities desired were demonstrated by the contenders identified for the short-lived Canadian Patrol Submarine Project that followed the aborted nuclear submarine acquisition of the 1980s. All were larger, long-range, conventional submarine designs of over 2,000 tonnes displacement. Assuming the requirement set remains similar, a valid assumption given the similar strategic situation, there is no MOTS option that clearly aligns with Canadian requirements. The available options tend to be slightly smaller with less endurance. Supporting this perspective, Australia, which has a similar long-range, long-endurance requirement, found in 2012 that no MOTS design met the requirement for the *Collins*-class replacement.

While no MOTS design precisely meets the desired requirements, there are a number of options in the marketplace that could provide an acceptable level of capability, particularly when viewed in the context of a cost capability trade-off. Both the Type 214 and Type 212A have deployed across the Atlantic and have greater than 30-day and 50-day endurances, respectively. The baseline *Scorpène* has a quoted 60-day endurance and the Brazilian variant has been lengthened to provide for more crew, stores, and fuel. These range and endurance capabilities parallel the 49-day endurance and transoceanic range of the *Victoria* class. MOTS designs are not fixed and are frequently modified to better suit requirements. Changing the overall length of a submarine, with the key pressure-hull diameter and overall system architecture unchanged, is technically feasible and provides options for greater range, endurance, and weapon/sensor capabilities. The *Scorpène* is offered in lengths varying from 66 to 76 metres and the Type 212A and *Dolphin* designs have been extended by 1.2 and 11 metres respectively for their second batches. This option opens up the cost capability trade space and provides a 'means-modified' MOTS design to more closely fulfill the desired requirement set. While this will not provide the same overall level of capability as a made-to-order design, a MOTS solution offers lower program risk and reduced cost. To properly assess this trade-off requires an examination of the risks associated with a new design.

Design Considerations

The alternative to the constraints on operational capability resulting from MOTS or modified MOTS options is a new design. Any warship design process involves the coordination of a range of different competencies. Submarine design requires additional, often unique, skill sets. Thus it is worthwhile to examine the common considerations, including resource requirements and rough order of magnitude costs and timelines to better understand the risks pertinent to an indigenous submarine design.

The head of the Royal Australian Navy (RAN) Future Submarine Programme, Rear Admiral Rowan Moffitt, commented in 2012 that the costs for a full production-ready submarine design equate to the unit production costs of one to two submarines. This is consistent with the United States' experience where the *Virginia*-class design cost USD two billion. For a modern conventional submarine, such as those noted above, this places the design costs in the USD 650 million to USD 1.7 billion range. These costs roughly scale on a per-ton basis; so larger, more capable, submarines have a higher cost.

The design stage typically comprises a concept phase and a detailed design phase, taking a statement of requirements and developing it to commencement of production. The design is rarely 100 percent complete at this point and maturity varies by program, complicating the use of the construction-start milestone as a basis for comparison. From a schedule perspective, the US *Virginia*, *Seawolf*, and *Ohio* classes all had design phases of six to seven years.

Photo courtesy the DCNS Group

A French *Scorpène* submarine in service with Chile.

> *"In addition to the cost and schedule necessities, designing a submarine is an extremely demanding and challenging technical endeavour."*

The UK *Astute* class took eight years to achieve this milestone, but it was still a relatively immature design. While these initiatives all feature the additional complexity of a nuclear propulsion plant, the Australian Future Submarine Programme offers a conventional example with a planned seven-to-eight-year design phase.

Within these cost and schedule windows, there are significant specialized resources required to design a submarine. The design effort for the *Upholder* (late 1970s) and *Collins* (mid-1980s) classes consumed approximately seven million person-hours, and the more complex, nuclear-propelled *Virginia* class took approximately 18 million person-hours. In response to contemporary performance requirements and more demanding safety standards, modern submarines are more complex and take more time to design. In a study for the RAN Future Submarine Programme the RAND corporation estimated that an entirely new submarine design would range between eight and 12 million person-hours with a peak workforce of 600 to 900 engineers and drafters required, with 400 to 600 required over a five-year period. This represents a significant resource demand over a lengthy period on some specific skill sets that do not readily transfer to other industries. Ultimately, a submarine design capability requires a significant, specialized, and highly-skilled workforce. A workforce Canada currently lacks.

In addition to the cost and schedule necessities, designing a submarine is an extremely demanding and challenging technical endeavour. In a 2014 speech, the Australian Minister of Defence stated: "A submarine design and build is one of the most complicated engineering projects a nation can undertake. And some of the more experienced countries have struggled to achieve excellence on every design occasion."[1] The minister was referring to the inherent program risk associated with submarine design activities.

As noted, only a limited number of countries maintain an indigenous design and production capability. Even the US and the UK, historically major players, have seen submarine force structures and the corresponding industrial base shrink over the past decades as funding levels decreased. Large and complex programs, such as submarine design, require unique skill sets and ongoing practical experience to maintain perishable skills. These competing forces have stressed the western submarine industrial base, as there are fewer new-build projects. The result can be a less-skilled workforce, resulting in program disruption, even for experienced organizations. The UK experience with *Astute* is an example of how perishable submarine design skills can be, even for a nation with a long pedigree. As a result of post-Cold War budget cuts, there was a gap of 15 years between *Astute* and the preceding *Vanguard/Upholder* class submarine programs that resulted in atrophy of specialized skill sets, the impact of which was not fully appreciated at the time. The consequences of this atrophy were problems during the *Astute* program, where design challenges contributed to cost growth of 53 percent (GBP 1.53 billion) above the original contract price and a delay of 58 months.

The Spanish experience with the S-80A program offers a further example. Although Spain has a robust naval surface vessel industrial base, has constructed French-designed submarines in the past, and has collaborated on the *Scorpène* design and build, the S-80A represented its first truly indigenous design. Concept design began in 2002, with a EUR 2.13 billion detail design-and-build contract signed in 2004. In 2013, after construction of the first-of-class hull was nearing completion, a design error was discovered resulting in the submarine being 75 tonnes overweight. In order to rectify this error, attributed to a single misplaced decimal point, the vessels were redesigned, adding three to four metres to the overall length. This late-notice change resulted in a two-year delay and contributed to the 36-percent cost growth.

It is important to note that steps can be taken to manage these design risks. In both the *Astute* and S-80A cases, General Dynamics Electric Boat (GDEB), the centre of excellence for US submarine design and build expertise, was contracted to provide assistance. The Australians are being proactive and are collaborating with the US and GDEB for their Future Submarine Programme. However, these arrangements can only provide so much assistance and

1. David Johnston, "Address for the ASPI Conference: The Submarine Choice, 9 April 2014," Australian Strategic Policy Institute, https://www.aspi.org.au/__data/assets/pdf_file/0011/20720/Johnston-Speech.pdf (accessed May 6th, 2014).

Photo courtesy ThyssenKrupp Marine Systems

Germany's HDW Class 212A

capacity is not unlimited. In the lead-up to the *Virginia*-class program GDEB significantly reduced its submarine-specific workforce in order to align capacity to the post-Cold War situation, resulting in less excess capacity. The assistance provided to *Astute* consisted of approximately 100 designers and managers; however, only a dozen of these were dedicated full-time onsite GDEB employees. This contrasts with the peak design demand for several hundred technical staff.

The challenges associated with a made-to-order submarine design can be summarized as follows: It takes approximately seven years, costs a minimum of several hundred million dollars, requires several hundred personnel with specialized skill sets, and is a complex and risky endeavour. Internationally, there are only a handful of countries that maintain such a capability, and the current international military procurement climate makes it challenging for them to maintain the perishable skills and necessary practical experience to maintain competency. Even countries with long histories of naval design and construction struggle with the complexities inherent in modern submarine design. Additionally, the consequences of error are hundreds of millions of dollars in cost overrun and delays measured in years. However, potential issues do not end with completion of the design. Construction of a submarine poses a different set of challenges.

These challenges will be explored in Part Two of this document, scheduled for the *Journal*'s Summer 2015 issue (No. 77).

Cdr Anthony March is a naval engineer and submariner, currently employed as DNPS 2 in DGMEPM.

Reference

LCdr A.J. March, "Deeply Complicated: Canadian Submarine Procurement Options," Canadian Forces College, May 26, 2014.

10 years ago in the Journal...

[Excerpt from the Commodore's Corner]

Reaffirming our Commitment to Submarine Safety and Support

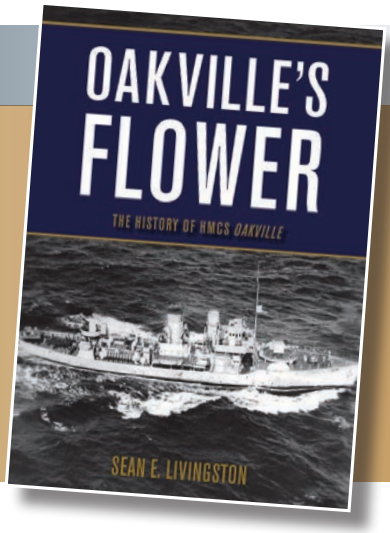
...We have faced many challenges in our effort to introduce the *Victoria* class to the fleet, and more tough work lies ahead. While we have not been without our setbacks, it remains our responsibility to maintain our professionalism, learn from our experience and move forward, building upon the successes we have achieved to date. I urge you to do everything you can to keep a positive outlook as we work toward our goal of giving the *Victoria*-class submarines the support they need to patrol the ocean's waters safely for many years to come.

— Commodore Roger Westwood, CD, DGMEPM

Book Review

HMCS *Oakville* – A small ship's valiant history

Reviewed by Tom Douglas



***Oakville's Flower – The History of HMCS* Oakville**
Sean E. Livingston © 2014
Dundurn (*www.dundurn.com*)
ISBN: 978-1-4597-2841-7 (pbk $30); 2843-1 (epub $4.99);
142 pages; illus; appendices; glossary; endnotes; bibliography and index

It has all the makings of a blockbuster movie. Under the cover of darkness a German U-boat slips inside the protective ring of Allied naval vessels shepherding a convoy of merchant ships in the Windward Passage east of Cuba. Just as the enemy submarine is about to torpedo its chosen victim, its presence is discovered and HMCS *Oakville* (K-178) drops a pattern of depth charges, forcing the damaged U-94 to surface. It is August 27, 1942.

The corvette then rams the German vessel, and in a scene illustrated later in a wartime "Men of Valor" poster, *Oakville*'s gunnery officer, SLt Hal Lawrence, and Acting Stoker Petty Officer Art Powell leap aboard the stricken sub and subdue the U-boat's entire crew. Lawrence himself described the incident in adventuresome detail years later in his 1979 memoir, *A Bloody War*.

Oakville's CO, A/LCdr Clarence King, received the Distinguished Service Order for his role in the sinking of U-94. Lawrence was awarded the Distinguished Service Cross while Powell was decorated with the Distinguished Service Medal. Six other crew members were mentioned in dispatches.

The exciting action is retold in author Lt(N) Sean E. Livingston's recent history, *Oakville's Flower*, which tells the story of the ship from its launch on June 21, 1941 by the Port Arthur Shipbuilding Co., through its routine war patrols, to its sale to Venezuala at war's end.

The bold exploits of the men of HMCS *Oakville* might well have faded away if Livingston, a Burlington-based history teacher and commanding officer of Royal Canadian Sea Cadet Corps 178 Oakville, hadn't felt compelled to write the relatively brief history of the ship. The author reveals that as a youngster he saw the Men of Valor poster in a history book along with a caption suggesting that the alleged bravery of the crew of the Flower-class corvette was merely an example of war propaganda.

"My teacher even agreed," Livingston writes, "how silly it would be to believe that men actually did such a Hollywood-like thing. Imagine my dismay when years later I discovered that it...actually happened – a proud moment not only in Canadian history but for the town in which I resided."

Suspecting that the townspeople of Oakville might no longer know about the ship's valiant history, Livingston conducted a main street poll. No one he spoke to was aware that HMCS *Oakville* had even existed.

Livingston credits a number of people for assisting him in setting the record straight, including former Oakville mayor Harry Barrett, Oakville naval historian Edward Stewart and staff members of the Oakville Museum.

They are all to be commended for helping to keep alive one of the many thrilling stories that reflect the rich history of the Royal Canadian Navy.

Tom Douglas is the associate editor of the Maritime Engineering Journal.

News Briefs

Presentation ceremonies held to mark a significant *Journal* milestone

Photography by Cpl Heather Tiffney, CFSU(O) Imaging Services

The current *Maritime Engineering Journal* team is made up of Cmdre Marcel Hallé (DGMEPM), project manager Lt(N) Peter O'Hagan, d2k Marketing Communications company representatives Marie-Josée Lemaire and Céline Lefebvre (d2k general manager Daniel Dagenais was unable to attend), associate editor Tom Douglas, production editor Brian McCullough and editor Capt(N) Simon Page (COS MEPM).

The launch of the 75th issue of the *Maritime Engineering Journal* at HMCS Bytown Naval Officers Mess in Ottawa last Nov. 26 featured presentations honouring individuals and organizations that have played a major role in the magazine's history.

In getting the proceedings underway, master of ceremonies Captain(N) Simon Page, Chief of Staff, Maritime Equipment Program Management (MEPM), touched on highlights within the magazine since its founding in 1982. He praised the publication for "always keeping a focus on our technical challenges, achievements, our people and the greater naval technical heritage."

Special guests at the ceremony included the commander of the Royal Canadian Navy, former directors general and senior representatives from other naval and civilian organizations. Many of those present were former contributors to the *Journal*.

Vice-Admiral Mark Norman, Commander, Royal Canadian Navy, made the first presentation, an RCN coin, to Pat Barnhouse, Chairman of the Canadian Naval Technical History Association (CNTHA), "to commemorate the important and ongoing work being done by this dedicated group of volunteers to record and preserve Canadian naval technical heritage." (See *CNTHA News* in this edition of the *Journal*.)

Rear-Admiral Patrick Finn, Chief of Staff, Materiel Group, presented a plaque and a commemorative coin to *Journal* Production Editor Brian McCullough, who has been involved with the publication since its very beginning. The elegant wooden plaque, inscribed with the words *For his many years of dedicated service to the Naval Technical Community through the Maritime Engineering Journal*, was fabricated by hull technicians CPO2 Rick Winters and

PO2 John Caldwell of the MSE Division of Canadian Forces Naval Engineering School in Halifax. Brian's wife, Bridget Madill, was also acknowledged by RAdm Finn (and others) for her decades of service to the magazine as an associate editor.

Commodore Marcel Hallé, Director General MEPM, marked the occasion by presenting a framed copy of the cover of the 75th edition of the *Journal* – prepared by the magazine's production company d2k Marketing Communications under the direction of owner and general manager Daniel Dagenais – to Bytown Mess heritage officer Bill Dziadyk. D2k had also created a special banner featuring a number of covers of past issues of the *Journal* that was presented by company representatives Céline Lefebvre and Marie-Josée Lemaire.

The *Maritime Engineering Journal* got its start following a Maritime Engineering (MARE) branch conference in 1980 when Commodore Ernie Ball and Capt(N) Dennis Reilley responded to the voice of the naval engineering community that was calling for a publication to be a forum for the dissemination of maritime engineering information. Its stated primary objective was to "Promote professionalism among Maritime Engineers and technicians."

In his recognition of the team that produces the magazine as we know it today, Capt(N) Page said, "The *Maritime Engineering Journal* is, for many of us, part of our DNA. It has been with us since 1982, and it has evolved into a sophisticated and polished product."

Bravo Zulu to *Journal* project manager Lt(N) Peter O'Hagan and his DGMEPM colleague Lt(N) Kevin Reyes for their superb organization of the afternoon's events.

— Tom Douglas, Associate Editor

HMCS Bytown mess heritage officer Bill Dziadyk accepts a framed copy of the issue no. 75 cover from Cmdre Marcel Hallé on behalf of mess president Capt(N) Yves Germain who was unable to attend the event.

Materiel Group Chief of Staff RAdm Patrick Finn acknowledges former associate editor Bridget Madill and production editor Brian McCullough for their decades of service on the *Journal*.

Cmdre Marcel Hallé (DGMEPM) set a festive tone for the well-attended launch of the *Journal*'s 75th issue at the Bytown naval mess on Nov. 26.

News Briefs (continued)

NTO Spirit Award

The annual NTO Spirit Award, sponsored by RAdm (Ret.) Ian Mack, Director General (Land & Sea) Major Project Delivery, is awarded annually to a naval technical officer (NTO) "whose demonstrated character epitomizes the spirit that enables Naval Technical Excellence."

The 2014 recipient of the award, **Lt(N) Tony Carter**, and 2015 recipient **Lt(N) Peter O'Hagan** were each cited for an impressive list of accomplishments, inspiring leadership and team-working qualities.

Lt(N) Carter was a buoyant member of MARPAC's 2013 Nijmegan route march team who literally danced across the finish line despite a painful foot infection. He also organized all-ranks sports activities and NTO adventure training, and on his own initiative briefed fleet engineers on stability considerations. His citation describes him as "one of the most motivated, proactive and inspiring leaders in the RCN."

Lt(N) O'Hagan was cited for "greatly enhancing the spirit and cohesion of the NTO community." He was the driving force behind a successful series of professional development mentorship seminars for junior NTOs, and was the OPI behind the special launch of the 75th edition of the *Maritime Engineering Journal* last November – the same month his DNPS 3 team raised nearly $800 for the "Movember" prostate health awareness moustache-growing campaign.

Bravo Zulu to both officers.

Photo by LS Zachariah Stopa, MARPAC Imaging Services Esquimalt

2014 NTO Spirit Award recipient Lt(N) Tony Carter with FMF Cape Breton CO Capt(N) Chris Earl.

Photo by Brian McCullough

2015 NTO Spirit Award recipient Lt(N) Peter O'Hagan with Cmdre Marcel Hallé, Director General Maritime Equipment Program Management.

News Briefs (continued)

CDS Commendation

On November 28, 2014 **Cdr Darren Rich**, Commanding Officer of CFMETR – the Canadian Forces Maritime Experimental and Test Ranges at Nanoose Bay, BC – was presented with a CDS Commendation from Chief of the Defence Staff Gen. Tom Lawson for his work as the inaugural Canada Command / Canadian Joint Operations Command Liaison Officer to NORAD and USNORTHCOM in Colorado Springs from July 2011 until June 2014. Bravo Zulu!

Photo by Cpl Brandon O'Connell, MARPAC Imaging Services Esquimalt

Command Changes at the DGMEPM Field Units

In the past eight months Cmdre Marcel Hallé, DGMEPM, has had occasion to preside over command changes at both of his field units – the Canadian Forces Maritime Experimental and Test Ranges (CFMETR) at Nanoose Bay, BC, and at the Naval Engineering Test Establishment (NETE) in LaSalle, QC.

On July 17, 2014, **Cdr Darren Rich** relieved Maritime Surface officer **Cdr Gerry Powell** who was retiring with 37 years of service, the last five as CO of CFMETR. Cmdre Hallé acknowledged Cdr Powell's "noteworthy" tenure and "tremendous leadership." Cdr Rich transferred from Colorado Springs, where he served as the Canadian Joint Operation Command's inaugural Liaison Officer to US NORTHCOM and NORAD, for which he received the CDS Commendation *(see news note)*.

On February 24, after a remarkable career of more than 32 years in the CAF, the last five of them as the CO of the Naval Engineering Test Establishment, **Cdr Chantal AuCoin** turned over command to **Cdr Rob McColl** as she will be retiring later this spring. Cdr McColl was recently with PMO HCM/FELEX (*Halifax*-class modernization and frigate life-extension project), and the National Shipbuilding Projects Office in DGMPD (Land & Sea).

(With notes courtesy CFB Esquimalt's The Lookout *newspaper and the NDHQ Materiel Group* MatFlash *newsletter.)*

Photo by Cpl Brandon O'Connell, MARPAC Imaging Services Esquimalt

Cmdre Marcel Hallé (centre) signed the change of command documents as Cdr Darren Rich (right) took over command of the Canadian Forces Maritime Experimental and Test Ranges from Cdr Gerry Powell at Nanoose Bay, BC last July.

Photo by MCpl Martin Long, St-Jean/Montreal Imagery Section (courtesy *MatFlash*)

In February, Cmdre Marcel Hallé presided over the change of command ceremony at the Naval Engineering Test Establishment in LaSalle, QC as Cdr Rob McColl (right) took the reins as CO from Cdr Chantal AuCoin.

News Briefs (continued)

End of an era

When **Petty Officer Second Class Darryl Harloff** was granted his steam Engineer of the Watch certification on December 3, 2014, it was a milestone event. PO2 Harloff holds the distinction of being the last member of the Royal Canadian Navy to qualify for steam EOOW. Currently serving in HMCS *Preserver*, the London, Ontario native was part of the crew of HMCS *Protecteur* during its deployment to East Timor from the fall of 1999 to the spring of 2000. Bravo Zulu!

Photo courtesy CPO1 Patrick Devenish

DGMEPM Unit Chief retires

Photo courtesy Materiel Group

DGMEPM unit chief **CPO1 Gérald Chapadeau** receives farewell best wishes from RAdm Patrick Finn (COS Materiel) during his "departure with dignity" retirement ceremony on January 13 following 36 years of service in the Royal Canadian Navy. Fair winds, Chief!

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. Contact information may be found on page 1. Letters are always welcome, but only signed correspondence will be considered for publication.**

PRESERVING CANADA'S NAVAL TECHNICAL HERITAGE

NEWS

Canadian Naval Technical History Association

Captain James Guthrie DEAN, CD, RCN (Ret.)

CNTHA News *Est. 1997*

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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

The CNTHA lost a valued team member with the passing of Captain James Guthrie Dean, CD, RCN (Ret.) on January 3 at the age of 77.

Jim had an interesting and fulfilling career that began as an Electrical Branch cadet at the Royal Military College of Canada in 1955. He graduated as a General List sub-lieutenant as the officer structure changed in 1960, and later attended the United States Navy Postgraduate School at Monterey, California where he demonstrated his substantial intellectual capacity. Upon his return to Ottawa he was posted to the electronic warfare section of the Directorate of Maritime Combat Systems (DMCS).

As a lieutenant-commander Jim attended Canadian Forces Staff College in Toronto, following which he was designated as the commissioning combat systems engineer in HMCS *Iroquois*, the first of the new Canadian tribal-class destroyers. As a commander Jim would go on to leadership positions as DMCS 3 (underwater systems) and as head of the Combined Support Division in Halifax. His promotion to the rank of captain in 1982 saw him appointed as DMCS, and later – in his final position – as deputy program manager in the Canadian Patrol Frigate project.

That's the bare bones of his career, but what of the person and his character? I first met Jim when he arrived at RMC. I was in senior year and was one of the few naval types in the Stone Frigate, so I think he tended to pick on me with questions to satisfy his interest and curiosity on a myriad of subjects.

We did not cross paths again until he arrived in Monterey (as I was leaving). The next time we met, Jim was preparing to join HMCS *Iroquois* and, on hearing that I was posted to Staff College, was most helpful in giving me a comprehensive brief on what to expect in Toronto. We connected again in the late 1970s when we were both section heads in DMCS and it was there as a section head and later as director that he demonstrated a knack for leading a mixed team of uniform and civilian staff.

Of his last posting to the CPF project, the program manager, now-retired RAdm Mike Saker, has commented that Jim was the ideal deputy to meld and add credence to a team that was having trouble coordinating with the National Defence Headquarters line organizations. Add in Jim's obvious technical competence and his ability to draft complex briefs and I think you have the measure of the man.

As a final note, I must mention his other contributions. As a lifelong amateur radio buff, he represented that community locally, national and internationally. He was also a valued member of our CNTHA team, always ready with a story to add colour and detail as we worked to piece together the jigsaw puzzle of Canada's naval technical heritage. He will be sorely missed.

RIP, colleague.

– Cdr Pat D.C. Barnhouse, OMM, CD, RCN (Ret.), Chairman, CNTHA

Canada

CNTHA recognized during "Issue No. 75" launch celebration

Royal Canadian Navy commander Vice-Admiral Mark Norman recognized the unique contribution of the Canadian Naval Technical History Association in preserving Canada's naval technical heritage during a special ceremony to celebrate the launch of the 75th issue of the combined *Maritime Engineering Journal* and *CNTHA News* on Nov. 26, 2014.

CNTHA News has been an integral part of this combined navy technical publication since 1998, one year after the CNTHA launched its own newsletter.

VAdm Norman presented CNTHA Chairman Pat Barnhouse with an RCN coin "to commemorate the important and ongoing work being done by this dedicated group of volunteers to record and preserve Canadian naval technical heritage," and offered his congratulations to the entire CNTHA team for an important job well done in capturing oral histories and other materials to complete the story of Canada's naval technical past.

Photo by Cpl Heather Tiffney, CFSU(O) Imaging Services

RCN Commander VAdm Mark Norman congratulates CNTHA Chairman Pat Barnhouse on a job well done.

Visit www.cntha.ca for more photos and details of this special event.

Photo by Cpl Heather Tiffney, CFSU(O) Imaging Services

The CNTHA was well represented during the special celebration. The contingent flanking the uniformed Cmdre Marcel Hallé includes (L-R): Brian McCullough, James Carruthers, Colin Brown, Pat Barnhouse, Tony Thatcher, Don Wilson and Ken Bowering.