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HMCS *Bras d'Or* 50 years after commissioning

Photo by Brian McCullough

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Maritime Engineering Journal

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HMCS *Chicoutimi* is assisted into port at U.S. Naval Base Yokosuka, Japan by the USN Valiant-class yard tugboat *Seminole* (YT 805) on Oct. 18, 2017. (U.S. Navy photo by Mass Communication Specialist 1st Class Peter Burghart/171018-N-XN177-123 Released)

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COMMODORE'S CORNER

A Few Departing Words

By Commodore Simon Page, OMM, CD

Note: Commodore Page has been appointed Chief of Staff Operations to the Commander of Military Personnel Command at NDHQ in Ottawa.

It has been a true privilege and honour working in the front office of the Maritime Equipment Program Management Division for the last five-and-a-half years. It is with much gratitude that I offer you all some departing thoughts through this issue of our *Journal*. The words below are for every individual contributing to our business, independently of the organization, but inclusively of every action dedicated toward the running of the enterprise.

The progress that the naval materiel management system has made on so many fronts, combined with the readiness it has delivered to the Royal Canadian Navy, has been in my eyes nothing less than spectacular. The RCN's latest *Year in Review* video, which showcases the operational successes achieved by the Royal Canadian Navy around the world in 2017, speaks to the effectiveness and resilience of an enterprise that can handle the magnitude and complexities of supporting a Navy that deploys globally: 18 ships/submarines, crewed by 2600 sailors, deployed to the waters of 30 countries on five continents – 345,000 nautical miles steamed. It stands as a testimony to the success of everyone's best efforts. Juxtapose this with the superb effort directed to our shipbuilding activities, capability enhancements, capital projects, safety management, materiel assurance, innovation, and to our overall collaborative in-service support solutions, and the achievements we have made during a period of recapitalization and complex sustainment become even more remarkable to consider.

I have so many people to thank for their support and commitment that trying to acknowledge everyone individually here would be impossible, so allow me to speak a bit more philosophically about the journey we are on together. The evolution of our naval materiel management system is a part of this journey, as is our collective path toward building and accepting new platforms. Working together to advance our common goals requires patience and perseverance, and as we move from one task to another it is important to remain conscious of the value of our joint effort in terms of the RCN's assets. As much as the products of our individual paths remain an essential output of our work, how we grow and develop both individually and collectively are arguably just as important. One thing I will cherish dearly about the last few years is how the people of our community have gained confidence and matured through their work, while fostering an environment of collaboration and trust – two key elements of any successful journey involving more than one person.

Photo by OS A. Proulx, Canadian Forces Support Unit (Ottawa) Imaging Services

I am humbled to have worked with such a fine group of individuals who have displayed such an inspiring level of commitment and profound sense of duty. The highest privilege of being a leader within this enterprise has been the opportunity to meet and connect with each of you. I am very proud of the achievements we have made in all aspects of our service delivery, and I sincerely hope you feel that same sense of pride.

As I leave the DGMEPM position, it is with pronounced gratitude for what you have done, and with confidence that you will continue to persevere through any challenges with the same professionalism and collaborative approach that have characterized us over the years. It is this that will guide me as I move on to the next stage of my own journey, and I wish you all the very best.

Yours Aye.

EDITOR'S NOTES

Bradley Laurence (Larry) Wilkins, 1927-2018

Retired commodore not only sailed ships, but built them as well

When Larry Wilkins graduated from Royal Roads Naval College in 1946, the writer of his short biography in the "Log" – the college yearbook – referred to him as an "outstanding" member of the contingent of "the many Toronto boys who arrived at Royal Roads in September 1944."

Commodore Wilkins died this past April 1 in Chester, Nova Scotia at the age of 90, after a distinguished career with the Royal Canadian Navy (RCN) and a short civilian career with Irving Shipbuilding Ltd. and MIL Davie. He leaves behind his wife Jane, daughters Pat and Cathi, four grandchildren and two great-grandchildren.

Following his graduation from what is now known as Royal Roads University, the then Midshipman (L) RCN earned an engineering-physics degree from the University of Toronto, an MBA at the University of Western Ontario, and later studied at National Defence College.

Cmdre Wilkins served at sea during the Korean War, and held seagoing appointments as an electrical officer during his career in HMC ships *Huron, Nootka,* and *Restigouche*. During the 1960s he worked on ASW and missile system projects in naval headquarters in Ottawa, and as Project Systems Engineer for the DDH-280 Project. His senior appointments included: Director Maritime Systems Engineering in Ottawa (1971-73), Commander Ship Repair Unit Pacific (1974-76), Director General Management Systems (1976-79) and, finally, Chief of Staff (Materiel) at Maritime Command HQ in Halifax until his retirement from the RCN in 1982.

As a civilian, Larry Wilkins would go on to serve eight years as a director of engineering in the shipbuilding industry before retiring fully in 1990 to embark on world travels with his wife. He pursued his involvement in photography and naturalist clubs, and with volunteer work at the Chester Playhouse, and enjoyed sailing, playing golf, and spending time with his grandchildren.

Commodore Wilkins' extremely active life was predicted in that write-up in his yearbook, where it was pointed out that he hoped to join the Electrical Branch of the permanent force. The yearbook editor added prophetically: "His spirit and good nature are sure to carry him a long way."

Fair winds and following seas….

SPECIAL FEATURE

Submarine Technical Support Success at Home and Abroad

As the Royal Canadian Navy's four *Victoria*-class submarines continue to fulfill their steady state cycle of at-sea operations and scheduled maintenance periods in home port, their crews, the Fleet Maintenance Facilities, and the submarine support teams that shadow the boats on deployment are very much part of a growing success story.

The 2017-2018 deployment of the Esquimalt-based HMCS *Chicoutimi* (SSK-879) to the Asia-Pacific region is a case in point. As authors **SLt Matthew Golding** and **Lt(N) Chris Niewiadomski** describe in the following two-part article, what began with a battery issue ended 10 months later as an overall impressive demonstration of the leadership, flexibility, and skills that the people of the RCN's technical support community bring to the table every day.

Part 1: HMCS *Chicoutimi* Alongside Battery Replacement – A First of Its Kind

By SLt Matthew Golding

Source: Royal Canadian Navy: See more at https://vimeo.com/236816699

In May 2017, while en route for Hawaii, HMCS *Chicoutimi* experienced a number of battery cell failures that eventually forced the boat to return to its home port of Esquimalt, British Columbia. The *Victoria*-class submarine carries two main batteries in tiered compartments, one forward and one aft, each consisting of 240 Type 8800T lead-acid battery cells. Under normal operation the batteries are configured in parallel to provide electrical power to all submarine systems. Given the significant weight of approximately 550 kg per cell, the batteries also act as ballast and provide critical stability.

The individual battery cells are tightly packed onto a set of steps inside the tiered battery compartments and secured with wedges. The cells are fitted with cooling plates, and connected to one another by an electrical busbar. A low-pressure air agitation system connects at the top of each cell to mix the cell's electrolyte. Cells are typically measured by their temperature and specific gravity (SG), which indicate the amount of sulphate in the electrolyte and thereby the charge remaining for that cell. Specific cells located near the hatch, and those that have SG

readings closely following the overall battery average, are designated pilot cells that allow the crew to take quick representative readings of the entire battery.

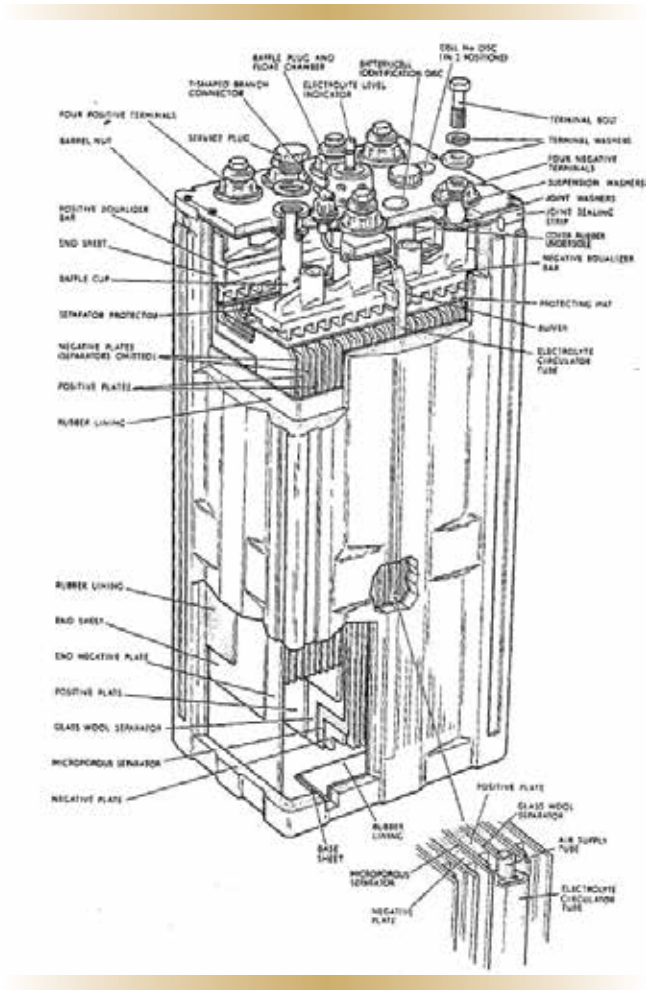
During the transit to Hawaii it was known to the crew of *Chicoutimi* that several cells had a tested SG outside of expected values, indicating early signs of degradation. A subsequent all-round reading of cell temperatures and SGs revealed that certain cells had become "sick," meaning they were more than 20 points below the battery average. The crew had a total of four cut-out kits that could be used to electrically isolate individual cells, but to ensure a consistent voltage match of the normally paralleled forward and after batteries, for every cell that was cut out from one battery there had to be a similar cut-out done to the other. With only four kits available, only two cells could be isolated per battery.

As the situation worsened to the point where there were 27 sick cells – nine forward and 18 aft – the decision was taken to turn the boat around and return to Esquimalt. As *Chicoutimi* made the trip back to home port, there was a risk that one of the sick cells could be overridden by the others and possibly catch fire. To minimize the chance of this happening during the transit, the batteries were "floated" so that the charge from the generators was equal to the discharge rate from the batteries.

Decisions and Preparations

In Esquimalt Dockyard, meanwhile, Fleet Maintenance Facility Cape Breton (FMFCB) was weighing its options. With only four operational submarine spare battery cells in storage, and with the cause of the cell failures still unknown, a complete replacement of both of *Chicoutimi*'s battery banks was deemed to be the best course of action. Where the 480 replacement cells would come from, and whether a complete changeout could be conducted without taking *Chicoutimi* out of the water – which would be both a massive undertaking and a first for the RCN – became the focus for FMFCB's Program Manager 2 team.

There were really only two possible sources for replacement cells, and both from a sister vessel. The first would be to use HMCS *Corner Brook*'s dry batteries that were currently in storage while the boat was undergoing an extended docking work period, but these would have to be filled with electrolyte and charged – a six-to-eight-week process in addition to whatever time it would take to remove *Chicoutimi*'s batteries and install the replacements. Given the need to get *Chicoutimi* back to sea as soon as possible, the better option would be to do a complete battery transfer from HMCS *Victoria*, which was also in the dockyard at that time for scheduled maintenance. Once a capacity test verified that *Victoria*'s batteries were healthy, the decision was made to go forward with this plan.



Anatomy of a battery cell.

The prospect of replacing *Chicoutimi*'s full battery held a number of unique challenges. Aside from the huge amount of work required to disconnect and hoist 480 large cells out of each submarine, transport them, and load-in the replacements, there was also the fact that *Chicoutimi* was still in the water – which raised concerns for the submarine's stability. The FMF Naval Architecture section created a detailed plan of the precautions and procedures to be followed by FMF workers and the submarine's crew to make sure the trim and list did not change by more than one degree. To ensure that the work could be conducted safely, any weight changes greater than 10 kg would be logged and monitored,

Tight work. A technician fits a lifting top onto a battery cell prior to its removal.

Each 550-kg cell battery acts as ballast in providing critical stability for the submarine.

All 480 battery cells had to be removed from each submarine before the replacements from *Victoria* could be installed on board *Chicoutimi*.

A healthy battery cell is lowered through a hatch on board *Chicoutimi*.

and hatch control plans were put in place to maintain watertight integrity. All calculations were checked, re-checked, and clearly communicated to all stakeholders.

Since the after battery compartment is located closer to the centre of the submarine than the forward one, and therefore has less of an effect on the trim, it would be changed out first. The gyro and main ballast tank trimming would be closely monitored throughout. As the work progressed, multiple daily meetings would be conducted to assess the submarine's condition and to approve the work scheduled for the next 24 hours. The plan was both ambitious and challenging, but safety was paramount.

The Work

A large multidisciplinary team that included crane operators, riggers, electricians, and shipwrights was divided into two groups working 12-hour shifts around the clock. Starting with the removal on *Chicoutimi*, 40 cells could be trollied through the battery compartment and craned out of the submarine per shift. At the halfway point of the *Chicoutimi* battery removal, another team began disconnecting the batteries on board *Victoria* in preparation for their removal.

Once the battery compartment on *Chicoutimi* was completely emptied of cells, it was washed down and a spark test was conducted. At this critical time it was discovered that a number of patches on the compartment's rubber insulation were electrically conductive and had to be replaced. Time was of the essence since the replacement battery cells were already being craned out of *Victoria*. The installation process continued for the forward battery with greater efficiency, and with even greater care paid to the trim of the submarine.

Once the cells were installed on board *Chicoutimi* and fitted with their connections for the busbar, air agitation, cooling, and covers, the battery auxiliary systems were checked to confirm that the cooling was functioning correctly. The agitation air readings were checked to ensure that low-pressure air was being fed to each cell at the correct flow rate – too high, and the air would not properly pick up the heavier sulphuric acid in the electrolyte; too low, and it would not pick up enough acid. Next, a hydrogen content trial was performed to prove that the ventilation system on *Chicoutimi* could effectively remove the hydrogen gas that is released as a result of the lead acid battery's charging cycle. A load bank battery charger, commonly referred to as a gizmo, allows for both charging

and load bank discharging of the submarine's battery, and was used to conduct charging cycles on the newly installed *Chicoutimi* battery.

Thanks to some meticulous coordination by the FMFCB operations department, and to the remarkable dedication of the entire team at FMF and the crew of *Chicoutimi* in working together, the battery installation was completed without incident. To get maximum value from *Chicoutimi*'s time alongside, concurrent work was also conducted to replace the periscope, repair the fridge compressor, and to complete more than 90 other planned maintenance routines.

Aftermath

In August of 2017, a technical investigation reported that a number of causes may have contributed to the battery cell failure, including issues with the cells' air agitation, lack of maintenance, and missed charging cycles. The 484 battery cells (480 aboard the submarine, plus the four spares at FMF) had been manufactured by Enersys Limited in Bulgaria in 2011, but had not been commissioned until 2013, thus making them approximately four years and three months old at failure – nine months short of the OEM's five-year rating. The investigation resulted in an increased awareness of battery maintenance culture, such that *Chicoutimi*'s battery has not experienced any issues since its replacement and is still fully operational.

Conclusion

This short article does not do full justice to the complexities of the work, nor the tireless effort put forth by the team at FMFCB and the crew of *Chicoutimi*. The entire job involved 18,000 person hours – including 6,500 hours of overtime – and took 60 days to complete. All told, the work involved the support of 17 trades from the production department, seven trades from the engineering department, and multiple project leaders from the operations department. Conducting a full battery replacement on a submarine while it was still in the water was a first of its kind for the RCN, and was done with remarkable efficiency. Thanks to the dedication and teamwork of everyone involved, *Chicoutimi* was able to return to sea in August 2017 as a fully operational RCN asset.

SLt Matthew Golding is a Marine Systems Engineer who graduated with a BEng Electrical from Royal Military College in Kingston in 2015. Upon completion of his Phase VI training aboard HMCS Ottawa in September 2017 during Operation Poseidon Cutlass, he was attach-posted to FMFCB Operations where, in addition to assisting Chicoutimi, he actively supported a challenging surface fleet program as an assistant program manager. SLt Golding just successfully completed the Maritime Tactical Operation Course, and is currently serving with F3 Operations at Canadian Fleet Pacific Headquarters in Esquimalt, BC.

Acknowledgment

While they are too numerous to acknowledge individually, the author would like to take this opportunity to express his significant gratitude to the Production and Engineering staff at FMFCB for providing him with invaluable feedback and data to complete this article.

References:

C-24-691-000/NQ-003, Main Battery Removal, Reinstallation and Maintenance.

BR 2075(KX) Submarine Main Batteries Type 8800T Dockside and Refit Procedures.

Victoria Class Submarine Main Battery (Type 8800 (37kr177t)) Commissioning Guidance.

"It takes a village..." The FMFCB submarine battery transfer team accepts a well-earned Bravo Zulu from Maritime Forces Pacific formation commander, RAdm Art McDonald.

Part 2: HMCS *Chicoutimi* Deployed Maintenance Support – FMF Flexibility in a Challenging Environment

By Lt(N) Chris Niewiadomski

Deploying a submarine far from home port inevitably requires a plan for maintenance in overseas harbours, and in this sense *Chicoutimi*'s 2017-2018 Asia-Pacific deployment was to be no different. While the boat would be followed from port to port by a submarine support team (SST) from Commander Canadian Submarine Force, lessons learned from HMCS *Victoria*'s previous operations indicated that FMF Cape Breton would nevertheless be called upon to provide mobile repair parties (MRPs) to address operational deficiencies (OPDEFs) and other defects outside the scope of the SST's capabilities.

Chicoutimi's deployment initially carried with it an additional caveat. Because her sailing schedule would extend beyond a normal operational cycle, a series of planned maintenance (PM) routines would have to be completed while she was deployed. By combining these routines into a deployed maintenance package similar to what the frigates conduct during a "RAMP" (Rest and Maintenance Period), and by deploying a mobile repair party to meet the boat to conduct the work overseas, FMFCB could have a maintenance team pre-positioned to address all manner of planned and corrective maintenance.

The original plan, conceived in the autumn of 2016, called for two RAMP-style maintenance support periods during *Chicoutimi*'s deployment – one at U.S. Naval Base Guam in the Western Pacific, and a smaller "RAMP Jr." at U.S. Naval Base Yokosuka 50 km south of Tokyo, the cornerstone base of the US 7th Fleet activities in and around Japan. In addition to fulfilling the necessary maintenance requirements, this construct would showcase FMFCB's ability to deploy en masse in support of deployed submarine operations, while at the same time provide a perfect opportunity for the production team to interoperate with its United States Navy (USN) and Japan Maritime Self-Defense Force (JMSDF) counterparts to build new strategic maintenance partnerships for the RCN.

The composition of the FMFCB team was crucial to success, and would be driven by two primary themes: capability and versatility. The deploying team needed to include the best submarine maintenance specialists

FMFCB had to offer, while at the same time ensuring that a broad spectrum of skillsets and abilities was represented. Equally important was the inclusion of recently qualified apprentices and journeypersons so that they could extend their opportunities to learn from the submarine subject matter experts (SMEs) during a challenging deployed maintenance program. All being well the team would be in place in Guam for a three-week RAMP starting in early July 2017, and then deploy again to Yokosuka for a five-day RAMP Jr in September. However, all this changed when *Chicoutimi* was forced to return to home port in May 2017 to address her battery issues (*see Part 1*). The two RAMP activities would still go ahead, but there would be a different focus placed on them.

By the time *Chicoutimi* resumed her operational tempo in the Pacific in August 2017, much of the deployed maintenance package originally planned for overseas had been completed during the battery changeout in Esquimalt Dockyard. Since PM was no longer the driving force, the primary goal now became that of an FMFCB deployed capability demonstration, as the teams would still be needed to address OPDEFs and other safety critical corrective maintenance. The other significant change was the timing of the work periods. Under the new deployment schedule, the first evolution would be the RAMP Jr in Yokosuka (October 18-23, 2017), followed by a more substantial RAMP in Guam (January 8-28, 2018.)

On a typical FMF mobile repair party and technical assistance visit (MRP/TAV), up to five SMEs might travel to meet a deployed unit. With such a small group, the organization, administration, and work management of the MRP does not require substantial effort. FMFCB arranges the travel, while command-and-control of the team is undertaken by the deployed unit upon arrival. Work management and personnel administration is typically followed up by FMFCB production supervisors upon return of the deployed members. However, with FMF planning to deploy approximately 60 personnel to Guam, and 30 to Yokosuka, it became a whole different ballgame. The leadership and planning for this endeavour fell to a four-person team consisting of an officer in charge (OIC), a project leader, a production lead, and a logistics lead to coordinate the forward logistics support (FLS).

The vast majority of the personnel deploying belonged to the production teams led, for the most part, by Ron Braithwaite, an FMFCB Group 3 work centre supervisor (WCS) with significant submarine maintenance experience. Ron represented FMF production during the reconnaissance visits, identifying key requirements, standards, equipment, and expertise necessary to ensure the success of the RAMP programs. A veteran of several submarine MRPs, Ron provided invaluable guidance when planning the execution of the work package, particularly with respect to personnel management. As a WCS, his experience was essential to building and maintaining team cohesion as each work period unfolded. For the RAMP Jr in Yokosuka, Ron was the overall production lead, responsible to the OIC for the entire FMFCB production contingent of 27 personnel. For the larger RAMP in Guam, with a production team closer to 50, the production lead was up-ranked to a work centre manager (WCM), a role assumed by Warren Lucoe, a submarine maintenance WCM for FMFCB Group 3, while Ron Braithwaite stayed on as one of four WCSs working under him.

The most significant difference between a standard MRP and a full-on RAMP is the spectrum of work required to be performed, and the size of the team needed to complete it. A three-person MRP normally does not require a dedicated supervisor on the ground, but when you have close to 30 people working on the same platform in close proximity during a RAMP, effective on-site supervision, personnel management, and material control are essential. The production leads might not end up doing much hands-on maintenance work themselves, but their management of the deployed Defence Resource Management Information System inputs, their guidance to command with respect to civilian collective agreements, and their deft handling of worksite personalities on a day-to-day basis are invaluable.

RAMP Jr. production lead Ron Braithwaite (left) and RAMP Jr. project lead Jeff McDonald inspect the USN Ship Repair Facility drydocks at Yokosuka, Japan (February 2017).

RAMP project leader Jeff McDonald was the first person to join the RAMP team after the OIC was appointed. Representing the FMFCB operations manager, Jeff brought an incredible volume of project management experience to the table. Moreover, as a former submariner, his familiarity in navigating the confines of *Chicoutimi* enabled him to create sensible RAMP and RAMP Jr work packages, and ensure the right people and skillsets were identified to handle nearly any unanticipated work requirement that might arise. During the reconnaissance visits, he quickly gained the respect of the OIC and the Foreign Liaison personnel through his dedication and persistence in getting things done.

Jeff's detailed knowledge of the overall work plan and his expertise with submarine maintenance led the OIC to designate him as the RAMP 2 I/C, an invaluable role within the RAMP command structure since the OIC was often called away to meetings with his USN and JMSDF maintenance partners. Jeff worked hand-in-hand with the RAMP production team by leading the plan-of-the-day meeting on the deckplates each morning to communicate the day's work priorities, and by coordinating and seamlessly integrating new and arising work requirements into the overall work packages without extending the work period. His hard work exemplified the benefits of proper project planning, and set a new standard for future RAMPs.

Coordinating the logistics support requirements for the deployed RAMP teams required much different concepts for each of the two work packages. For the smaller RAMP Jr in Yokosuka, the logistics lead was Brett Hood, FMFCB's acting Group 7 production logistics team manager. Since RAMP Jr's material requirements were necessarily minimal due to the difficulty of importing military equipment into Japan, Brett focused on personnel support, ensuring local transportation was in place and conducting local purchases of material as required. Working closely with the SST logistics team, he coordinated the movement and staging of the minor material that was shipped to Japan.

Meanwhile, for the larger RAMP in Guam, a more robust logistics team was necessary, given the wider scope of repairs, not to mention the much higher volume of material shipped. The management of RAMP logistics was divided between the material team, led by FMFCB Group 7 WCS Hope Hunt, and the RAMP FLS team led by Lt(N) Artur Gruszko, a logistics officer attached from National Defence Headquarters in Ottawa. The material team focused on the identification, coordination, pack-up, and management of two sea containers, one containing all the material and tools required for the completion of the planned work, and the other holding contingency materials in the event of arising work requirements. The FLS team concentrated on coordinating the administration aspects of engaging the local agent for facility and equipment support, managing the travel for all 60 RAMP personnel, and assisting with any arising local support item not previously envisaged. Although the Submarine Support Team logistics people were conducting similar support on behalf of *Chicoutimi*'s crew, the FMF team actually outnumbered the submarine's crew, so the requirement for an independent logistics team was readily evident from the start. Both logistics teams played critical roles in completing the work periods, despite some difficulties with local procurement in Guam. The material and administrative support ensured that the production team was safe, well-equipped, comfortable, and taken care of both on and off the worksite.

RAMP Jr. OIC Lt(N) Chris Niewiadomski presents SRF(Y) CO CAPT Garrett Farman (USN) with an FMFCB plaque in gratitude for the exemplary USN support in Yokosuka (October 2017).

Leading this whole enterprise was the OIC, Lt(N) Chris Niewiadomski, FMFCB's erstwhile deputy naval architecture officer. Appointed by FMFCB's commanding officer (at the time, Capt(N) Chris Earl), the OIC drew upon his experience in planning and leading the frigate HMCS *Regina*'s deployed RAMP in 2014 to devise the overall plan for *Chicoutimi*'s RAMP program. Even then,

The deployed RAMP Jr. FMFCB team at Yokosuka, Japan (October 2017).

the sheer size of the FMF contingent meant that several processes for RAMP planning had to be created out of necessity to deal with personnel coordination, communications, and the reconnaissance visits. With the expert assistance of the project leader and the production leads, streamlined methods were devised for identifying the many team members who would be required for the RAMPs, for organizing their travel bookings, and for establishing an efficient, operationally driven "daily comms" protocol. As well, to ensure the maximum benefit was gained from the reconnaissance trips to Yokosuka and Guam, a process was created to ensure that every aspect of the recces, from the identification of intended outcomes to the interpretation of the results, were carefully considered. Nothing was left to chance where the coordination and execution of these visits was concerned.

At the same time, the OIC was keen to enable the section leaders with appropriate autonomy to plan and lead their individual RAMP elements, allowing the project leader to build the work package, the production lead to assemble the production team, and the logistics lead to identify and coordinate all required material – all with reasonable, but not excessive, oversight. This individual autonomy enabled the successful completion of the work packages for RAMP and RAMP Jr, and also granted the OIC freedom to fulfill the other strategic objective of the RAMPs – engagement with our Allied counterparts.

Working with our American and Japanese colleagues was one of the eagerly anticipated elements of both RAMPs. The FMFCB workforce is a proud and professional team, and that pride translates into a genuine interest for comparison and improvement, not just with our Atlantic associates at FMF Cape Scott in Halifax, but with our counterparts from other nations as well. Normally, with an MRP/TAV, the deploying members rarely receive access to either material or expertise from the local facilities, and so must focus instead on their own resources, and those of the deployed naval unit they are supporting. For RAMP Jr in Yokosuka, Japan, Commander RCN's intent was for the FMFCB team to deploy with minimal materials and tools, and to work together with the USN team at Ship Repair Facility (SRF) Yokosuka to complete the required corrective maintenance.

SRF(Y) occupies a massive footprint in Yokosuka base, with a contingent of more than 2400 production staff and six dry docks. However, with a production workforce

A member of the FMFCB production team works hand-in-hand with USS *Emory S Land* USN production staff, Guam (January 2018)

The FMFCB production team tours the facilities on board the USS *Emory S Land*, Guam (January 2018).

RAMP OIC Lt(N) Chris Niewiadomski presents USS *Emory S Land* CO CAPT Douglas A. Bradley (USN) with an FMFCB plaque in gratitude for the outstanding USN support in Guam (January 2018).

consisting entirely of Japanese civilian personnel, it became politically impossible for the SRF to provide maintenance support on the eve of a snap general election held in October 2017. Instead, the RAMP Jr team sought other opportunities to work with our American and Japanese counterparts, borrowing tools and workshop space, and working together on standard port visit support activities such as crane services. The American military and civilian leadership of the SRF, headed by SRF(Y) commanding officer Captain Garrett Farman (USN), and SRF visiting ships coordinator John Mahony, was also incredibly supportive by providing the FMFCB team with an empty warehouse/workshop to use as an office and staging area, and spending long hours assisting with local procurement.

In Guam, the RAMP team found great success interoperating with our American hosts. Being a USN submarine maintenance base, Guam was home port to two submarine tenders – USS *Emory S Land* and USS *Frank Cable* – large floating repair facilities, crewed by USN uniformed production staff. With an agreement between the commanding officers of *Emory S Land* and FMFCB, our team members were allowed to work on board the tender alongside USN personnel, using major fitted equipment and tools. Local SUBRON 7 staff also arranged for us to use a large accommodation barge as an additional office and staging area. The cooperation went even farther when USN maintenance staff on board *Emory S Land* fully integrated the FMF team into their maintenance planning and daily operations meetings, even assigning a dedicated USN maintenance chief, Chief Chris Carruthers (USN), to facilitate our support requirements. With the assistance of Chief Carruthers and the tender repair officer, Commander Ethan Fidel (USN), the USN-FMFCB partnership developed into a tremendous strategic success.

Each of the deployments presented a unique opportunity for the FMFCB teams to experience something different from their normal Esquimalt workday, and to their credit the teams made the most of their deployed time. In Japan for RAMP Jr, many of the team members avidly immersed themselves in the local cuisine and music culture. The weather was abysmal for much of the work period due to the approach of Super Typhoon Lan, but the team never complained of the heavy driving rain and continued its work as long as possible. The storm made landfall in the early morning hours of October 23, but passed through more quickly than expected, so that by afternoon the all-clear was given. In fact, the weather improved enough that many members took the opportunity to visit Disneyland Tokyo, fair reward for the successful completion of nearly 30 jobs in 2000 workhours over just five days.

Guam's RAMP also broke new ground for the FMFCB team – deploying in a larger group than it ever had done before. It provided the opportunity for the team to bond in a number of new ways, and demonstrated how the full command and supervisory structure of the FMFCB production department could translate to a deployed setting. A year-end overtime crunch meant that the standard RAMP workday was only eight hours long, and with the necessary shifting of the workday to avoid rush-hour traffic, this meant that the vast majority of the FMFCB team was finished work by 1500 each day. Guam being a resort destination, the team members were able to relax in a tropical atmosphere during their leisure time, a rare opportunity for most considering it was January. Members of the FMFCB team also reached out to their USN counterparts on their off-duty hours, building new friendships through mutual interests in kite-surfing, scuba diving and other outdoor pursuits. Having ample time to rest paid off in the latter half of the RAMP, as the work tempo increased to meet *Chicoutimi*'s scheduled departure date. Even with significant material shipment problems the workforce morale remained high, and the team stayed close-knit and productive right to the end. In fact, the close of the RAMP came not a moment too soon as the OIC returned home on February 2, 2018, only 48 hours ahead of the birth of his first child.

> ***"In Guam, the RAMP team found great success interoperating with our American hosts."***

There were many key lessons learned from the RAMP and RAMP Jr deployments. Given that *Chicoutimi* departed both ports with all repairs complete, and successfully returned to Esquimalt in March 2018, it is a fair statement to say that the RAMPs were a complete technical success. The real success lay in what we learned so that we will be able to do things better and more efficiently in future. The RAMPs proved that building a deployment team with a wide enough scope of skillsets to cover nearly all possible contingencies and types of repairs was essential to success,

and that the importance of logistic support cannot be overstated, given how the difficulties we experienced in shipping dangerous goods and other items to Guam threatened the completion of the work package.

On the IT front, we learned a tough lesson through the complete failure of the deployed TDVPNI/DRMIS solutions for both RAMPs. The OIC and other key leaders had no alternative but to organize and run the maintenance programs entirely via Blackberry. The integration of Fleet Technical Authority's Materiel Certification team process into the RAMP also presented several hiccups, but great progress was made, and the next evolution with deployed MATCERT will be much more streamlined. Finally, the FMF travel cell, while skilled and dedicated, was woefully understaffed in supporting the travel bookings of up to 60 individual team members in a short period of time.

However, even with all of these serious problems and deficiencies, the RAMP teams returned to FMFCB as a close-knit group with real-world deployed experience under their belts, having twice successfully repaired a submarine in a foreign port and returned it to operations at sea. The value of deploying such a large and diverse team was reinforced not only by the completion of all the planned and arising work, but by the improved cohesion and morale that the FMFCB team returned home with. That such a degree of success was realized is a testament to the professionalism and hard work of the FMFCB team, and leaves no doubt about the ability of FMFCB to support a deployed RCN platform. As always, FMFCB serves the fleet – anywhere on the globe.

Lt(N) Chris Niewiadomski was the Deputy Naval Architecture Officer at Fleet Maintenance Facility Cape Breton in Esquimalt, BC, during HMCS Chicoutimi's deployed maintenance demonstration program. He completed his postgraduate Masters in Naval Architecture at UCL in London, UK following his Assistant Head of Department tour aboard HMCS Vancouver, and between positions at Maritime Forces Pacific Headquarters and Fleet Technical Authority. Lt(N) Niewiadomski joined HMCS Regina as the ship's Marine Systems Engineering Officer in July 2018.

The assistance of Fleet Maintenance Facility Cape Breton Operations Manager Cdr Amit Bagga in the preparation of these articles is gratefully acknowledged. — Editor

FMFCB RAMP members with USN maintenance staff at U.S. Naval Base Guam.

FEATURE ARTICLE

NAVAL FLEET SCHOOL ATLANTIC MAR ENG QL6 COURSE TECHNICAL SERVICE PAPER ADAPTATION

Editor's note: The QL6 course technical service paper gives senior non-commissioned personnel an opportunity to develop their ability to study a technical problem, devise solutions, and present their findings. It is a valuable training project and no small challenge. The *Journal* is pleased to support this important initiative.

A Proposal to Use Radio Frequency Identification (RFID) Technology on Board HMC Ships

By LS Daniel J. Hilchey

[Supporting references are contained in the author's source document.]

The term RFID is used to describe a number of technologies that employ radio waves to automatically identify an object. The object is identified using an RFID tag that is powered by and responds to a radio-frequency query from an RFID reader. These RFID tags/chips may contain and relay information essential to lifesaving operations, such as the location of a crew member during a man overboard or verification muster.

The scope of applicable scenarios included in this report has been restricted to Verification Musters and Emergency Stations for a fire (at sea); this is intended to give a more focused picture of the benefits of using RFID to track personnel at sea.

Personnel Location Awareness

Verification Muster: The purpose of a verification muster is to confirm the presence and safety of all members on board.

1. A verification muster is initiated by the general alarm followed by the pipe "**Verification muster, Verification muster**".
2. In response to this pipe, the Ops Room will record the ship's current physical location,
3. Personnel on watch must reduce to minimum manning based on the tactical situation.
4. All other personnel proceed to their messes and cabins, lie in their bunks and remain there until the muster is completed.

Radio Frequency Identification Personnel Tracking

5. Personnel remaining closed up are accounted for by their supervisors.
6. All remaining onboard personnel are sighted in his/her bunk/cabin and a sentry is posted at the entrance to the mess when the verification muster is started.
7. Late arrivals are to be kept in the settee area and accounted for upon completion of the mess verification.
8. The Senior Hand proceeds to the Regulating Office Flat and falls in to report his/her mess.
9. The Cox'n matches the list of personnel remaining closed up with the lists of the Senior Hands;
10. When the Senior Hand has accounted for everyone in the mess (s)he will say, "_____ Mess correct" and return to the mess or as directed by the Cox'n; and
11. The names of any missing personnel are to be passed to Command/Cox'n who will pipe the individuals to report to the Regulating Office.

With the exception of certain key positions in the Ops Room and Bridge, every member of the ship's company is required to respond to a fire. This can be a very confusing time and mistakes can be made with respect to personnel location and safety. Without RFID technology, the chain of command will be only vaguely aware of some of the physical locations of the ship's company before and during the incident. Given the sheer number of workspaces on board a *Halifax*-class frigate, it can be hard to account for 200 or more crew – especially during an incident such as a fire.

Areas of Improvement

Some of the areas of improvement that could be tackled with Radio Frequency Identification would be missing personnel monitoring, better situational awareness during emergency operations integration with the battle damage control system (BDCS)[1], indication of personnel on upper decks during heavy seas or emergency operations, controlling access to certain areas of the ship, and locating personnel on board the ship in an efficient and timely manner.

The Problem

Inefficiencies and uncertainties occur during emergency situations on board; decreasing inefficiencies by increasing situational awareness could result in a better chance of survival and operational effectiveness. During emergency operations, personnel on board are located in various parts of the ship performing direct operations or supportive roles. Without accurate and timely information passed on about each member's whereabouts, mistakes can be made and miscommunication could adversely affect lifesaving or equipment-saving efforts.

Tracking Area Map

Implementation of Personnel Tracking via RFID

Radio Frequency Identification equipment should be installed to track members' locations on board, via a passive or active system. This would allow command to monitor the location of every asset on board.

The installation of a dynamic, preferably wireless, cloud-based system of interconnected Radio Frequency Identification equipment would provide the solution. Each respective space would be outfitted with an interrogator that could either actively or passively identify RFID tags within its range. Upon identification of a given RFID tag, the database would simply assign the crew member a physical location based on the static, known location of the interrogator. Ideally, this would be a decentralized and cloud-based system in order to increase resilience.

In the case of a verification muster, members could simply scan into their respective space on board to send location information directly to the Cox'n through either a wireless handheld device and/or a BDCS console. This technology

1. See MEJ 78 Fall 2015, p.13.

would save time and increase operational efficiency by eliminating the need for members to traverse through the ship to their respective messes, be sighted, and be reported to the Cox'n. Verification musters would not only be faster, but the system could also be used to spot anomalous scan timings for possible life-saving information – such as an on-watch crew member who hasn't scanned into a space in several hours, or a crew member who scanned into the upper decks alone and hasn't scanned back in below decks.

In the case of a fire, this information would also be available to Section Bases, Casualty Clearers and Emergency Response Teams to allow them to track their personnel and increase situational awareness. The likelihood of a miscommunication resulting in two attack teams showing up to a fire, for example, would be greatly reduced. The system would also track casualties and personnel in adjacent zones and could be used to quickly direct casualty evacuation efforts.

Option A – Passive RFID

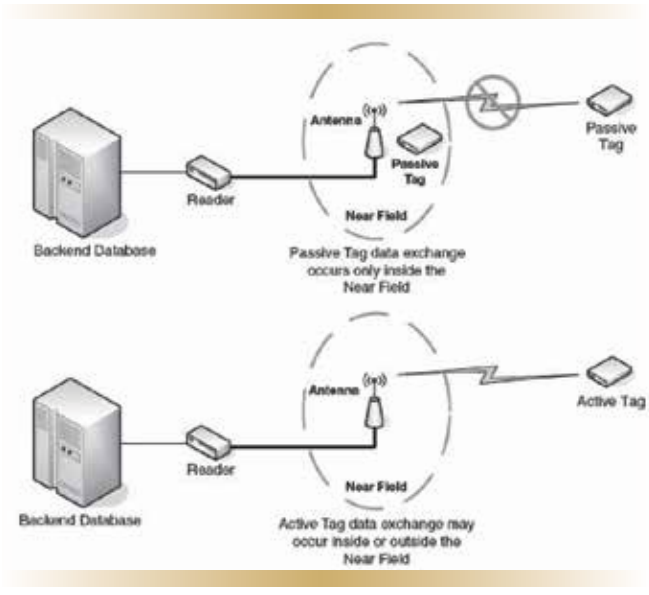
Radio Frequency Identification is not currently used on board HMC ships. A dynamic, preferably wireless, cloud-based system of Radio Frequency Identification equipment on board would provide the solution. Wireless capability would increase resilience to damage if portions of the system are lost and the need for physical connections is eliminated. Each respective space would be outfitted with an interrogator that would identify RFID tags, which are passively energized by electromagnetic induction from the interrogator, within in its range. Passive radio frequency identification could best be utilized for tracking assets, inventory control, and controlling access to restricted areas on board HMC ships – and have a life span of up to 25 years or more. This information would be shared throughout the ship to be utilized by whichever means command desired. When a tag enters an RFID area it would be identified, the information sent to the cloud-based system, and disseminated through appropriate channels. This information would then be available to the Cox'n during verification musters to locate personnel, which could prove invaluable to lifesaving efforts. This information would also be available to Section Bases and Emergency Response Teams to locate incoming/outgoing personnel to increase situational awareness.

Option B – Active RFID

Active Radio Frequency Identification systems and tags would offer a more accurate method of providing real-time asset tracking on board the ship. The active RFID tags contain a battery that provides long ranges, and increase in memory capacity with a life span of three to five years.

Table 1 – Option Comparison

	Option A	Option B
Tag Cost	$0.15 - $5 per tag	$15 - $100 per tag
Benefit	Durable and cheaper	Durable with wider range of capabilities
Operational Capabilities	• Longer Range • Large data capacity • Larger	• Shorter range • Small data capacity • More compact
Maintenance Cost	Nil	Battery replacement
Reliability	Extremely durable and long lasting, 25+years	3-5 year life span due to battery



Source: Google Images

Passive versus Active tag

There are two types of active tags available; the first are transponder tags, which operate similar to passive tags where they wait to receive a signal from the transponder before responding with the applicable information. The other type are the beacon tags, which have an extended range and do not wait to receive an interrogation signal from the transponder; instead they broadcast the signal on a set interval. The type of tag that would be more applicable on board would be the transponder type, as its battery life would be more conservative and the longer ranges would not be necessary on board ship.

Summary and Recommendation

In both options, the goals have been met. The solutions presented here would be capable of increasing efficiency and safety on board HMC ships.

Throughout this report, opportunities have been identified for improvement in the area of personnel tracking. These options demonstrate simple and cost-effective means to resolve common issues that affect the emergency operations detailed above on board HMC ships.

While both Option A and Option B meet the criteria to perform the desired functions on board, Option A is better due to its compact size. It is more cost-effective and the tags are much more durable – reducing maintenance and increasing resilience to long-term usage.

It is recommended that further applications of Radio Frequency Identification on board ships be explored once a system is installed, and that the system be versatile using off-the-shelf components that are commercially available for ease of installation and replacement.

Reference

A Proposal to Use Radio Frequency Identification Technology on Board HMC Ships, Technical Service Paper, LS D.J. Hilchey, Canadian Forces Naval Fleet School Atlantic – QL6 System Maintainer Technical Communications Course 5273, NFS(A): 4500-1 (CSE Div), 4 April 2017.

Leading Seaman Dan Hilchey and sons

Photo courtesy Adam O'Brien Photography, Halifax, NS

LS Daniel Hilchey is a Weapons Engineering Radar Technician on board HMCS St. John's. The Dartmouth, Nova Scotia native joined the Canadian Armed Forces in 2009, and the Royal Canadian Navy in 2012. Daniel says he spends the majority of his off-duty time with his sons Dawson, 7, and Jace, 3. This great shot of Dad and the boys was taken by Halifax photographer Adam O'Brien.

OUR PEOPLE

Finding opportunity, independence and fulfillment

By Priyanka Swamy
(DNPS 3-5-3, Marine Electrical Systems, Directorate Naval Platform Systems, Ottawa)

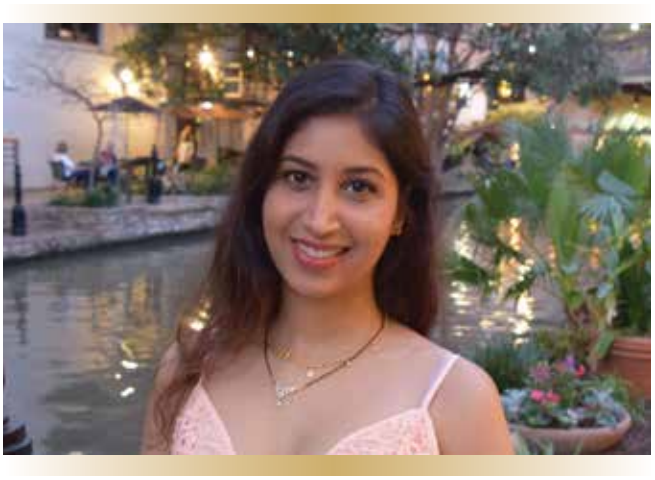
Whenever people ask me about my background, I respond proudly that I have roots in two countries – my homeland India and my adopted country Canada. Born in the southern Indian city of Bengaluru, I immigrated to Canada with my family at age 12, thinking naively that we were just going on a trip. Despite the initial culture shock, my life in Canada has been incredible. We were welcomed with open arms and given a sense of belonging.

Canada is a land of abundant opportunities, as I learned in 2011 when the Department of National Defence (DND) hired me. I was practically invited to join before even graduating from my four-year undergraduate program at Carleton University in Biomedical and Electrical Engineering. When I had my first interview with DND in 2008 for a co-op placement, I was thrilled to get hired after my second university year because this met my need for financial independence and power over my own future – the driving force in the choices I have always made.

I am a very independent person and try to be an overachiever in all areas of life. I was able to fund all four years of my university education and graduated with no debt. It had been ingrained in me to make good use of the resources my parents had provided me by achieving great things, both as a way to thank them and to show appreciation for their hard work during our initial years in Canada.

By 2010, I had spent three work terms as a DND co-op student, building my knowledge and creating a place for myself in the organization. Initially, I had no idea what it was like to work as an engineer, nor what would be expected of me. I absorbed everything I could that first summer, trying to understand an engineer's responsibilities. When given an opportunity to go on board a frigate in Halifax, I got to see first-hand how the work in Ottawa can affect the quality of our Navy and the safety of its men and women. I was fascinated by the size of the RCN, and by the importance of the team here in Ottawa in supporting it. This realization had me aspire to join DND with a sense of purpose.

My supervisors were pleased to refer me as a strong candidate, and this solidified an indeterminate position as



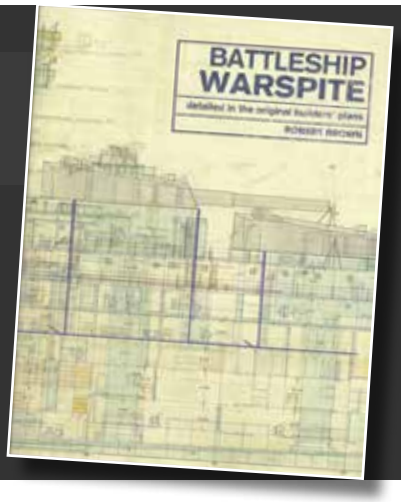
an Engineer-in-Training at DND upon graduation. I was thrilled to work for an organization that both inspired me and was willing to invest in me.

Since 2013, I've been responsible for ships' internal lighting, cabling, degaussing, cathodic protection, heated windows, active shaft grounding units, and casualty power. Initially, taking on numerous projects at once was overwhelming given that my predecessor had been in the position for decades. But through determination and the support of my colleagues, I feel I have successfully carried projects forward and proven my capabilities as an engineer. I love the fact that the work we do in the RCN's technical branch in Ottawa is as tangible as it gets. The exciting challenges and risks truly test an engineer's capabilities. Every day, I feel fulfilled and happy over my decision to join DND. It's an engineer's dream to be involved in such a field.

Away from work, when I need time to myself, I find it therapeutic to create acrylic paintings. They can be seen at www.priyankaswamy.com. My husband and I also enjoy travelling around the world in search of new experiences. He and I share similar stories of how we settled here at about the same time. I have Canada to thank for bringing us together and for providing me with this uplifting "opportunity" as well.

BOOK REVIEW

Battleship WARSPITE: Detailed in the Original Builders' Plans



Reviewed by Tom Douglas – Associate Editor *Maritime Engineering Journal*

Seaforth Publishing – An imprint of Pen & Sword Books – 47 Church Street, Barnsley, South Yorkshire, United Kingdom S70 2AS Email: info@seaforthpublishing.com

ISBN 978 1 5267 1937 9 (Hardback: £24) Available from Amazon.ca at CDN $48.90

144 Pages: 128 colour plans showing original design, modernization and major reconstruction; bibliography; acknowledgements

Canadian author Robert Brown came up with the idea for this treasure trove of memorabilia about this showpiece of the *Queen Elizabeth*-class battleships while researching original builders' plans to assist him with his ship-modelling hobby.

Published in association with the National Maritime Museum in Greenwich, England, Battleship WARSPITE is the first in a series of volumes laying out in a comprehensive set of colour plates the technical details of early 20th-century British warships as recorded in a set of plans produced by builders on completion of every vessel.

Known as the "as fitted" general arrangements, these drawings documented the exact appearance and fitting of the ship as it entered service. They were very large – more than 12 feet long for capital ships – highly detailed, annotated and labelled, and drawn with precision by skilled craftsmen in multi-coloured inks and washes.

The publisher points out that these drawings were intended to provide a permanent reference for the Admiralty and the dockyards and "… represent the acme of the draughtsman's art."

While the emphasis in this compendium of detailed "blueprints" of *Warspite* is on the ship as recommissioned in 1937 after her major reconstruction, sections also cover the original design, the ship's earlier modifications, and details of action damage and wartime alterations.

With the popularity of his first effort, the author has turned his attention to other warships. Additional titles already available or soon to be published are:

- German Destroyers
- German Battlecruisers
- Japanese Battleships: Fuso and Ise classes
- *Rodney* and *Nelson*

HM ships *Rodney* and *Nelson* are described by the publisher as "… the only capital ships designed and built between the wars – a special concession of the Washington Treaty's ban on new battleships – and they were unlike anything before them, with the superstructure three-quarters aft and all main armament turrets forward of the bridge."

During the Second World War, HMS *Nelson* sustained mine and torpedo damage, while *Rodney* played a major part in the destruction of the German battleship *Bismarck*. Both survived hostilities and were eventually broken up post-war.

Students of naval history – be they professional sailors or armchair admirals – are the lucky beneficiaries of the decision to make these officials plans available to the public in this coffee-table-style book.

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.

NEWS BRIEFS

The Secret Invasion Diaries of Able Seaman Fred Turnbull

Veterans who saw active duty in any branch of the Canadian military during the Second World War consider themselves lucky if they survived one major battle. Able Seaman Fred Turnbull "delivered the goods" as a bowman on an assault landing craft (LCA) in four major Allied invasions and lived to write about it.

In fact, he is still alive and well, and helping to honour his fellow seamen through a book he wrote about his experiences called *The Invasion Diaries*. AB Turnbull's account of his hair-raising experiences – kept in secret notes that he bent the rules by scribbling – is still for sale. Even better, all proceeds are donated to the Canadian Naval Memorial Trust (CNMT), the organization charged with preserving HMCS *Sackville* as a floating museum in Halifax Harbour.

CNMT Director Bill Gard, CD, RCN (ret.) has taken on the task of seeing that the book is still available for purchase. Bill can be contacted at **wgard@eastlink.ca** The $20 price tag for the book includes the cost of mailing.

Born in Montréal, Fred Turnbull joined the RCN in the summer of 1942 at the age of 17. At 18, he was a bowman and gunner on an LCA during the invasion of Sicily – an exercise being commemorated this year as the 75th anniversary of the Allied landings in Italy. At 19, AB Turnbull landed Canadian soldiers on the beaches of Normandy and Southern France. In addition, his Canadian flotilla spearheaded the liberation of Greece in September 1944.

At the end of hostilities, Turnbull enrolled at McGill University in his home town, where he studied history and economics. He spent most of his post-war career in the financial industry and retired in 1989 as assistant vice president of Montreal Trust.

As Terry Meagher, Publisher of Veterans Publications – the company that produced the book in 2007 – wrote in the Foreword to the 114-page paperback: "This book is the unique creation of a man with an historian's training and a sailor's understanding and experience. He is able to combine the freshness of a young kid seeing things for the first time with the theories of strategists. His belated work should provide the most unique perspective on invasions yet written by a Canadian."

— Tom Douglas

AWARDS

Weir Canada Award

NTO Award photos by A/SLt Darrell Read

Slt Kyle Vantol
Top Marine Systems Engineering Phase VI candidate
(With Mr. Joel Parent)

L-3 MAPPS – Saunders Memorial Award

NTO Award photos by A/SLt Darrell Read

Slt James Melville
Top student, Marine Systems Engineering Applications Course *(With Cmdre Simon Page)*

Mexican Navy Award

NTO Award photos by A/SLt Darrell Read

Slt Taha Moufid
Top student, Naval Combat Systems Engineering Applications Course
(With Capitán de Navío José Manuel Ramírez Villalobos)

Naval Association of Canada Shield

NTO Award photos by A/SLt Darrell Read

Slt Kai Imai
Highest standing, professional achievement and officer-like qualities during Naval Engineering Indoctrination
(With Cmdre Mike Cooper, RCN (Ret.))

AWARDS

MacDonald Dettwiler Award

NTO Award photos by A/SLt Darrell Read

Lt(N) Jeremy Hamilton
Top NTO candidate to achieve Head of Department qualification *(With Mr. Robert Quinn)*

Royal Military College of Canada Carruthers NT Sword

Photo by Robert Haddow

NCdt Andy Lee
For academic achievement and exemplary performance
(With Capt(N) Jim Carruthers, RCN (Ret.))

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CNTHA

NEWS

Canadian Naval Technical History Association

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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.

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HMCS *Bras d'Or* at 50

By Cdr (ret.) Pat Barnhouse and Brian McCullough

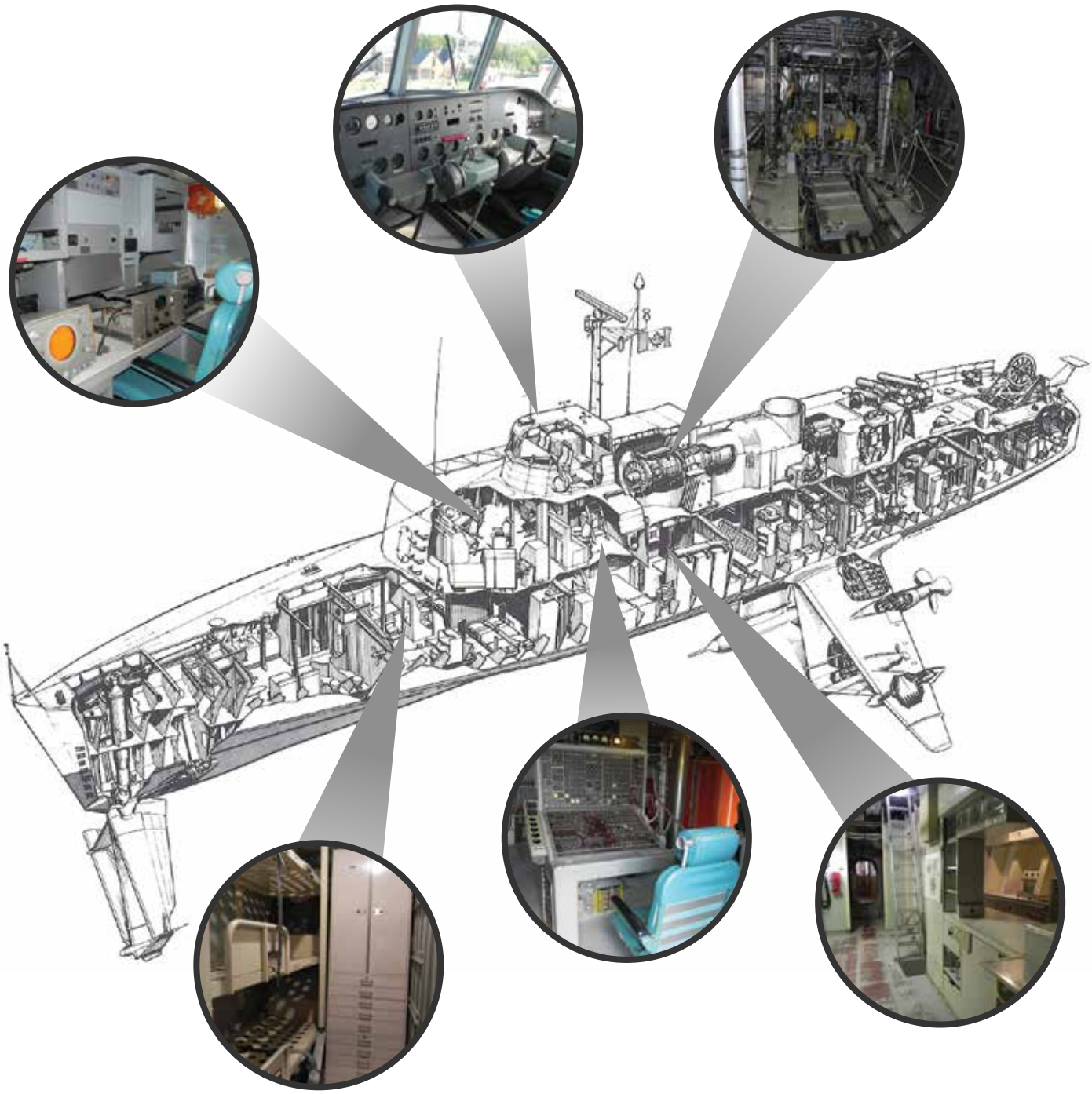
The 50th anniversary of the commissioning of the RCN hydrofoil HMCS *Bras d'Or* (FHE-400) passed without fanfare in July, in stark contrast to the press frenzy associated with her heyday as the fastest warship in the world when she clocked an astounding foilborne speed of 63 knots during trials. Decommissioned in 1971 after a service career that many claimed was unnecessarily cut short, the vessel demonstrated the very best of forward-looking Canadian naval technology that would forever change the face of warship design, construction and capability.

The CNTHA has been fortunate over the years to receive the recollections of a number of people who had first-hand experience on the FHE-400 Hydrofoil Project, among them Rolfe Monteith, Tom Bennett, Brian McNally, Pat Barnhouse and others. While we have published some of this material here in our newsletter and the *Maritime Engineering Journal*, other papers pertaining to the *Bras d'Or* project can be found archived on our website. If you can find a copy, author Thomas G. Lynch's 1983 book, *The Flying 400*, is both a definitive reference and an enjoyable read.

Since 1983 the ship has been maintained as an exhibit at the **Musée Maritime du Québec** (the Bernier Museum) at L'Islet-sur-mer on the south shore of the St. Lawrence River, one hour east of Quebec City. This progressive museum is an outstanding destination for anyone interested in the maritime heritage of Eastern Canada, and guided tours of the hydrofoil are offered during the regular tourist season. *CNTHA News* gratefully acknowledges the extraordinary access granted us to photograph the ship inside and out. We also thank Ian Mack (no relation to the retired rear-admiral of the same name), representing the family of FHE-400 project design engineer Thomas Drummond, for scouting out copies of the historical photos used with this article.

Canada

HMCS *Bras d'Or* (FHE-400)



(Cutaway diagram courtesy DeHavilland Canada)
Photos by Brian McCullough