

## CREWING NAVAL SHIPS



We have all heard of the National Shipbuilding Strategy – and if you haven’t you should consult Briefing Note #6 National Shipbuilding Strategy. This strategy is designed to re-build (referred to as recapitalization) the fleets of the Royal Canadian Navy (RCN) and the Canadian Coast Guard (CCG), both of which have been neglected for many years. The talk in the media and policy circles is about ships, capabilities, communication suites and weapon systems.<sup>1</sup> What receives less public discussion is the question of crews and crewing.<sup>2</sup>

Technology is changing and it may be that in the near future, ships will not need crews. But for now, a ship needs a crew. But what size of crew? Naval warships tend to have much bigger crews than cargo ships, for example. This is because the ships have different purposes – one is designed simply to take cargo from Point A to Point B as cheaply as possible, the other is to provide security and defence, as well as undertake constabulary and diplomatic functions. A warship requires different capabilities than a cargo ship for more complex roles, and the ships themselves are much more complicated as a result. Building new ships for the navy raises significant questions about crews. Let us examine some of the considerations that go along with crewing a new class of navy ships.

As new ships start to appear through the NSS, we tend to think only of the price tag of the ship itself, but that is only part of the cost of the life of the ship. Operations and maintenance are significant costs throughout a ship’s life, and so are personnel costs. Therefore, decisions on the design of new ships have to take into consideration not only the propulsion, weapon and communication systems but also the size of the crew. Reducing the crew can lead to significant cost savings. But reducing the number too far can have serious negative implications. For example, the US Navy’s (USN) experience with the Littoral Combat Ships “suggests that these ships, which were designed to have very small crews, may present significant risks for manning and logistics (i.e., high workload and inadequate sleep for the crew, and inadequate shore support), and maintenance.”<sup>3</sup>

In Canada, the Arctic and Offshore Patrol Ships (AOPS) currently being constructed, are huge ships but they will have only a small crew. This could mean significant cost savings if an AOPS is sent on a mission with 65 sailors, rather than a frigate with 240 sailors. However, it should be noted that the classes are designed for different missions. An AOPS is not expected to fight whereas a frigate is, and this dictates a certain size of crew. As well, the AOPS crew may grow in size because of mission-specific augmentation, or if the navy finds that a crew of 65 leads to fatigue. Of course, crew size is not the *only* consideration – i.e., the mission is important as are other factors such as potential greater fuel efficiency in new ships – but it’s an important factor.

The size of the crew must be determined early in the ship build because accommodations must be configured in the design – things like sleeping quarters, washrooms and cooking/eating

facilities need to be put into the design. But determining the optimal number of personnel is a tricky proposition – particularly for ships with new designs. How can you determine what is the best size of crew when the ship is still a design on a piece of paper? That’s not easy. According to Renee Chow et al,

If the crew size is over-estimated in the design phase, then design and build costs may be inflated by the need for additional crew accommodation. If the crew size is under-estimated, then the platform may fall short in operational capability or readiness, and there may be limited feasibility, significant costs, or delayed schedules associated with subsequent design changes.<sup>4</sup>

As technology has changed, particularly over the past century, jobs have changed for naval personnel. You might once have needed personnel to stoke coal for the engine, or load weapon systems manually, but this changed as propulsion and weapons systems become more automated. The decision to utilize certain technologies affects which crew roles are required. Most modern warships require less manual labour and more technical experience, and that will increasingly be the case. It is also important to determine what the ship will do. If it will conduct replenishment-at-sea operations, then it will need a crew for that, and if it will incorporate helicopters it will need space for the personnel of the helicopter detachment.

As noted, the size of the crew is increasingly related to the technology on board the ship. According to Chow et al, “Once specific technologies are assumed, a specific number of roles can be defined for the crew to operate and/or maintain these technologies, and the qualifications can be defined for each role.”<sup>5</sup> This has all sorts of implications for the size of crews – and serious implications for training and military occupational structures because it affects the type of people who are needed for crews. This leads to a whole new headache for navies as training must change, there will be elimination or amalgamation of trades, addition of new trades, and changes in personnel classifications – which is never a pleasant experience for people whose profession disappears with technological or organizational change.<sup>6</sup>

Another complicating factor related to crewing – which is not to say that this is a bad thing – is the RCN’s plan to increase the proportion of women serving in the navy. This is an excellent plan, but it complicates crewing decisions because on ships women are accommodated with other women. So, there must be sufficient accommodation for all the women who are on the crew. (It should be noted that this rule does not apply to Canadian submarines where accommodation rules are different.) Additionally for major warship design, accommodation has been modernized whereby the number of individuals in each mess is smaller than before hence there is more flexibility accommodating women. That said, at this point accommodation in the new CSC is unknown because the original design is from the Royal Navy which has different accommodation standards than the RCN.

There are both Canadian and international regulations about the living conditions, personnel training and the hours that personnel can spend on duty. If there are requirements that a watch must be kept, that emergency personnel are paying attention and that crew must eat, then there is a need for personnel to keep the watch, prepare for emergencies and prepare the food. On every warship there are big tasks – in addition to the specific mission tasks – that must be undertaken

by a crew, i.e.; watchkeeping, propulsion, damage control, technical maintenance, supply, feeding, cleaning, etc.

The addition of automated systems does not (as yet) eliminate the need for humans to be on the ship using their eyes and their experience to make sure that all is well. The question that requires much consideration, however, is how many humans and doing what? Will a small crew mean that crew members have to take on more primary and secondary duties and, if so, will fatigue reduce their effectiveness? Effective operation of a ship and its systems cannot be undertaken by personnel who haven't slept in days.

This is just a brief introduction to a complex situation. When you hear about a new ship being built for the RCN, think about all the decisions that had to be made about personnel on that ship.

## Notes

1. The navy is of course thinking about the issue. Defence Research and Development Canada (DRDC) has worked with the RCN to conduct crewing analysis for new naval platforms. One analysis tool, called Simulation for Crew Optimization for Risk Evaluation (SCORE), can undertake what-if analysis on ship crewing to determine optimal crew size.
2. For a very good discussion on this topic, see Renee Chow, Commander Ramona Burke and Lieutenant-Commander Dennis Witzke, "A Systems Approach to Naval Crewing Analysis: Coping with Complexity," *Canadian Naval Review*, Vol. 11, No. 3 (2016), pp. 16-21.
3. See Chow, Burke and Witzke, "A Systems Approach to Naval Crewing Analysis," p. 16; US Government Accountability Office, "Littoral Combat Ship: Deployment of USS Freedom Revealed Risks in Implementing Operational Concepts and Uncertain Costs," GAO-14-447, 8 July 2014; and M. Burke, "Littoral Combat Ship Sidelined again by Maintenance Issue," *Stars and Stripes*, 13 November 2013.
4. Chow, Burke and Witzke, "A Systems Approach to Naval Crewing Analysis," p. 16.
5. *Ibid.*, p. 17.
6. For a good discussion of this, see Commander Luc Tremblay, "Naval Occupations and the RCN: A Complex Yet Necessary Restructuring," *Canadian Naval Review*, Vol. 13, No. 2 (2017), pp. 11-16.