Oral History – Written submission

Contributor: W.B. Harris

SUBMISSION TO CANDIB

As a Lieutenant Commander E (ME) in the Royal Navy, I was appointed to serve on exchange service with the Canadian Armed Forces at NDHQ, Ottawa, in DMEE3 under Don Nicholson, with direct responsibility for design matters concerning marine propulsion transmission systems and propulsors. The appointment was from October 1977 to May 1980. My predecessor was also a Royal Navy exchange officer, Lieutenant Commander Bob Stone as was my relief, Lieutenant Commander Bob Allan.

The day to day work was in supporting the Fleet, mainly through the Engineering Units on each coast, providing Design Authority advice on repairs and operating matters. I remember that Lieutenant Commander Homer Brinnen was my main contact in Halifax and, in Esquimalt, it was Fred Zurowsky. Both would now be in their late seventies or early eighties. Both were good engineers.

The most serious operational problem I dealt with was with the starboard gearbox of HMCS FRASER. After refit, in I think January of 1979 or 1980, there were persistent high temperature problems with the high speed pinion forward bearing. The Captain, the Engineer and ship's staff were very concerned because of the KOOTENAY tragedy. I inspected the bearing and established that it was correctly fitted so I decided to modify it by providing circumferential guttering in the middle of the bearing to increase the oil flow and therefore cooling. This worked well and the bearing ran at normal temperature thereafter allowing the ship to proceed with training exercises in the Caribbean with minimum delay.

As I recall, the gearboxes in the steam frigates were of Maag design as were those in the DDH 280 class. I know that the main propulsion steam turbines were built under licence to GEC by Dominion Engineering but I believe that the gearboxes were built by Maag in Switzerland. Don Nicholson was in no doubt that Maag produced the highest quality and most accurately finished hardened and ground gears; accuracy being of key importance in reducing noise signature.

On the research and development front, there were a number of initiatives ongoing during my time. At NETE in Montreal, there were trials of various new water lubricated propeller shaft bearing materials, one of which was a type of phenolic resin from a Canadian company called 'Thorden': I believe this is still in widespread use today.

The 'O' Class submarines had experienced liner corrosion on the propeller shafts in way of the stern seals and so an Inconel alloy cladding was tried instead of the bronze liner and this was successful in preventing corrosion.

There were trials of various 'Prairie' air seals for introducing air to the propeller blade leading edges via the shaft. Sea trials of two types were conducted on the West coast in HMCS RESTIGOUCHE. I think that the wrap around shaft seals in the CPF were the eventual outcome although I don't think that they were particularly successful. I believe that they were made by the Huhn Seal Company based in a town somewhere just west of Montreal. The owner of the company was a bombastic but amusing former East German whose name escapes me.

There were trials of various stern seals of lip and face types. The Huhn Seal Company pushed their lip type seal very hard but the Crane seal made by their subsidiary Deep Sea Seals in the UK was superior.

In regard to propellers, there was a good deal of effort expended in trying to improve noise signatures. I attended the much delayed First of Class noise trials for the DDH 280 in I think, HMCS HURON, at the noise testing range in the Bahamas. The ranging included propeller viewing trials, which highlighted the importance of accurate pitch setting of the blades to ensure equal load sharing and optimum cavitation reduction. Further work was carried out with Lips of Holland to try to improve the accuracy of the pitch setting servo- mechanism and I well remember standing in a minus 30 degree wind chill at the back end of the floating dock at Hal Ships checking propeller pitch settings in mid winter.

There was interest in improving the design of propellers to reduce noise signature and to this end the research establishment in Halifax designed a raked and skewed propeller to be tried in a new research vessel. Being a keen advocate of the adoption of rake and skew, I personally drew the specification drawings for the propeller and instigated procurement. I don't know how it turned out.

There were regular problems with the Voith Schneider propellers fitted in some of the tugs. These arose because skippers drove them over/onto rocks rather than from any inherent unreliability but the sagas that ensued in getting them overhauled in Germany were disproportionate to the importance of the vessels.

For the CPF, there was considerable contact with Lips and Escher Veiss to establish state of the art capabilities in pitch setting and noise reduction. Escher Veiss seemed very responsive to requirements and I believe were in the end favoured.

Towards the end of my appointment, the CPF project gathered momentum and I was tasked with writing the Statement of Technical Requirements (STR) for my areas of responsibility. Don Nicholson had undergone a change of heart about the wisdom of using highly loaded hardened and ground gears in warships because of the noise signature problems that resulted from high loadings. I fully shared this view and recognized the noise advantages that would be gained by reverting to highly accurately formed gears produced through hobbing and shaving with a much wider face width and therefore lower loading. The weight penalty incurred through having a bigger gearbox no longer posed a problem because of the advent of gas turbines, which were so much lighter than a steam plant. Indeed having weight low down in the ship was now an advantage in keeping stability without recourse to water displaced fuel systems.

Whilst the CPF Project's intention for the STR's was that they should be non prescriptive so that there could be technical risk transfer to the builders, Don Nicholson was adamant that in regard to the gearbox and main propulsion layout, the STR should be prescriptive. Accordingly, in consultation with Lieutenant Commander Larry Taylor, who was responsible for the prime mover aspects, I produced a number of sketch designs for a cross connected, flexibly mounted, three input, two output shaft gearbox, including calculations of gear loadings based on the Maag design guide. The clutching arrangements were such that in no drive mode would there be any unloaded gear trains in order to reduce noise. I presented the sketch designs to Don who summoned me about a month later and told me which design to put in the STR. He had made no changes to the sketch design and did not even discuss it with me. I think he was content. And so it came to pass that the gearboxes for the CPF were designed and built by De Schelde in Holland in what appeared to be exact compliance with the sketch design. The result was an outstandingly quiet gearbox.

Whilst the DELEX programme was being planned during my time in Ottawa, there were no significant changes envisaged in my area of the propulsion systems apart from the possible introduction of Prairie air.

After two and a half years in Canada, I handed over to Bob Allan and left what had been one of the most stimulating and enjoyable jobs in my whole career. I learned a tremendous amount and my horizons were greatly broadened. I still owe a great debt of gratitude to colleagues there, particularly to Don Nicholson, who could be taciturn and difficult at times but who was undoubtedly an outstanding engineer.

26 October 2004.