PRESERVING CANADA'S NAVAL TECHNICAL HERITAGE

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Mark the plot! The RCN's Operations Room Plotting Tables

Recollections of Pat Barnhouse, Ken Bowering, and Brian McCullough

The CNTHA's support to DND's Directorate of History and Heritage (DHH) involves a team of energized volunteers whose efforts are laser focused on preserving Canada's naval technical heritage for future generations of researchers. Regular online meetings, email discussion threads, recorded oral history interviews, and an increasingly well-populated website (www.cntha.ca) are used to capture and present information that might otherwise easily be lost. This includes details of historical naval programs, technical systems and equipment, and the role industry played in their development.

The undertaking is extensive, and the team of naval, industry, and academic volunteers does its best to chronicle the major waypoints of the topics of interest through personal recollection, and an infectious spirit of collaboration. One of the recent endeavours has been to profile the role and evolution of the Operations Room plotting tables that first saw RCN service in the 1940s/1950s.

The *Prestonian*-class frigates had one Admiralty Research Laboratory (ARL) plotting table, the original 205-class destroyer escorts (pre-DDH *St. Laurent*) had two plotting tables: one an ARL, and the other a completely manual table. In all ships, the ARL was used as the ASW Action Plot, and the other table was used as the Local Operations Plot. The ARL tables were somewhat automated in that they could — with operator assistance — develop a real-time paper rendition of the evolving tactical situation. On the other hand, the LOP covered a larger geographical area but was completely manual. The ARL tables originally fitted in the 205 class were replaced with the Canadian-developed AN/SSA-502 plotting table during their DDH conversion refits. Follow-on classes were also fitted with these tables.

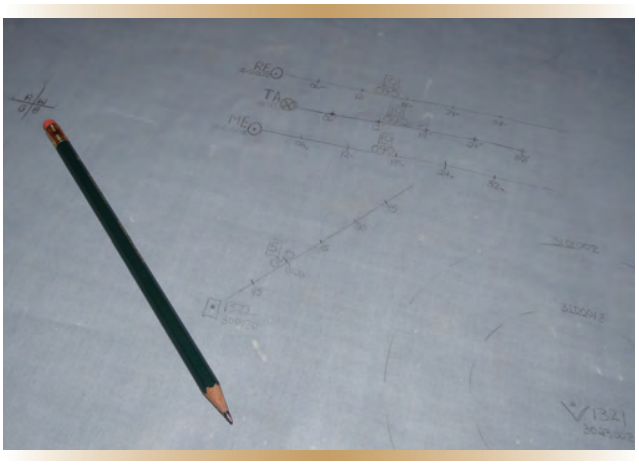
Photos by Brian McCullough with the kind permission of the CFB Esquimalt Naval & Military Museum.

While the early ARL tables were based on mechanical gears and cams, the synchro-driven, Canadian-developed AN/SSA-502 design that came later (built by Marsland Engineering Ltd. of Waterloo, ON)[i] was a vast improvement. The following is an extract from Capt(N) Jim Knox's paper in Chapter 18 of Jim Boutilier's book, "The RCN in Retrospect: 1910-1968."

> The synchro tape gyro repeater and plotting table developed in conjunction with the St. Laurent programme were Canadian accomplishments of particular note. These developments were initiated by the electrical engineer-in-chief when the potential of a Sperry, Montreal, gyro re-transmission unit, which gave multiple synchro outputs using a magnetic amplifier, was recognized. The specification for the table was written around the use of magnetic amplifiers. A target plot attachment was included as an integral portion of the projection head. The developer, Marsland, later requested the substitution of what was then a novel transistor amplifier. This became the first piece of transistorized equipment in the RCN and was probably the first such equipment available to any navy at that time (1955). The initial production run was for about 130 tables and ultimately some 500 tables were produced, including orders for the USN.

(Continues next page...)

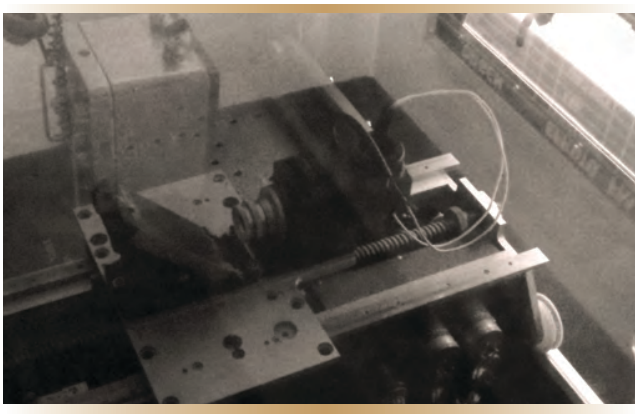
i. "Marsland" started out as Marsland Radio Services and later changed its name to Marsland Engineering Limited. The company was purchased in 1969 by Leigh Instruments of Ottawa and Leigh was later purchased by Spar Aerospace. Subsequently, Spar Aerospace was taken over by DRS Technologies. Leigh Instruments was also the company that developed the Canadian Navy's original SHINCOM systems.



The Action Plot tables had a Target Plot Attachment (TPA), driven by own ship course and speed, that projected a graticule upward to the underside of the table to mark own-ship position in real-time. The TPA was used to project red and green spots of light marking a target's range and bearing (sent to the table by the ship's radar or sonar). These red and green spots could represent a variety of parameters — e.g., another surface ship, a submarine, or even a weapon entry point.

The Action Plot table facilitated command and control during close ASW action. The glass-topped plotting tables combined an analogue/synchro feed of sonar, gyro compass, and speed-log information that was projected to the upper surface of the table, and on which the Operations Room team could build the evolving tactical situation.

Translucent paper was spread across the table surface, and Radar Plotters would trace the movement of the graticule and the TPA spots. Updates would be annotated with the time. Thus, a real-time picture of the battle would be created, and the CO could determine the optimum time to fire weapons. In the DDE/DDH-205 class ships, through the Canadian Integrated Sonar Control System, the WO/OpsO could select which sonar had the best target data, and what the TPA was assigned to — i.e. a ship in company, a submarine's current position, and/or a submarine's future position where it would encounter ASW Limbo Mortar MK-10 depth charges, or vectored helicopter or maritime fixed-wing aircraft-delivered torpedoes. In Improved Restigouche (IRE) ships, ASW action and firings of ASROC-launched torpedoes and mortars were controlled from the Sonar Remote Indicator (SRI) station. The plotting table was still used to plot the broader action picture.



The battle could run to the edge of the table and, when that happened, a clean sheet of paper would be taken from the roll, and the position of "own ship" could be moved to the other end of the table. Alternatively, for ARL tables, instead of using paper to create the plot, the battle was plotted on 12"x 12" Perspex tiles. These had the advantage that, when the battle reached the edge of the table, the graticule could be reset and the tiles moved. This allowed the picture to evolve more or less seamlessly, but there wasn't a historical record.

The multifunctional tables were also capable of maintaining a situational picture for blind pilotage navigation, and were useful during man overboard evolutions. Upon hearing the man overboard alarm raised, the officer of the watch could call down to Ops to "mark the plot," thereby establishing a datum to guide the ship back to the estimated recovery point. The plotting tables proved extremely effective in all of their roles.

Introduction of the DDH-280 class brought an end to the Action Plot tables, though they remained in the last of the 205-class ships, and the three AOR replenishment oilers, until they were paid off.

NC2 Plot Table Fire

By Pat Barnhouse

I joined HMCS *Haida* (DDE-215) as Electrical Officer in December 1959, just as the ship was completing a fairly extensive refit that saw major changes made to the Operations Room equipment in conjunction with an update to the gun fire-control systems. One piece of equipment new to the Ops Room was the NC2 plot table which was an early, if not the first item of equipment in the RCN to be of solid state (transistor) design.

To visualize the mechanical operation of the plot table, it can best be thought of as an upside-down gantry crane; in other words it consisted of two parallel rails on which a carriage rolled back and forth. On the carriage was a light projector that indicated ship's own position on the overhead plotting surface, along with a device called the Target Plot Attachment (TPA) that was used to project the position of two targets (sonar/radar) relative to own ship. Unfortunately, not enough thought was given to the layout of the flexible wiring to this projector and its associated TPA. One day during operation of the plot table, the combination of carriage and projector movements conspired to catch the wiring around the edge of a rail and pull it tight enough to bare the wires. The resulting short-circuit caused a fire that burnt most of the wiring interior to the plot table.

Fortunately, the ship carried similar spare wiring, and one of our petty officer electricians was able to repair the damage, a job that occupied him for a considerable number of hours. Subsequent to my submission of an Unsatisfactory Condition Report, two CANAVMOD (Canadian Naval Modification) instructions were issued. One dealt with an improvement to the flexible wiring layout, and the other inserted fuse protection in the flexible wiring circuit.