

Introduction

The completion announcement for Halifax Class Modernization (HCM) FELEX program is the second page of this paper. Yes, this means that after 30⁺ years the SHINPADS SDB has been finally retired in the Canadian Fleet. How many of you remember what SHINPADS stands for or could name the other SHINxxx systems deployed during our time?

Does this mean, no more UYKs? Not so! The Communications Control Management System (CCMS) still has two AN/UYK-507s and an MU-5028 Disk Drive? For how much longer, no one knows.

Interesting factoid, the Combat Management System that replaced the SHINPADS Command and Control Suite is no other than the Q-70 and water-cooled server/system racks developed by our colleagues in Eagan, a fitting ending to a great legacy. Eight system racks distributed through the ship now run the Combat Management System.

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Those Q-70 products [display consoles and Mission Critical Enclosures (MCE)] that were designed in Eagan were all built in Kanata, Ontario under license [no charge] by Lockheed Martin Canada.

By John Westergren².

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¹ Ed is a former employee of Sperry/UNISYS facility in Winnipeg Canada.

² John is co-chair of the Legacy Committee. During his corporate career, he was chief engineer at the Winnipeg facility for a few years.

"News Release: Government of Canada marks major milestone in a multi-billion dollar defence procurement

November 29, 2016 – Halifax, N.S. – National Defence / Canadian Armed Forces

The Government of Canada is committed to providing the women and men of the Royal Canadian Navy with the modern equipment needed to protect Canadians at home and abroad. Keeping with this commitment, a ceremony was held today marking the completion of the *Halifax*-class Modernization/Frigate Life Extension (HCM/FELEX) project, which provided state-of-the-art upgrades, allowing Canada's fleet of 12 *Halifax*-class frigates to meet 21st century threats.

HMCS *Toronto*, the seventh and final frigate on the East Coast, has now completed the refit portion of its modernization by Irving Shipbuilding Inc. This means all 12 frigates, five on the West Coast and seven on the East Coast, have completed the refit portion of their modernization. The final step will be a period of tests and trials in the reactivation phase for HMCS *Toronto* and two other ships.

Member of Parliament for Halifax, N.S. Andy Fillmore, on behalf of Defence Minister Harjit S. Sajjan, along with Vice-Admiral Ron Lloyd, Commander of the Royal Canadian Navy, delivered remarks to mark the occasion.

The HCM/FELEX project included a new Combat Management System procured from Lockheed Martin Canada, as well as new radar capability, a new electronic warfare system, and upgraded communications technologies and missiles. The modernized frigates also boast new systems that offer better damage control, as well as more modern electrical and machinery control.

Quotes

"I would like to thank all those involved in the HCM/FELEX project for their hard work in successfully completing the refit portion of the modernization of all of Canada's 12 frigates. This project was delivered on time and under budget, and allows the *Halifax*-class frigates to continue to operate as the backbone of our Navy."

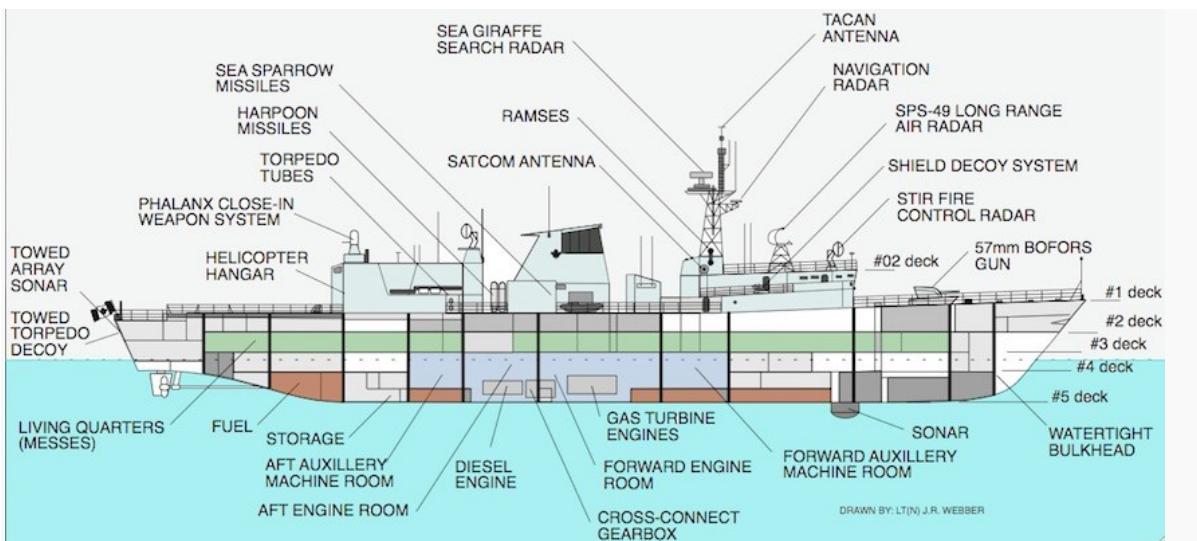
Defence Minister Harjit S. Sajjan

Quick Facts

- The *Halifax*-class Modernization (HCM) program represents an investment of \$4.3 billion and allows the frigates to serve the Navy until the early-to-mid-2030s.
- HCM/FELEX falls under the larger HCM program. The HCM program is a highly complex and collaborative effort between DND, the Navy, and more than thirty companies within the Canadian shipbuilding industry. Together, they have been working to deliver a first-class capability, on time and under budget while also ensuring robust economic benefits to Canada.
- The first modernized frigates re-entered service in late 2014. Currently, nine of the Navy's 12 frigates are capable of being employed on operations and exercises around the world. Three frigates are in their reactivation phase.
- On November 29, 2016, HMCS *Toronto*, the seventh and final frigate on the East Coast, completed the refit portion of its modernization by Irving shipbuilding Inc. This means all 12 of the *Halifax*-class frigates, five on the West Coast and seven on the East Coast, have completed the refit portion of their modernization."

Background Information

The Canadian Patrol Frigate Program



The Sperry Corporation advertisements say "at Sperry, we listen!" The simple success story on the Canadian Patrol Frigate (CPF) program can be told in two words, *we listened*. The emphasis must be placed on both words because the 'we' represents an extremely enthusiastic and caring team of Defense Systems people. The 'listening' made them dedicated to the dream of being partners in the development of the first-of-a-kind Distributed System Architecture. The result, the Canadian Patrol Frigate program, represents the largest single systems contract in the history of Defense Systems.



SHINPADS

The Canadian Navy's AN/UYC-501(V) SHINPADS (**S**Hipboard **I**ntegrated **P**rocessing **A**nd **D**isplay **S**ystem) and the AN/UYK-502(V) Data Processing Set were among the first Canadian products to be developed, manufactured, and supported in Winnipeg. The system concepts and initial hardware design for these were created at Sperry in Eagan then transitioned to the manufacturing facility in Winnipeg, Canada.

To read more about the SHINPADS, go to our Legacy page and enter SHINPADS into the Google search box to find links to another dozen related articles/stories on our site; for example some of the wording included herein came from <http://vipclubmn.org/SysDocImg/2012ReunionProducts.pdf>.

Extracted from Marc Shoquist interview³: <http://vipclubmn.org/Articles/MarcShoquist.pdf>

How about other obstacles, technical obstacles? I know that you had one or two of those, especially in the interface area. Well, one of the technical problems (and it still exists) in serial transmission systems in using coaxial cable is the interface between the cable and the circuit board. For inexperienced designers, this would cause a lot of noise that would essentially not allow the interface to work. So, that was a technical problem. Not so much with us. As a matter of fact, on another area of the interconnect system is my group's contribution to local area networks, particularly the SHINPADS data bus system. There was a major technical discriminator in that project, which started out as a study contract from Canadian National Defense (CND). They gave an award to two companies. One to Lockheed Canada, which was an in-country company; and the other to us. The challenge was to develop a bus with which the network did not have a single point of failure. Our approach was to have the connection to the primary bus be passive. The alternative approach was a ring bus where every connection was an active tap and the signal would be regenerated. Of course, this represented a single point of failure since it was active. But, I believe that our approach, the passive tap connection, helped us win the program. But it presented a major challenge. One of my engineers Bill Davis, modified the coaxial connector, the key connector to the line that minimized the reflections. He and Ernie Griffith have the basic patent on that connector. That allowed us to put up to 28 connections on the primary bus, meeting that technical challenge.



Wasn't SHINPADS the first real local area network to be deployed on a Naval combat...? Yes, and there were complimentary data buses being developed by the US Navy at the time, but the Navy takes a long time to implement new systems. So, the Canadian Navy could do it in a matter of months, because they were very small and didn't have communication problems between all their different divisions, plus there was a champion of the SHINPADS data bus – Commander Carruthers. At the time, he had a PhD in electrical engineering, and had enough clout with CND that he could get the Ship board integrated display system where everything would be connected to a central bus. The study contract was awarded in 1977 or so, and I think by 1978-9 we had developed the bus. It became, you're right, the first data bus used in a combat data system.

Dozens of St. Paul engineers, managers, programmers, et al' were resident in Canada during the development and systems testing of SHINPADS. Ask Dave Kolling and Denny Abbot about the leadership challenges there.

³ Questions in italics are by John Westergren. Marc passed away in Oct. 2013.

UYKs

What does the military equipment designation AN/UYK stand for? Mil-Hdbk-6 provides the military equipment nomenclatures' definitions.

- AN/ – Army-Navy-Air Force
 - 1st letter: U – General utility (includes two or more general installation classes; shipboard and ground), A – Airborne,
 - 2nd letter: Y – Data processing, S - System
 - 3rd letter: K – Computing, C – Communications, Q - Display

Nomenclatures are important in the defense systems as they are used in the spare parts chains, unit inventories, etc. Numbers are assigned in the order that nomenclature applications are submitted. For example, the AN/UYK-7 was a 32-bit computer developed for the Navy while the AN/UYK-8 was a 30-bit computer developed for the Marines. The UYK-8 design started before that of the UYK-7, however its nomenclature request was later in the contract.

Nomenclatures for Canadian equipment start with 500 to distinguish them from US equipment. The UYK-502 and a technology upgraded UYK-507 are both members of the 16-bit UNIVAC/Sperry/UNISYS computer family that began with the Type 1616 desk top processor. <http://vipclubmn.org/cp16bit.html> describes the lineage. The US Navy had required that the AN/USQ-70 be function code compatible with the NTDS AN/UYQ-21 display units.



Q-70s

The family of ruggedized display consoles and processors comprised by the Navy's AN/USQ-70 Advanced Display System is the Government's largest commercial off-the-shelf program. Development of the AN/USQ-70 began with a proposal to the US Navy in 1993. The Q-70 has successfully harnessed the rapidly advancing computing technology of the commercial realm through its ground-breaking technology refresh process. Thousands of Q-70s populate the Navy's subsurface, surface and airborne platforms.

LMCO MS2 team delivered the 8,000th AN/USQ-70, or Q-70, combat console suite to the U.S. Navy. This unit was installed in the USS Minnesota, SSN 783 submarine – launched in 2015.



Thanks to Ed and John for their inputs and review of this paper. LABenson