

## EVOLUTION OF THE COMBAT SYSTEMS ENGINEERING SUB-CLASSIFICATION

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*[Preamble: Ken has considerable experience in the CSE world and this document represents his recollection of some of the things that went on over a rather tumultuous period for the Navy (fewer ships, fewer men, unification, integration, ...). Readers are invited to contribute their comments on the CNTHA website. Go to: <http://cntha.ca/comments.html>].*

The 1950s saw introduction of the ST LAURENT Class of destroyer escorts (DEs), lightly armed but with somewhat modern weapon and command systems – although the Navy had not yet entered the digital computer or solid-state technology era. The few computers in these ships were all analog technology – namely the surface/air gun fire control system and the sonar system computers. At the same time, the RCN was experimenting with digital computers when it developed and sea-tested its Digital Automated Tracking and Resolving (DATAR)<sup>1</sup> system. Ahead of its time, DATAR never did get into production and it would be nearly 20 years before any of the associated technology would get installed in RCN ships.

In the early-1960s the ST LAURENT Class underwent conversion to helicopter destroyers (DDHs) and had variable depth sonar installed. At the same time, follow-on Classes of these ships were built – a total of 20 ships – as DEs and some as DDHs. And in “manning” these ships, the RCN adopted a trade-specific “user-maintainer” concept whereby the same individual would operate as well as support all of the ship systems.

In the Combat System world, the RCN had several technical/operator men’s trades – Weapons Surface (WS), Weapons Underwater (WU), Fire Control (FC), Sonarman (SN), Radar Plotter (RP), Electronics Technician (LT), Radioman Special (RS – electronic warfare specialists), Signalmen Sea (SG – the communications operators), and Radioman (RM), who were radio and cryptographic equipment specialists. Men’s training still was system/trade-specific and progressed through Trade Groups (TGs) 1 through 4 in all disciplines. This training consisted of extensive courses at the Fleet Schools in Halifax and Esquimalt and, for the junior ranks, considerable “On-The-Job” (OJT) training aboard ship to gain qualification to well-defined standards.

For Officers, while there were some who still felt associated with the former branches – Electrical, Ordnance, TAS, Gunnery, etc.<sup>2,3,4</sup> – most came under the General List concept.<sup>5,6</sup> During this period – in

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<sup>1</sup> The brainchild of Lt Jim Belyea (later Cdr), DATAR was tested aboard HMC Ships GRANBY and DIGBY in Lake Ontario; it led to development of the Naval Tactical Data System (NTDS) and the Tactical Data Link (TDL) such as Link-11. The DATAR acronym has been given to “Digital Automatic Tracking and Remoting” in some literature.

<sup>2</sup> Cdr Pat Barnhouse, RCN Ret’d: In general the naval community was divided into specialties (Executive, Engineering, Supply, Electrical and so on) which in a true divisional system saw most branches consisted of officers in charge of associated other ranks trades. There were some exceptions such as Chaplains and Instructor Branch officers (“schoolies”) who were on their own. Except for the Executive Branch (the original naval officers) each other branch had coloured distinguishing cloth between their gold braid. This distinguishing cloth was done away with just prior to the adoption of the Tisdall Report which introduced the General List officer and user/maintainer concept in 1960. There existed a feeling at the time that the original reason for the loss of the coloured cloth was that the Royal Navy had mandated the same action a couple of years previously and that the RCN was still unduly

fact, from the 1950s – the RCN sent many officers on post-graduate training, including nuclear, naval architecture, acoustics, guided missiles, and electrical engineering – most of which was done at US universities or at the US Navy Post-Graduate School in Monterey, CA.

Newly-enrolled General List Officers came from two streams – HMCS VENTURE or Regular Officer Training Plan (ROTP) – and both these streams required junior officers to complete basic sea training in all of a ship's departments, to gain their Upper Deck Watch Keeping Tickets and, in the case of ROTP (and perhaps VENTURE), their Engineering Certificate of Competency (C of C) Part I, and to take on responsibilities such as Communications Officer or Navigation Officer. In all, while there had been very basic training when these Officers were Officer Cadets and some shore training in each discipline, most of the sea training was also OJT.<sup>7</sup>

Upon promotion to the rank of Lieutenant RCN, and after having completed an appointment as a departmental assistant, many Officers were offered the opportunity to select their area of specialty – namely Operations and Weapons. These Officers then attended either the Long Operations or Long Weapons Courses – year-long courses at the Fleet School in Halifax. These courses were a combination of technical and operational and so worked well within the RCN's user-maintainer concept. Eventually,

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influenced by its long time close association. In any event, the revised personnel concept made branches and their distinguishing cloth obsolete. There was one exception – the Navy doctors retained their crimson stripe, most probably as an identification symbol as required under the Geneva Convention on medical personnel.

<sup>3</sup> Cdr Pat Barnhouse, RCN Ret'd: The Executive Branch trained some officers as specialists whilst some remained as "salt horses". Most specialist training was taken with the RN – Torpedo/Anti-Submarine (TAS), Gunnery, Navigation, Direction (for when we had a carrier and real aircraft), Navigation/Direction, Clearance Diving, P&RT. These qualifications were usually shown in brackets following their name so Lt(N) and Capt(N) meant something different in the old days. Of course we also had Pilots and Observers – rank followed by (P) or (O).

<sup>4</sup> Cdr Pat Barnhouse, RCN Ret'd: The navy had an educational system for its ratings (a very comprehensive one run by the instructor branch). It started with BET (basic educational training), CIET (intermediate), and CHET (higher). These were all sets of courses that were available to any sailor to take on his own time and completing them led to what was the equivalent of Grade XII Ontario. If a sailor completed these courses or entered with that level of education and was considered suitable for consideration as an officer candidate he would be sent to "Prep School" at HMCS NADEN. This was more than the equivalent of Grade XIII in Ontario. Now the sailor could be considered for a number of options. Those with technical background usually were selected for university (in some instances and if young enough they were sent to RMC/RR. The Executive Branch sent their candidates to the Upper Yardman course in the UK (the equivalent to Midshipman training – ???) and there were a few Upper Yardsmen in the Electrical Branch. These fellows took exactly the same Long L course as university graduates.

<sup>5</sup> As has been pointed out in a separate article, many of these individuals had joined the RCN during WWII or shortly thereafter; some had transferred from the RN and others had transferred from the Merchant Navy. For most, promotion to LCdr was automatic and promotion dates were listed in Naval General Orders.

<sup>6</sup> There were still some specialists such as Medical Doctors (whose rank designation was crimson between the gold stripes), Padres/Chaplains (Roman Catholic and Protestant), and Legal.

<sup>7</sup> There were other initiatives to recruit Officers including JOLTC courses (Junior Officers Technical and Leadership Course – a course for Executive Branch officers who had not entered the RCN as Midshipmen but came from other sources – direct entry as sub lieutenants, from the merchant navy, from the reserves, ...), and short-service commissions, though neither of these are believed to have resulted in bringing technical officers into the Navy. In the mid-1970s, NDHQ initiated a couple of initiatives which were aimed at recruiting Officers and Men into the technical disciplines. In addition, it's believed that at least one Officer – a Junior College graduate – joined the Navy to become an Engineering Officer and eventually reached the rank of Vice-Admiral.

Weapons and Operations Officers could become Executive Officers and Commanding Officers. That was the only route to command a warship.

But, by the mid-1960s, it was apparent that, insofar as Officers were concerned, the user-maintainer concept was not working.<sup>8</sup>

The early/mid-1960s could be considered a somewhat tumultuous time insofar as Officers' and Men's training and employment was concerned. In this period, the RCN embarked on two very ambitious projects, neither of which came to operational fruition before being cancelled.<sup>9</sup> These were the General Purpose Frigate and the Hydrofoil Projects. But what these projects would have done – and what they did partially do – was to take the Navy into the guided missile, digital computer, and Naval Tactical Data System (NTDS) age.

Although these Projects were cancelled, they were followed shortly thereafter by what was supposed to be the "Repeat ANNAPOLIS Class" Project, but which morphed into the DDH 280 Project.<sup>10</sup> But, one of the "leftovers" from the Hydrofoil Project was the IBM 360 computer system and the Maritime Tactical Data System (MARTADS) trainer at the Maritime Warfare School in Halifax. MARTADS would later provide a basis for Officers destined to serve aboard the 280s and other ships as Combat Systems Engineers.

In order to get into this new era (beginning with the Hydrofoil Project), the Navy had to quickly train (at least some) Officers and Men in three areas – computer programming, solid state, and digital computers, and signal processing and pulse techniques. Thus, a cadre of Officers and Men who possessed technology attributes was selected and this cadre attended relevant courses given at the US Naval Station in San Diego.<sup>11</sup> It should be noted that this cadre, and several of those who followed and participated in this interim period, were brilliant engineers, technicians, and technologists. That they chose to stay in the Navy when there were opportunities elsewhere in the emerging industries is a credit to their desire to serve their country.

By the mid/late-1960s the DDH 280 Project was proceeding with all of the technical design for the combat systems being undertaken in-house by the Navy, while companies had been selected to undertake the detailed design of individual systems and to train those who would maintain those systems (still under the user-maintainer concept).

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<sup>8</sup> Perhaps one reason was that educational backgrounds of these Officers varied considerably – from high-school graduates to university graduates who had majored in Arts, Science, Commerce, or Engineering.

<sup>9</sup> The GP Frigate Project was abruptly cancelled in 1963 by the Liberal government of Lester Pearson before designs were completed and, of course, before any ship construction took place. The Hydrofoil Project progressed much further and one ship, HMCS BRAS D'OR was built and commissioned, but never really completed before it was mothballed in 1976 (sea trials had been stopped in 1971).

<sup>10</sup> The DDH 280 Project turned out to be anything but a "Repeat ANNAPOLIS" project. Although there were setbacks during the project, the Navy obtained four excellent ships – HMC Ships IROQUOIS, HURON, ATHABASKAN, and ALGONQUIN – which would serve Canada for the next 40+ years.

<sup>11</sup> Some details of this training and those who participated in it are documented in "Canadian Naval Contributions to Tactical Data Systems & Data Link Development" in the 1985 Commemorative Edition of the Maritime Warfare Bulletin,

At the same time (mid-1960s) the Navy, Army, and Air Force had been integrated into one Force – the Canadian Armed Forces with a unified command structure. In the mid/late-1960s, as part of integration, the Officers' Classifications were rationalized. As part of this rationalization process, the Navy's General List concept was dropped and two Classifications – Maritime Surface and Sub-Surface (MARS) and Maritime Engineering (MARE) were created. MARS Officers were now the operators while MAREs became the technical specialists – replacing the almost forgotten Electrical, Ordnance, Naval Architects, and Engineering Officers of the 1950s (the circle had almost gone 360°).

And, within the MARE Classification, there would be three sub-classifications – Marine Systems Engineers (MSEs), Naval Architects (including CFR<sup>12</sup> Constructors), and Combat Systems Engineers (CSEs).

Officers (Lts, LCdrs, Cdrs, and Captains) with a technical and/or engineering background were generally offered a few alternatives, one of which was to become a MARE (CSE).<sup>13</sup> Thus, most, if not all of the former Electrical, Ordnance, Naval Architects, and Engineering Officers were now classified as CSEs. Officers who had come up through the General List concept were, if they had an engineering or technical background, also offered a few alternatives, one of which was to become a CSE.

Concurrent with the DDH 280 Project, the Navy had a project to modernize four of the RESTIGOUCHE Class of DEs – HMC Ships GATINEAU, KOOTENAY, TERRA NOVA, and RESTIGOUCHE – into what became referred to as the Improved RESTIGOUCHE Class (IRE). These eight ships – the four DDH 280s and the four IREs – would be the first ships in the Canadian Navy to include a CSE in the crewing complement. Ultimately, training would be undertaken by the newly-established Combined Support Division (CSD) of the Fleet School in Halifax. But it wasn't possible to simply post a person from a steam-driven ship to a DDH 280 or, to a lesser degree, to an IRE without providing them with specialized equipment training.

The first CSEs to be posted to ships had varying technical backgrounds and had undergone basic (First Sea Phase) training as Sub-Lieutenants. Some had their Upper Deck Watch Keeping tickets but, with possibly/probably one exception, none had their C of C Part I. None had ever been a Weapons Officer or an Operations Officer. The initial attempt by the Navy was to train at least one of the Officers at the system manufacturer's plants, an idea which sounded fine but which simply didn't work as manufacturers were not prepared. Instead, when convenient to the manufacturers' work schedules, the CSD sent trainers to those sites to collect suitable training material. Thus, these first CSEs were given elementary system training in Halifax at the CSD.

These CSEs all went to the IREs and were followed by CSEs who went to the DDH 280s. But none of these CSEs had received any detailed training for their intended role. It would be another two or three years before a formal CSE course was created. Eventually, CSEs were posted to all of the destroyer

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<sup>12</sup> Commissioned From the Ranks

<sup>13</sup> Depending on their backgrounds, many of these Officers were offered the opportunity to become part of the MARS classification and some were also offered the opportunity to become part of the Communications and Electronics Engineering (CELE) classification, a "green" classification.

escorts and frigates and became department heads, responsible for technical readiness of all of the ship's combat systems.

Initially, the CSE concept met with mixed acceptance by DDH 280 and IRE Commanding Officers, Weapons Officers, Operations Officers, and, to a lesser degree, by Executive Officers. Within the DDH 280 world, the CSE was enthusiastically greeted by other ship's officers and men. However, within the IRE world, there were diehards who opposed the concept and did little to see it succeed. In the main, these latter officers were Weapons Officers (or former Weapons Officers) who viewed the CSE as an unnecessary evil. However, those views were short-lived and, after the first CSEs had passed through an operational cycle, the concept was finally accepted.

The Men's technical training remained largely unchanged during this period with the exception being the SN trade which sub-specialized into Computer, Display, and Sonar specialists.

This situation prevailed into the mid-1970s when projects such as the Destroyer Life Extension (DELEX), Automatic Data Link Plotting System (ADLIPS), and the Shipborne Integrated Interior Communication (SHINCOM) system had a profound effect on Men's training which, in virtually all combat systems trades, meant that training now included computer, signal processing, and data processing as well as system-specific training.

By the early-1980s, the DDH 280s and the IREs were fully operational and DELEX refits (with all they entailed) were underway and systems such as ADLIPS, and SHINCOM were being installed in the steam-driven destroyers. At the same time, the Canadian Patrol Frigates (CPFs) and the Maritime Coastal Defence Vessels (MCDVs) were on the drawing board, close to reality.<sup>14</sup> CSE training was also evolving and introductory CSE training was initially undertaken at Manadon in the UK. This course was followed by more specific courses given at the Fleet School in Halifax. Subsequently, training at Manadon was discontinued and an arrangement was made with the Nova Scotia Technical College to deliver a custom CSE course.

Fairly soon after the Navy had entered the 21<sup>st</sup> Century, all of its steam-driven destroyers had been retired, leaving only the DDH 280s and the CPFs as its combatant ships. The CSE concept had been in place for over 30 years and seemed to work. However, Men's trades continued to evolve. The Navy finally realized that training was expensive and that multiple trades did not have to have similar skill sets. Some trades disappeared and some were merged, and that process goes on today. It's a story for tomorrow's historians to document.

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<sup>14</sup> The first CPF – HMCS HALIFAX – was delivered in 1992 while the first MCDV – HMCS KINGSTON – was delivered in 1996.