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FHE-400 Hydrofoil Combat Systems Equipment — More to the story!

By Cdr Pat Barnhouse, RCN (Ret'd)

Energy Storage

One of the more interesting pieces of kit supplied for the FHE-400 hydrofoil fighting equipment (FE) was the energy storage system for the AN/SQS-507 sonar. As I recall, there was considerable discussion over how to provide enough oomph (non-metric term for power!) to generate the required output power for the transmitted sonar pulse. The discussion drifted from flywheels to large capacitors. In the end, Westinghouse (the combat systems contractor) did settle on a form of capacitor, going for a nickel-cadmium (NiCad) based "coulometer." If memory serves, the NiCad batteries used in this device were of the vented type that would suffer from thermal runaway if not properly controlled. The whole contraption was fitted out in a coffin about 4' by 2' by 1'.

The subcontract for the energy storage system was let to Gulton, Inc., a NiCad battery manufacturer in Metuchen, NJ (USA). I really didn't know much about NiCads, except that the Royal Canadian Air Force recommended separating NiCad battery shops from lead-acid battery shops by the full width of a runway to prevent a hygrometer used on the one type from being used on, and contaminating, the other.

During our visit to Gulton, we were treated to a practical demonstration of the NiCad's power-to-size ratio, vis-a-vis that of a lead-acid battery. At the end of our meeting, the project engineer took us out to the parking lot, and lifted the hood of his great "boat" of a 1960s station wagon to show us the NiCad battery he had installed in place of the original lead-acid unit. I expected to see something of comparable size, but what was there was a tiny battery, about 3" x 6" x 1"! It was January, and the temperature was well below freezing, but this little battery provided more than enough power to crank and instantly start the big V8 engine. I was later to learn that NiCads were often used in big semi truck trailers, and that what prevented their more general use in the automobile business was cost.

Photo from 2012 by Brian McCullough

HMCS *Bras d'Or* (FHE-400) on display at the Maritime Museum of Québec, at L'Islet-sur-Mer. This wonderful museum on the south shore of the St. Lawrence River 75 km east of Québec City is well worth a visit.

Mk 32 Torpedo Bore Gauge

The Mk 32 torpedo tubes specified for the hydrofoil needed certain functions that increased the size of the on-mount control boxes, to the extent that the torpedo tubes could not be mounted in the same tri-tube configuration as was being procured for our surface ships. I believe it had something to do with air mode launch, and the functions that had to be remoted to suit hydrofoil operation.

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In any event, discussions at Naval Ordnance Station Louisville, KY (USA) led us to purchase individual tubes with the intention of designing our own tri-tube mounting arrangement. While at Louisville we were advised that, since we were buying and mounting individual tubes, it would be prudent to acquire a bore gauge to verify that the tubes had remained true after handling and mounting. We bought the gauge.

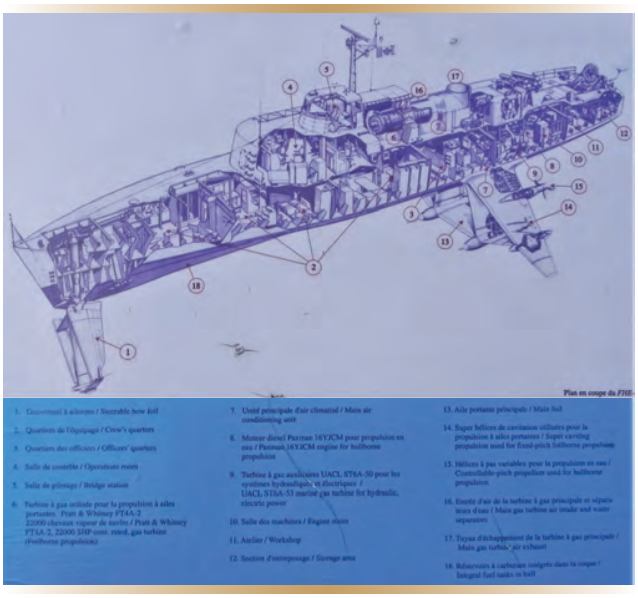
All fighting equipment items bought for the hydrofoil and not intended for first fit (i.e., not essential for going to sea) were sent to the Gladstone Stores in Halifax marked, "For FHE-400 hydrofoil." Consequently, the torpedo tubes and bore gauge ended up there, but were never fitted due to the cancellation of the FHE-400 program.

Some years later, while serving in Halifax, I received a call from George Bishop at National Defence Headquarters in Ottawa. George was an underwater weapons technician in the Combat Systems directorate, and wanted to know if, perchance, I had purchased a bore gauge for the hydrofoil, as the Navy had not seen fit to do so when buying all the Mk 32 Mod 5 triple torpedo tubes for the fleet. A problem had arisen that required checking the tubes, and they had no money to buy the requisite gauge. I was able to tell him where to find one, along with six Mk 32 tubes of somewhat different pattern to those in general use, and believe it or not the gauge was still right there in Gladstone Stores.

The Case of the Imploded Transducer

The specifications for the hydrofoil's AN/SQS 507 variable-depth sonar (VDS) transducer required it to be capable of surviving immersion to a depth of approximately 900 feet without physical damage, and without impairing its operating ability. Since there were no facilities in Canada for conducting a test to demonstrate this capability, arrangements were made to have the transducer tested at the US Navy's Underwater Sound Reference Laboratory in (pre-Disney World) Orlando, Florida.

The transducer itself, unlike the AN/SQS 505 transducer that was made up of elements with each radiating face covered by its own "rubber" boot (Rho-C rubber, I presume), was designed with one boot to fit over the whole cylindrical radiating face. Somewhere in the setting-up of the depth test in the laboratory's pressure tank, the 900-foot depth specification was misunderstood as 900 psi. Since every 30 feet of depth in water equates to a pressure of one atmosphere (approximately 15 psi), then 900-psi pressure represents a depth of 1,800 feet, twice that specified for the



The triple-banked torpedo tubes and variable depth sonar equipment are visible on the after part of this ship, once billed as the fastest warship in the world.

transducer. The transducer was duly tested with the 900-psi specification in place, and while the mistake may have been discovered before reaching the full value, the transducer was subjected to considerably more pressure than intended by us. When it was removed from the test tank, the rubber boot had clearly imploded into the spaces between the transducer elements.

The transducer was duly shipped back to EDO (Canada) Ltd. in Cornwall, ON (the subcontractor for the transducer and, incidentally, the builder of the AN/SQS 505 sonar transducer) for damage assessment. Luckily, because the SQS 507 was a VDS set, Westinghouse and yours truly had decided to procure two of everything that hung in the water, so there was another transducer on the assembly line that became available about two weeks later for a repeat of the test. I am happy to report that this latter test went off with no hitches, and that the transducer passed (survived?) the test. The original transducer was not badly damaged, apart from the boot, and was subsequently repaired.

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