



KEEPING NAVY SHIPS/BOATS AT SEA MAINTENANCE

The Royal Canadian Navy (RCN) is a blue-water navy – it does not spend all its time around the coast of Canada, it crosses oceans to serve the government’s foreign policy goals. This means that RCN ships and submarines are subject to extremes of temperature, from cold weather on Arctic operations to searing heat on operations near the Middle East or in the Caribbean. These temperature extremes cause wear on equipment (and sailors too, but that’s a different story). But it isn’t just travel that causes warships to need maintenance – mechanical and electrical equipment can be negatively affected by salt water/air even sitting at the dock.

Naval Maintenance in General

Warships and submarines are expected to float, move and fight. They are also expected to be ready to serve whatever purpose the government assigns them. Ensuring that ships/boats continue to float, move and fight means regular maintenance. The ability of a warship or submarine to succeed in its mission largely depends on training of personnel and readiness of equipment. Fleet maintenance directly supports operational readiness. Some elements of the mission cannot be predicted, but the RCN ensures that machinery and equipment is fully operational before heading out of the harbour. Properly maintained machinery and equipment is less likely to fail during a deployment. But maintenance is not only for *mission* success – it is crucial to ensure that risk is mitigated so that the crews are safe from injury if machinery breaks, as well as safe from fires, floods, hazardous material spills, or in the worst case scenario, a ship sinking.

Canada has a history of keeping warships for long service, and that means maintenance. Just like you take your car in for a safety inspection or an oil change, warships need regular check-ups and maintenance. The difference is that a warship is a big complex entity. We think cars are complex machines and most of us don’t understand them or fix them ourselves. But multiply that complexity by a 100 – i.e., consider the ship’s hull, propulsion, weapons, sensors, navigation, communications, crew accommodation ... and you begin to see how much more complicated maintenance is on a warship. Therefore, maintaining it takes longer than fixing your car, and costs more. It should be noted that the older the vessel, the more maintenance it needs – and that costs even more money.

There are two types of maintenance: preventive and corrective. Corrective maintenance means that something has broken and needs repair. The plan in the navy is to do preventive maintenance so that things don’t break. All equipment in the ship requires routine maintenance and inspection. Equipment/machinery has a lifespan, and the key is to make sure that the lifespan is as long as possible, and that critical elements don’t fail. The routine maintenance and inspection may be undertaken based on condition (for example, the number of rounds a gun has fired), or by time (for example, how many hours a diesel generator has worked).

There are three lines of maintenance. The first line is the ship’s crew which is expected to do routine service or minor repairs. Technicians onboard warships and submarines have the skills to

make repairs that are necessary to keep most equipment functioning, and they use spare parts that are carried on the ship. When warships leave home port on a mission or exercise, they take spare parts with them, hopefully in sufficient quantities. (An interesting point to make on this topic is the possible adoption of 3-D printers. There has been much testing and research into having 3-D printers onboard naval vessels so that parts can be made while at sea instead of storing parts or having a part shipped from home.)

The second line of maintenance is the Fleet Maintenance Facility (FMF) – FMF Cape Scott in Halifax and FMF Cape Breton in Victoria. The FMF takes care of most maintenance and repair while a ship is alongside. If we continue with the car analogy, the Fleet Maintenance Facilities would be equivalent to a car dealership. They have trained workers and specialized shops (i.e., electrical, propulsion, communication, radar, sonar, etc.). FMF personnel also have access to the Naval Supply System, a huge warehouse in the dockyard with spares for all equipment used by the RCN.

The third line of maintenance is the Original Equipment Manufacturer (OEM). This would be for something that neither the ship’s crew nor FMF is qualified to handle. The manufacturers of highly complex equipment used in a warship or submarine are contracted to undertake the maintenance of the material they have supplied.

Depending on the complexity and scope, the maintenance can take a warship out of service for varying times. There are short work periods (SWP) of 1-3 weeks, long or extended work periods (EWP) lasting weeks or sometimes months, and a docking work period (DWP) or extended docking work period (EDWP) which is the longest maintenance period and may last several years.

Same as with car maintenance, maintenance needs to be booked in advance to ensure availability of a workshop and parts. When a ship enters SWP/EWP/DWP is tied to the navy’s Operational Schedule. The RCN requires that at least eight of the 12 frigates are able to deploy to meet the navy’s commitment to the government. It requires careful planning to make sure enough are ships available on both coasts to defend Canada or support a mission overseas. Ships undergo work periods in turns, unless there an urgent repair or mission-specific fitting required.

Maintaining Canadian Frigates and Submarines

The 12 *Halifax*-class frigates split between the East and West Coasts are the backbone of the RCN (see Briefing Note #13). The oldest of the frigates, HMCS *Halifax*, came into service in 1992 – and thus has been in service for approximately 28 years. The rest of the ships joined the fleet between 1992 and 1996. So, even the youngest frigate is now 24 years old. Docking maintenance work periods are essential to ensure that the *Halifax*-class frigates are available and reliable during their operational cycle and deployments.

In July 2019, the government announced a plan to invest more than \$7.5 billion in the 12 frigates to provide ongoing maintenance to keep them in service until the early 2040s.¹ (If you do the math, you’ll realize that by 2040, HMCS *Halifax* will be 48 years old!) The plan is to make sure that the frigates remain effective and operationally ready until the Canadian Surface Combatants enter into service. In an attempt to spread the maintenance work to different

1. Public Services and Procurement Canada, Press release, “Halifax-class Frigates: Maintaining Canada’s federal fleet of combat vessels,” 16 July 2019, available at www.canada.ca/en/public-services-procurement/news/2019/07/halifax-class-frigates-maintaining-canadas-federal-fleet-of-combat-vessels.html.

shipyards, the government awarded contracts to Chantier Davie, Seaspan Victoria Shipyards and Irving Shipbuilding, with guarantees of a minimum of three frigates for each shipyard, with work planned to begin in the early 2020s.

Like the surface ships, the *Victoria*-class submarines undergo routine maintenance on a rotating schedule. Because they operate in extreme conditions, and are incredibly complex, submarines require a great deal of maintenance. Canada purchased four submarines from the United Kingdom in 1998 – and there was much heated discussion about the purchase but that is the topic for another day. After years of work to ‘Canadianize’ the submarines, they became fully operational.² The idea now is to keep the submarines ‘operationally effective’ until the mid-2030s.³ The government has an agreement with Canadian industry for support and maintenance through 2023 – the *Victoria* In-Service Support Contract – with the possibility of extension.⁴ This contract includes material acquisition, repair and overhaul, engineering services, and organization of the refit and maintenance schedule.⁵

In general, the plan is to operate in a cycle in which each submarine is available to the fleet for six years (the operational period), and that is followed by two years in deep maintenance. On rotation they undergo extended docking work periods. This is to ensure that the RCN has a steady state of three fully operational submarines. Plans, however, sometimes go awry. After a busy year in 2018, when submarines travelled to Asia and across the Atlantic for operations, in 2019 the submarines did not go to sea at all. So, instead of three submarines available and one in maintenance, work was being done on all four of them at once. Several submarines are scheduled to back at sea in 2020.

Conclusions

A warship’s ability to succeed in its mission largely depends on training of personnel and readiness of equipment, ensuring that the ships continue to float, move and fight. Warships are expensive to build. This means that governments are tempted to keep ships in service as long as possible in order to save taxpayers’ money. Whether this is a wise choice, given equipment obsolescence and increasing maintenance costs as warships get older, is a discussion for another day. The bottom line is that maintenance of RCN warships and submarines is a necessity if they are to serve Canada.

2. Royal Canadian Navy, “*Victoria*-class Maintenance and Modernization,” last modified 3 May 2019, available at www.navy-marine.forces.gc.ca/en/fleet-units/submarines-maintenance.page; and Department of National Defence, “*Victoria*-class Submarines,” no date, available at www.canada.ca/en/department-national-defence/services/procurement/victoria-class-submarines.html.

3. Murray Brewster, “Canada’s submarine fleet spent ‘zero days’ at sea last year: government documents,” CBC News, 11 February 2020, available at <https://www.cbc.ca/news/politics/submarines-canada-fleet-repairs-canadian-navy-1.5458632>.

4. DND, “*Victoria*-class Submarines.”

5. Government of Canada, Department of National Defence, “Backgrounder: *Victoria* In-Service Support Contract,” 4 July 2013.