Oral History Interview Transcript

Interview Control Number: 6 C6 Smith

Interviewee: Gordon Smith

Interviewer: Douglas Hearnshaw

Date of Interview: 27 February, 2006

Location of Interview: Ottawa, Ontario

Transcribed by: S. Johnston

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Gordon Smith

Interviewed 27 February, 2006

By Douglas Hearnshaw

INTERVIEWER: This is a CANDIB Oral History Project and presents an interview with Gordon Smith. It was recorded at Ottawa on the 27th of February 2006. Gordon Smith was interviewed by Douglas Hearnshaw. Both the interviewer and interviewee have signed a copyright release form. Tape one side one.

This interview relates to the DDH 280 program which spanned a period from 1964 to 1973. It reflects the particular experience of our interviewee who was directly involved in several aspects of the project both during the design development phase and subsequently, right up to 2005. As a naval engineer Gordon Smith took part in the development of the design concept for the class and participated in the building, setting to work, and trials phases through his subsequent employment roles in industry. I would like to begin by asking Gordon to introduce himself and to outline for us his naval career up to the start of this program.

SMITH: Thank you Doug. I'll start off with a very short beginning of my career. I went to Royal Roads in Victoria, 1951 to 1953. I then went to the United Kingdom and joined HMS GLASGOW in Malta. I returned to the UK and went to Royal Naval Engineering College Manadon for the basic course from 1954 to 1956. I then went to HMCS ONTARIO in Victoria, for a year and returned to Manadon for the specialist course from 1957 to 1958. From 1961 to 1963 I attended the Royal Naval College Greenwich for the post graduate course in marine engineering known as the Dagger Course. I returned to Canada and I was then in Naval Headquarters in DG Ships Preliminary Design section.

I was the marine engineer in a team of about six people responsible for designing ships to satisfy various staff requirements. The team included Lieutenant Commander Bill Ogle who was the head of PD, Lieutenant Larry St. Laurent (Naval Architect), Roger Kinsley and Bob MacGillivary who were design draughtsmen, other draughtsmen and Jeanine, our secretary. Commodore Sam Davis was Director General Maritime Engineering and Maintenance, Captain Keith Farrell, Director Maritime Engineering and Maintenance, Captain Howard Minogue was Director Marine Engineering and Electronics and Jock Allan was Director Maritime Combat Systems. Captain Derry Dawson was head of the Naval Engineering Design Investigation Team (NEDIT) in Montreal. Our first major project was the concept of the DDH 280 Destroyers.

INTERVIEWER: So Gordon, can you explain what was involved in the design concept development?

SMITH: The general purpose frigate design had just been cancelled and Preliminary Design was given the task to design another destroyer, of roughly the same size but with many changes to the GP Frigate design. In order to give more deck space it was decided to lengthen the tribal destroyer which was known as the Nipigon design, by 30 feet at the bulkhead between the boiler room and engine room. This meant that the power of 30,000 SHP (shaft horsepower) steam propulsion system would be reduced and consequently we would not meet the ship's speed requirements. We needed more power. The only proven steam plant that I could find in the world was the US Navy propulsion system design of about 75,000 SHP. This design had very high temperatures and pressures with their inherent problems; also the power was too high. The Royal Navy had no steam plants over 30,000 SHP so I thought why not go for a gas turbine propulsion system of about 50,000 SHP which the naval architects wanted. DMEE and

NEDIT looked at various arrangements of combined diesel, steam and gas turbine. It appeared the most logical choice was the all-gas turbine arrangement with two main gas turbines of 25,000 SHP each, and 2 small gas turbines of 3,700 SHP each for cruise power. At this time, the first marine gas turbine propulsion ships at sea was in the Royal Navy, the HMS EXMOUTH which was a type 14 Blackwood Class frigate. This ship was originally built with steam propulsion which was removed and replaced by single Olympus and a Proteus-COGOG - Combined Gas Turbine or Gas single shaft arrangement. From 1965 to 1968 the Ship Department in Bath was designing destroyers with gas turbine in Combined Gas or Gas systems. They produced preliminary designs, performance details, and costs for a common arrangement for the Invincible Class Aircraft Carriers, the type 42 Sheffield Destroyers and the Amazon Class Type 21 Frigates. Amazon went to sea in 1974 followed by Sheffield 9 months later. It turns out that Canada was the first Navy that designed, built and put to sea in the summer of 1972, a Destroyer with all gas turbine propulsion system destroyer size warship.

I had done some preliminary design work on Combined Steam and Gas system while in Greenwich but I did not know what the Royal Navy was doing. The only gas turbine available was the Olympus engine. It was also necessary to design and build gearboxes that would take a main and cruise engine gas turbines with shaft speeds of about 3600 RPM and reduce to 230 RPM main shaft speed, and employ self synchronizing and shifting clutches. Don Nickolson said this could be done. Next was to find controllable pitch propellers. Kamewa and Lips could produce a 25,000 SHP propeller but a new design was required to meet the Canadian Navy's noise requirements. I went to Gwen Holtby about the machinery control system which had never been designed before. He said a control system could be produced and he preferred pneumatic and "hardwire" type. I went to the DMEE auxiliary section regarding the gas turbine alternators. Garrett had a design using the solar gas turbine engines. These engines were combined with a waste heat boiler to produce hot water for ship's use. There was no problem finding diesel driven alternators. After consultation with other sections such as DMCS, Jock Allan, for his electrical requirements for combat systems, we decided on having three gas turbine alternators and one diesel alternator.

The preliminary design all came together and the "yellow apparel" was produced to satisfy the staff requirements. The Board made the final decision to build four DDH 280 destroyers. I remember one of the major considerations the Naval Board had was whether the ships should have gas turbine or diesel alternations. It was finally decided to go all gas turbine alternators with one diesel alternator for emergency and harbour use. Once the Naval Board approval had been obtained, the DDH 280 project moved to DGMEM (Director General Maritime Engineering Maintenance)- Contract Design (CD), which was headed by Commander Hy Shenker. In this section the raft design was introduced. The raft, which carried the gas turbines, gearbox, and auxiliary machinery, was mounted on rubber mounts to attenuate the noise being transmitted to the hull of the ship. A Vulcan coupling was used to prevent noise being transmitted down the shafts.

Nobody from industry approached me regarding gas turbine use in naval ships. I knew Rolls Royce was involved with the Royal Navy but I had no knowledge about United Aircraft or Pratt and Whitney or General Electric gas turbines in North America – especially with marine capabilities. The only information available was from the DMEE section, Gord Amundrum who had brochures and limited gas turbine information. NEDIT had very limited knowledge of gas turbine technology with their senior personnel being from a Merchant Navy background. Also the only naval officer in NEDIT was the commanding officer. NEDIT did not contribute very much to the program.

After the DDH 280s were conceived I went on to participate in other studies such as the replacement of HMCS BONAVENTURE and others. The contract was let for the DDH 280s and I understand that MIL and Davie in Lauzon, Quebec got the contract for two ships in each shipyard.

INTERVIEWER: So Gordon we have concluded the design concept development phase. Can you tell us what your follow up involvement was in the 280 program after the design concept phase concluded?

SMITH: I came back from HMCS PROVIDER and my next appointment was to the Marine Design and Drawing Office known as the MDDO, in Canadian Vickers in Montreal. As Senior Staff Officer marine engineering. MDDO was under contract to the two shipyards – MIL in Sorel and Davie in Lauzon Quebec. MDDO produced some 300 to 400 'as fitted' and about 3,000 to 4,000 working drawings for the DDH 280 program. By this time United Aircraft in Longueuil had received a contract in competition with Rolls Royce to supply four propulsion systems plus the land base test site. The lowest bidder got the contract with about 4% difference in the fixed price incentive type contract. Garrett received the contract for the gas turbine alternators and other auxiliary machinery. The Drawing Office, shipyards and the Navy worked very well together. Captain Keith Farrell was the head of the Overseers Group, Lieutenant Commander Jock Dobie (Naval Architect), and Lieutenant Commander Chris Bennett was the electrical section.

United Aircraft had a small section called the Industrial and Marine section that was involved in producing peeking packs for electricity generation. They expanded the I&M division for the DDH 280 contract and produced a gas turbine for marine use by adding a power turbine to the exhaust of a J4 engine to produce the FT4 gas turbine, capable of producing 25,000 SHP. The cruise engine was the FT 12 of about 3700 SHP. Some names that come to mind are: Dick Guthrie, Bob Sacks, Bob Thompson, David Leslie, Peter Davies and others. United Aircraft bought the MAAG gearbox, Lips propellers, Bailey Meter control system and a variety of auxiliary machinery. Machinery information and drawings were sent to Headquarters in Ottawa and then to MDDO for inclusion into the overall DDH 280 drawings. There was the usual frustration of obtaining information from suppliers, but overall United Aircraft did a good job. They received all 5 incentive payments.

A very good description of the DDH 280 propulsion plant can be found in Bob Sack's American Society Naval Engineers (ASME) paper titled "*Description of Propulsion Systems for DDH 280 Class Gas Turbine Destroyers*" presented at the Gas Turbine Conference & Products Show, Cleveland, Ohio, March 9, 1969.

INTERVIEWER: I understand you resigned from the Navy during the drawing office phase and perhaps you can tell us how you subsequently became once more involved with the DDH program.

SMITH: I left the Navy in 1969 and joined the Industrial and Marine (I&M) Division of United Aircraft Ltd. I was employed to market gas turbine propulsion systems to other Navies and Canadian Coast Guard. I did not get involved in the I&M DDH 280 program. Two years later, I went to German & Milne, Naval Architects & Marine Engineering Consultants in Montreal. In 1972, German and Milne received a contract from United Aircraft to supply personnel to the Machinery Operating Team for the DDH 280's. I became the first Chief Engineer responsible for setting to work and trials of HMCS IROQUOIS and HMCS HURON in Sorel, Quebec. Once the ships were successfully trialled, they were commissioned and the Engineering Officers took over from me and the Chief ERA took over from my assistant, the late Jack Phillips. Jack was a Chief Engineer 1st class in HMCS PROVIDER. To qualify to be Chief I had to take 3 three hour exams to get my First Class Certificate in Steam and Diesel and Jack had to take 7 three hour exams to get his 2nd class MOT certificate. The Engineering Officers who took over from me after satisfactory sea trials were Lieutenant Commander Ron Hahn and Lieutenant Commander Don Wilson. The remaining operating team consisting of 18 naval personnel who stayed with the ships to Halifax.

I really had four bosses. German & Milne who paid me, United Aircraft who paid German and Milne for my services, the Navy who paid United Aircraft and then the shipyard who I was really working for in the ships. It was quite an arrangement and it worked out well.

Setting to work the complete machinery package was quite an experience. United Aircraft personnel had previous experience with their system from the Naval Land Base Test unit in Philadelphia, USA. Some personnel involved included: Agie Sodi, Bill Burke, Art Sunley and others. The team were very cautious and a lot of greasy fish and chips were consumed after working overtime while UACL would check the engine results after running engines during the day. During heeling trials when the IROQUOIS was heeled to 20 degrees, and engines running in the "paul" free condition (main shaft not turning), the electrical watch keeper shut off the field to the running alternator when changing alternators. The ship blacked out and the lube oil pump supplying the main gearbox stopped. We quickly shut down the gas turbine and luckily, there was no damage done to the gearboxes.

Before we went on sea trials, I talked to the Captain to find out where he wanted the "stops" put on the throttles. In merchant ships, the stops are put on slow, half ahead and full ahead and same for astern. Marcel Goulet, our civilian Captain, had no idea of the speed/power of the ship. So I said the ship could go about 17 knots on cruise engines and 30 knots on main engines. We agreed on 17 knots for half ahead on cruise engines and 30 knots for main engines. I don't remember a setting being made for slow ahead. It turned out that entering and leaving harbour, I would order the main engines. This decision was confirmed in Rimouski in Quebec when we were alongside with 2 large bulk carriers fore and aft of IROQUOIS. The order came as slow ahead starboard, slow astern port. We had the cruise engines on. These orders stayed for some time, then stop, then back to the same setting. All of a sudden 'full ahead port, full ahead starboard' was given. We got the main engines on as fast as we could. Few minutes later, 'stop both'. I got curious and called the bridge and the Officer of the Watch said we hadn't even left the jetty because the beam wind was too strong. The Captain said to stand down until the wind had subsided.

The IROQUOIS, which was the lead ship, was ready to go to sea for sea trials around June 1972. The machinery control system was not operational and the gas turbine engines were manually controlled by Jack Phillips and the senior naval chief engineer. The propeller and other functions were controlled by a machinery watch keeper. I figured the ship was being operated by three men and a boy. When we returned from trials everybody was standing around with the machinery in complete automatic control.

The shipyard personnel were very cooperative and helpful. There were no work orders, written orders etc. Some problems with language which were solved by forefinger up was the equipment that was wrong, then the thumb down or up was the situation i.e. thumb down was no good.

Day after day we did various trials in accordance with the trials program. The head of the naval trials team was Commander Ed Healey. All orders to the machinery had to go through me except when we were setting to work the control system and I gave Commander Holtby permission to give orders directly to the machinery control watch keeper. Trials were held throughout the day and night. About 2 o'clock in the morning the full astern trial was scheduled. The bridge had control and the orders for full astern was received. We got up to about 11 knots astern and then the main gearbox lube oil temperature started to climb. It got into the red and I ordered "stop the main engines". I called the bridge and said we had a problem and could we take control in the machinery control room? The Captain said there was a ship on the horizon and could we wait for about a half an hour? We determined that the problem was that the anti siphoning tubes had not been fitted on the sea bays. The [vent] cocks were closed and air bubbles from the propellers were getting into the bays and there wasn't sufficient cooling getting to the lube oil. I organized that all the cocks would be opened and the water drained into the bilge once the engines started to operate. The captain called and said we had control – do whatever you want. We had no problem getting to full astern, about 30 knots, where we stayed for about 2 hours in accordance with the trials program. The Captain commented that it would be surprising to other shipping to have a ship going astern at 30 knots in the Gulf of the St. Lawrence in the middle of the night.

INTERVIEWER: I understand from our recent interview with Jock Allan who was the project manager for the Navy on this project that you experienced some problems with the cruise engines. Can you elaborate on this?

SMITH: We were operating normally on the cruise engines when the machinery control operator said the combustion chamber temperature was going up on one of the cruise engine, the FT4 engine. I called Bill Burke, the United Aircraft Engine representative; he watched for awhile then said "there appears to be something wrong". The cruise engine was shut down and we went to the main engines. On examination of the combustion chamber it was found that the carbon had built up to a point that the flame was being restricted and it was only a case of time before the flame burned out the chamber. United Aircraft Limited got a replacement engine from Montreal and the shipyard replaced it with the new one. It was later determined that a copper element was in the fuel which built up in the chamber. We complemented the watch keepers for saving the engine and possibility preventing a serious fire.

INTERVIEWER: Does that really summarize all your experiences and problems in setting work the lead ship HMCS IROQUOIS?

SMITH: Yes there were other small problems but the shipyard and the other field service representatives were able to solve them. We returned to Sorel in complete automatic control, everybody sitting down having a coffee coming alongside. We returned to Sorel, IROQUOIS was commissioned and Commander McGillivray took the ship to Halifax.

INTERVIEWER: Well that brings us really to the second of the ships that MIL were building, that is HMCS HURON, no doubt you were involved in the setting to work and the trialling of that ship too. Do you have any experiences in that regard that you would wish to share with us?

SMITH: We went from the IROQUOIS to the HURON and the HURON was scheduled to leave harbour at 8:00 on 27th November 1972. I had arrived on board at midnight and about 0400 in the morning the vent fans stopped so I suspected the ship's power had gone off. I went to the machinery control room and the watch keeper said that when they were changing over the alternator from number 2 to number 3, the number 3 would send a signal to number 2 telling it had overloaded and it would shut down. Then there was a complete power failure because number 3 had not started. We tried all scenarios but could not determine the fault. I was not happy with going to sea with the generator stopping for some unknown reason, especially when we were on special sea duties in the St. Lawrence River. Maurice Gendron, who was the shipyard manager and his chief electrician and I had a discussion. Maurice said there was nothing they could do. I decided to go and we left the jetty about half an hour late. Alex Arnott was not very happy with our delay.

We had some problems with the anchor door and the anchor machinery. At the end of the anchor trials the starboard anchor was being stowed with one of the flukes fouling the anchor door. We went alongside in Rimouski and the shipyard personnel went to work to free the anchor. I have never been in a colder place in all my life. During the anchor trials the anchor was lowered as far out as possible, then the machinery could not haul it back again. The problem was eventually solved.

Marcel Goulet was the civilian captain of both ships. He was an employee of the Branch Line in Sorel. I got along very well with him throughout both ships' operations. A number of years later I heard that he had died rescuing a child who was caught in a fire. We returned to Sorel in HURON in late December and the commissioning reception was brought forward so that Navy captain, Captain Hitesman, could proceed to Halifax before the St. Lawrence River froze.

INTERVIEWER: Those were interesting observations about the setting work of the HURON and the IROQUOIS, I was just wondering if you have any further comments or observations concerning the DDH 280 program up to the acceptance of these two ships by the Navy?

SMITH: The Navy Board took a great risk in deciding to go with an all gas turbine propulsion ship. I can only speculate they had confidence in their engineers. Since the ships are still operational after 35 years of service, the Board made a good decision. The US Navy followed the Canadian and the Royal Navy and built all their destroyers and cruisers with gas turbine propulsion systems. Gas turbine propulsion is planned for the new Royal Navy aircraft carriers which are due to be in service in 2012. Operating the machinery during setting to work and sea trials is a unique situation.

INTERVIEWER: Interview with Gordon Smith.

End of side one.

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SMITH: The shipyard personnel were very cooperative and worked well with no work orders, records, history sheets etc. The field representatives were on board, willing and determined to make their respective machinery work. The Navy personnel were on board to witness any problems and give approval for work to be done irrespective of cost and effort. By the way I did not get involved in any contractual considerations. Here is a case of the navy and industry working together in harmony with a common aim to get the ships operational and accepted by DND. As far as IROQUOIS and HURON were concerned these two ships were a success and I understand were under budget.

INTERVIEWER: Well Gordon, in conclusion I wish to thank you for sharing your experience with us. Interview with Gordon Smith on the 27 of February 2006, interview ends.

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