

Shipbuilding in Canada and the Development of an Industrial Base in the early 20th Century

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Introduction

An essential element of any navy is the supporting engineering infrastructure necessary to keep the fleet maintained and repaired when needed. When it was first established in 1910, the branch of engineering directly applicable to the Naval Service of Canada (which became the Royal Canadian Navy (RCN) in 1911) was marine engineering. In its broadest sense, marine engineering deals with the design, construction, maintenance, support and technical operation of ships and their internal systems. It also embraces the parallel discipline of naval architecture. Naval engineering is a more specialised branch that deals solely with warships. Naval engineering is not confined to the Navy or to government agencies. Its practitioners include the industrial base of the infrastructure of shipyards, engine builders, mechanical and electrical engineering companies, and the myriad of companies, large and small, that supply components, parts and materiel.

In 1910 there was a limited capability in naval engineering represented by the naval Dockyards in Halifax and Esquimalt. These yards performed running repairs and routine maintenance, including dry docking, on ships of the Royal Navy (RN). Both yards had been transferred from the British Admiralty to the Canadian Government in 1907 to provide support and running repair services for the ships of the Department of Fisheries and Marine, the precursor of the Naval Service, as well as to visiting ships of the Royal Navy. In addition, there was considerable engineering expertise in Canada related to steam propulsion technology. For example, the first practical compound marine steam engine was invented by the brilliant mechanical engineer Benjamin Franklin Tibbets from New Brunswick, and installed in the Saint John River steamer *Reindeer* in 1845. Much of this expertise was developed in support of the construction and operation of the railroads. The technology needed for a steam locomotive is essentially the same as that needed for a steam power plant in a ship. The use of the internal combustion engine in marine applications was not yet widespread except in small launches.

When the Naval Service of Canada was created, there was a small but substantial and

long-standing infrastructure of shipbuilding already in existence in the country. Canada had shipbuilding capability on both coasts and in the Great Lakes region. While it was not as sophisticated as that of Britain or the United States, it could and did produce a variety of capable, small cargo ships and fishing vessels for commercial ownership as well as the specialized vessels plying the canal systems of the Great Lakes. However, there was no Canadian shipyard capable of building the cruisers and destroyers that the government intended to acquire to form the nucleus of the Naval Service. Also, there was a lack of the necessary subsidiary industries, the industrial base, to produce specialized naval equipment and there was limited naval engineering expertise outside the small staff of the dockyards.

The modest fleet planned by the government of Prime Minister Sir Wilfrid Laurier for the new Canadian Navy was to comprise four *Bristol*-class cruisers and six *River*-class destroyers, identical to those already in service with the RN. The logical approach would be to have the ships built in Britain. This would take advantage of the British expertise, obtain the fastest delivery schedule and keep the acquisition costs to the lowest possible level. Another option considered was to have the first two ships of each type built in Britain while a specialised shipyard was built in Canada. Canadian workers would train in the British yards and assist in the construction. However, the government decided that all the ships should be built in Canada despite the difficulties, a longer delivery schedule and the additional cost. It was, in the view of the government, a worthwhile expenditure to encourage the development of a sophisticated shipbuilding industry - an early example of the use of defence spending for industrial development which became a fact of life in defence procurement following World War II.¹

The key to the program was obtaining the plans and specifications for the ships from the Admiralty. With certain constraints on security requirements to maintain the secrecy of the plans and specifications, the Admiralty agreed to provide plans for both the ships and for the requisite upgrades of the Canadian shipyard that would build them. In addition, they would provide technical support and expertise to the shipyard selected to build the ships. The schedule proposed was for a six year program. The first cruiser was to be delivered three years after contract signing with the others following at intervals of one year. The first two destroyers were to be completed within three years and the rest

¹ Tucker, G. N., 1952, *The Naval Service of Canada*, Ottawa, King's Printer, Vol I, p.163.

to follow at intervals of nine months. The deadline for the tenders from companies seeking to build the ships was set as 1 May 1911.

There was considerable interest in both British and Canadian shipyards in the program. As many as nineteen companies corresponded with Naval Service Headquarters (NSHQ) throughout 1910. Of the seven proposals received, six offered to build the ships in Canada while the seventh misread the tender documents and prepared a bid based on a build in Britain. This latter bid demonstrated the premium the government would have to pay for building in Canada. Three of the bidders were Canadian, one of which proposed a consortium with two famous British shipbuilders.

The prices offered for the build in Canada solution ranged from a high of \$13.1 million to a low of \$11.3 million - roughly a billion dollars in today's currency. The bid from the company which priced a build in Britain was just over \$8.5 million showing a premium of more than \$3 million to meet the requirement of the government.

Laurier's plan never came to fruition as his government lost power in the general election of 1911, before the negotiations for the contract were completed. The incoming government of Sir Robert Borden did not accept any of the tenders for the construction of the ships. Deposits from the bidders were returned and the ambitious program died and the new Navy would barely survive with obsolete cast-offs from the Royal Navy. It would be almost another generation before major warships would be built in Canadian shipyards for the RCN. The potential for a strong industrial base for a viable naval force would diminish until the onset of World War II.

Shipbuilding

World War I was a stimulus for the Canadian shipbuilding industry, especially on the West Coast, and this laid the foundation for the formation of the industrial base which produced such outstanding results later in the 20th Century. There was a healthy and thriving wooden shipbuilding industry in British Columbia but no yard had the capability to build steel ocean-going ships. With one exception, the steel ships in coastal service on the West Coast had all been built elsewhere, primarily in Britain because of favourable tariffs. The exception was the coastal vessel S. S. *Princess Maquinna*. Built in 1913 by the Bullens shipyard in Esquimalt (bought in December 1913 by Yarrows of Scotland) for the Canadian Pacific Railway Company, she was the first steel steamship to be built in BC. However, the need to service and repair the coastal trade fleet had

produced an influx of marine engineering expertise and talent to the region in the early years of the 20th Century as the trade flourished.

The initial wartime production on the West Coast was almost exclusively wooden sailing ships built for the lumber trade. Direct subsidies and favourable financing from both the government of BC and the Federal Government were made available to the shipyards to ensure an adequate supply of vessels for the export trade which was vital to the BC economy. As the war progressed and merchant ship losses mounted, orders came from the British Imperial Munitions Board (IMB) in 1916 and 1917.

The first orders were for 28 wooden cargo steamers of 2300 gross tons of a standard British design. They were built by six different yards in Vancouver and Victoria². They were not a success having been built with unseasoned lumber which made them short-lived and their cargo capacity was limited.

Subsequent orders from the IMB were for standard designs of steel cargo ships that were awarded to J Coughlan & Sons of Vancouver, BC and to Wallace Shipbuilding & Drydock Co. Ltd., of North Vancouver. Coughlan built seven dry cargo ships of 8,800 tons (deadweight) and Wallace produced three smaller ships of 4,600 tons³. The first ship launched was the *War Dog* at the Wallace yard in May 1917 and it became the first steel steamship for ocean-going service ever built in Canada. When the Coughlan yard launched the S. S. *Alaska*, the first of its IMB order, it was the largest ship ever built in Canada at that time.

The shipyards in the Great Lakes region, in Quebec and on the East Coast also produced steel and wooden ships to the standard designs for the IMB. Contracts were issued for a total of 35 steel ships of various tonnages but only 29 were actually completed before the end of the war. The largest orders went to Polson Ironworks Ltd. of Toronto (eight of 3,500 tons), Port Arthur Shipbuilding Co. Ltd. (one of 4,300 tons and six of 3,500 tons) and Canadian Vickers Ltd. In Montreal (six of 7,200 tons). Port Arthur

². 20 basic Standard designs of cargo vessels, coasters and tankers were produced and built in British, Canadian, US and Hong Kong shipyards to cover all types of shipping needs.

³. Garth S. Wilson, *History of Shipbuilding and Naval Architecture in Canada*, Transformation Series Number 4, Ottawa, 1994, National Museum of Science and Technology . The order from the IMB for J. Coughlan & Sons yard was for ten ships but the final three were cancelled at the end of the war.

completed all of its order but Polson delivered only six and Vickers just three ships prior to war's end. Other yards in Quebec, as well as some in Nova Scotia and New Brunswick delivered 16 wooden hulled ships all of 2,300 tons. The ships built in the Great Lakes yards were constrained in length and beam by the dimensions of the locks in the canal systems in the St Lawrence between Lake Ontario and Montreal although, on occasion, large ships were split into sections on barges and rejoined in Montreal.

The shipping crisis caused by losses to the U-boats in the Atlantic in 1916 also generated an urgent need for more naval patrol ships. Canadian shipyards benefited since the British yards were at or near capacity. Both the Canadian and British Governments placed orders with Canadian yards for the construction of steel trawlers and wooden drifters based on drawings to be provided from the Admiralty.

In February 1917 orders were placed for 48 steel trawlers - 12 for RCN service and 36 for the Royal Navy - together with 100 wood hulled drifters. The yards involved in the build of trawlers for the RN were:

Collingwood Shipbuilding, Ont.	7 hulls, engines and boilers;
Kingston Shipbuilding, Ont.	2 hulls (engines and boilers built elsewhere);
Polson's Ironworks, Toronto	4 hulls, engines and boilers;
Government Yard, Sorel, PQ	3 hulls, engines and boilers;
Thor Iron Works, Toronto	2 hulls (engines and boilers built elsewhere); and
Canadian Vickers, Montreal	12 hulls, engines and boilers; and,
Western Dry Dock, Port Arthur, Ont	6 hulls, engines and boilers.

The orders for the RCN ships were split between Polson (6), Vickers (4) and Kingston (2). The Canadian ships were named after towns in Belgium or France where Canadian troops had fought whereas the British ships were simply numbered.

Deliveries had been planned to commence between five and seven months after receipt of the drawings from the UK. Problems with delivery of steel from the United States delayed the plan until late 1917. Nonetheless, this was a remarkable feat on the part of

the yards involved⁴. Another major problem which contributed to the delays was the surprising lack of a manufacturer in Canada of ship's magnetic compasses. This was eventually resolved through finding a source in Boston.

In January 1918, the Canadian Government approved an Admiralty request to construct a further 24 trawlers in Canadian yards. These additional ships were allocated to yards in both Quebec and Ontario:

Port Arthur Shipbuilding ⁵	8 vessels
Kingston Shipbuilding	4 vessels
Davie Shipbuilding, Lauzon, Quebec	6 vessels
Government Yard, Sorel, Quebec	3 vessels
Tidewater Shipbuilding, Trois Rivieres, Quebec	3 vessels

All of the ships were completed and delivered by the summer of 1919.

One remarkable aspect of this program was the establishment of what was in effect a single centralized procurement agency. Mr. J. W. Norcross, the Vice President (later President) of Canada Steamship Lines (CSL), volunteered to implement his own suggestion to the Minister of the Naval Service that all orders for the steel and machinery be progressed through the headquarters of CSL. He offered the services of his staff and facilities to the Government at no charge - a gesture which the Minister accepted and praised as resulting from a "... very patriotic attitude..."⁶ Thus Mr. Norcross became the first Director of Ship Construction of the Naval Service Department and, due in large part to his efforts and energy, he was instrumental in the timely completion of the program.

This building program was also remarkable in that it represented a significant feat of

⁴. Daniel Harris, "Canadian Warship Construction 1917-19", *Mariners Mirror*, Vol 75 No. 2, May 1989, 149-158 .

⁵. Formerly the Western Drydock Company.

⁶. Harris, p 150. It is not known whether or not Mr Norcross was a "dollar a year man" such as those who joined government service in World War II and later. In 1918 Norcross was a partner in the reorganization of the Halifax Shipyards.

ship construction for Canada - 72 steel trawlers and 100 wooden drifters built and delivered in an 18 month period. As well, it was the first instance of the construction of warships, and these trawlers were indeed warships, in Canada for the RCN. It would take another World War before Canadian yards would again build warships for the RCN.

Submarines

Canadian Vickers Ltd was established by its British parent, shipbuilder and armaments manufacturer Vickers Ltd, in Montreal in 1910. It was intended to become the primary yard for the construction of the ships planned for the RCN and was built to replicate the organizational structure of the parent. Key personnel from Britain were seconded to the Montreal establishment and in early 1914 the Canadian government awarded a contract for the construction of an Arctic patrol icebreaker the *John D. Hazen*⁷. The yard was fully operational by the outbreak of World War I.

The war had barely commenced when, in late August 1914, Canadian Vickers made an unsolicited proposal directly to George J. Desbarats, the Deputy Minister of the Naval Service. Vickers offered to build two or three submarines in the Montreal facility for the RCN. Delivery of the first two boats was promised in time for the opening of the navigation season on the St Lawrence in early 1915. Vickers, the British parent company, owned 50% of the Electric Boat Company of Groton, Connecticut (EB). EB was the builder of the *Holland*, the first submarine built for the USN and it was their design of a 400 ton submerged displacement boat that was offered to Canada⁸.

The advice of the Admiralty in response to a query by the Canadian Government on the wisdom of proceeding with the build was to reject the offer based on the grounds that the schedule was impossible and the design proposed was technically unsound. However, not long after having provided the Canadian Government with this advice, in November 1914 the Admiralty entered into an agreement with the Bethlehem Steel Company of Pittsburgh, Pennsylvania for the construction of 20 submarines to an EB design which was very similar to that offered to Canada. This design became known as

⁷. John D. King, *History of Canadian Vickers*, circa 1975, produced as an internal company pamphlet as a commemorative souvenir.

⁸. J. D. Perkins, *The Canadian-built British H-boats*, The Great War Document Archive, 1999, <http://www.gwpda.org/naval/cdnhboat.htm>.

the H-class in British service. The submarines would be built by EB as kits in their yards in Massachusetts and in San Francisco and delivered within six months to British yards for completion. This arrangement soon ran afoul of US neutrality laws and the build of the first 10 boats was shifted to Canadian Vickers in Montreal. The contract schedule called for the first two submarines to be completed and ready for sea within four and a half months and each succeeding pair at two month intervals after that. This was essentially the same schedule as had been originally proposed by Canadian Vickers and the one that the Admiralty had found “impossible” three months earlier

In a classic example of arbitrary Imperial disdain for its colonial partner, the Admiralty requisitioned Canadian Vickers on 1 January 1915. All other work in the yard ceased, including work on the Canadian Government icebreaker. The Government of Canada was neither asked nor even informed officially of this action for some considerable time. The yard itself was completely fenced off and guarded by military personnel. Work on the submarines began with the first keel laying on 11 January. The workforce toiled on a 24 hour a day basis under the supervision of Admiralty overseers and key management and technical personnel from the Electric Boat Company. That the contract was completed on time and on budget is a tribute to the men who worked at Canadian Vickers and this remarkable effort is an outstanding major technical achievement. The Montreal yard later built eight more H-class submarines to the order of the Italian Government as well as six hulls intended for Russia⁹.

James Venn Paterson was a Scottish-born naval architect who had trained in the shipyards of the Clyde. He had moved to Philadelphia in 1895 and was credited with the invention of the expansion joint for steel ships as well as other innovative design techniques. In 1906, at the age of 39, he accepted the position of Vice President and General Manager of the newly reorganized Moran Company shipyard in Seattle. When the US Navy began to build its first submarines, Paterson made great efforts to have his shipyard participate in the program. Eventually his persistence paid off and in 1909 he won a contract to build two boats with two others going to a yard in San Francisco. However the Seattle yard actually delivered the first submarines ever built on the US west coast. Other submarine orders followed, including those for Chile which famously ended up as HMC Submarines CC-1 and CC-2. Thus, by the beginning of

⁹. Perkins, p 2-3.

World War I the Moran Company was a well established submarine builder¹⁰.

As World War I began, Paterson approached the Premier of British Columbia with a proposal to build submarines for the RCN at the BC Marine Railway in Esquimalt (Yarrows). This idea went nowhere but in June 1915 the Electric Boat Company, with which Paterson had very close ties, asked if Paterson could build five H-Class submarines destined for Russia in BC. The submarines would be fabricated, assembled then knocked down and packaged into kits. The kits would be shipped to Russia across the Pacific Ocean to the port of Vladivostok. They would then be transported overland by train to the Baltic.

Paterson agreed and started a new company named the British Pacific Engineering and Construction Company to implement the contract from EB. He leased what is now known as a “green field” site on the south side of the eastern end of Burrard Inlet at Barnet close to the tracks of the Canadian Pacific Railway (CPR). Barnet is now part of Burnaby in greater Vancouver and the building site is part of the current Barnet Marine Park. By mid-August, in a remarkably short period of time, the yard was up and running, spur tracks from the CPR main line were in place and construction of the first submarines had begun.

The work was undertaken in great secrecy. As with the build at Canadian Vickers in Montreal, no one bothered to advise the Canadian Government of the activity yet the site was under the guard of troops from the Canadian Militia. After rumours began to circulate in Ottawa, an inspector from the Naval Service was despatched to visit the shipyard. The officer selected was Lt Bertram Jones RCN. Jones was a retired Royal Navy officer, qualified in submarines, and had commanded a British submarine. He was also the first commanding officer of HMCS CC-2. The report that Jones submitted in late October 1915 confirmed that submarines were under construction for Russia. He commented favourably on the progress and the facilities that had been installed. He also noted that 460 men were employed on the site¹¹. A significant number of these men were drawn from the Coughlan and Wallace yards.

¹⁰. Bill Lightfoot, *Beneath the Surface, Submarines Built in Seattle and Vancouver, 1909-1918*, Vancouver, BC, 2005, Cordillera Books.

¹¹. Lightfoot, p 38.

By 15 November 1915 the construction was complete. Packed and shipped by rail to the port of Vancouver, the first three kits left for Vladivostok on 28 December. The final shipments of the contract comprising engine parts left Vancouver by mid-March 1916. Again, this was a remarkable achievement; from green field to final delivery in seven months.

No more submarines were built in the yard at Barnet although materiel was assembled for a further three vessels. The company became embroiled in a dispute over the price of the land and the site was shut down. Paterson returned to Seattle and the materiel was shipped to Canadian Vickers in Montreal for eventual inclusion in their Russian order.

Paterson again came to Vancouver in 1917 as the British Pacific Engineering and Construction Company was awarded a contract for six more H-Class submarines for Russia. This time a site on the Vancouver waterfront was leased from the CPR as a temporary building yard. The facility was located very close to the current Canada Place pier in modern Vancouver. Six open building slips were constructed and work on the submarines commenced in mid-April using forged and cast steel parts supplied from Canadian Vickers in Montreal. Completion date was set as 15 August - only four months from the start. By the end of August all six submarines were crated and ready for shipment - nominally two weeks late but still an astonishing feat¹².

These submarines never reached their destination due to turmoil of the Russian revolution. They remained in storage on the building site until finally sold to the US Navy in 1918. They were removed to Seattle where they were completed and commissioned into the USN thus ending the short yet remarkable history of submarine construction in Canada. The British Pacific Engineering and Construction Company was dissolved in 1921.

The Birth of a Merchant Fleet

The expansion of Canadian shipbuilding capacity in World War I gave rise to speculation that the industry could be sustained at similar levels in the post-war world. The Deputy Minister of Marine and Fisheries asserted in a paper published in March 1918 that an opportunity existed for Canadian shipbuilders and their allied trades to lay

¹². Lightfoot, p 43

the foundations for a permanent industry in Canada. He based this on the assessment that "...for several years to come the shipbuilding yards of the whole world will be fully occupied in replacing lost tonnage of all descriptions as well as in keeping pace with the ordinary requirements of water transportation."¹³ As early as January 1918 the Government had announced that it would place orders in Canadian shipyards for a fleet of merchant ships to be owned by the Government to be known as the Canadian Government Merchant Marine (CGMM). The CGMM fleet would be operated by the newly formed Canadian National Railway. The timing of the orders would be such that there would be no idle period in these yards after the orders for the IMB had been completed. By October 1918 a total of 25 of these vessels had been ordered and were under construction. By the end of the program in 1922 some 63 cargo ships ranging in size from 750 to 8100 tons, and displacing in total 380,736 tons, were delivered. Also a new steel rolling mill was opened in Sydney, NS and a new shipbuilding facility in Halifax was opened despite the Government's intention to avoid subsidizing new ventures.

The pace of this kind of shipbuilding could not be sustained on domestic orders and the Canadian yards were not cost competitive with British or US yards. Throughout the years leading up to World War II, Canadian shipowners could and did buy ships constructed offshore. British-built ships were not charged duty when sold to a Canadian ship owner and imported to Canada. In 1925 the shipbuilders appealed to Parliament for assistance - even the busiest yards were producing no more than one ship a year. Citing higher labour and material costs as well as higher duties on imported equipment and repairs than the USA in particular, the shipyards complained in effect that there were no incentives for Canadian shipping companies to buy Canadian-built ships. The Government did not respond favourably to the appeal. This would become a recurring theme right up to the start of World War II. Almost to add insult to injury, Canadian National went to a British yard to purchase the famous "Lady" boats for its West Indies liner service.

Much of the problem had to do with factors beyond the shipbuilding industry itself. Virtually all the steel used by the yards came from outside Canada - primarily the US. Most of the fittings were also imported - as in the case of ships' compasses noted above. Without a domestic source of supply of such critical items it was no wonder the

¹³. Quoted in Wilson, p 51

Canadian yards had difficulty competing on cost. Although marine steam engines and boilers were built in Canada for the relatively simple cargo ships for the IMB program, the electric motors and other essential engineering components of the H-class submarines came from the US.

Another critical issue was the lack of significant in-house design capabilities in the Canadian yards. Only Canadian Vickers had extensive naval architect expertise on staff and there were few independent naval architectural firms. So it was, or should have been, understandable when Canadian ship owners went offshore for the design and build capability lacking at home. Government subsidies to the shipyards would not have resolved these issues.

Nevertheless, the fact that a core of shipyards and allied industries did survive the great depression of the 1930s meant that Canadian shipbuilders could again contribute to the Allied war effort in World War II.

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