Standard shipping containers, the humble ‘sea cans,’ revolutionized global trade. They made the cost of shipping much cheaper and more efficient, and this changed the pattern of the world economy. According to one writer, “The value of this utilitarian object lies not in what it is, but in how it is used.” Like the container did for world trade, can standardized modules be used to revolutionize Canada’s next navy?

Canadian planners have long understood the key benefits of modularity. A 2006 paper for Defence Research and Development Canada identified the benefits as: operational flexibility, or the ability to reconfigure a ship for various missions; increased availability of the ship or reduced operational downtime; and a reduced total number of mission modules for the fleet. All these would result in cost savings. Cost savings are key to government interest in warship modularity, and many navies have examined modularity in some form or other. In some cases, ships have been designed to be fitted ‘for’ but not ‘with’ certain systems. This means that ships can go to sea without some elements that are not necessary for their mission. As well, modularity means that there is space and/or the ability to add systems in the future. As Norman Friedman phrases it, “[q]uite aside from its direct financial advantages, modularity allows for surprises during the life of a ship.”

The Royal Danish Navy is widely credited with pioneering work in warship modularity, with its Standard Flex (StanFlex) concept. During the Cold War different ships had to perform a number of different tasks (surveillance, minelaying, anti-invasion, mine counter-measures operations, anti-submarine warfare) at different stages of the conflict. As the Cold War ended, a number of older ships in the Danish Navy had to be replaced, but a one-to-one replacement was not possible due to budgets constraints. So the Danish Navy came up with the modular concept to outfit the fewer ships with mission equipment matching the different elements or stages of a conflict.

Today, the US Navy is building two variants of the Littoral Combat Ship around the concept of modularity. The USN looked to aviation and the concept of reconfigurable airframes and it has designated the Freedom and Independence ship types as ‘seaframes.’ These seaframes have the ability to be outfitted with reconfigurable payloads – called ‘mission packages’ – which can be changed quickly as missions or situations change. The mission packages are supported by special detachments that also have the ability to deploy manned and unmanned vehicles and sensors in support of missions.

The USN has had ships of each type in service, and it is learning the strengths and weaknesses of the system. One of the important challenges is how to integrate the people who accompany a module on board with a core ‘permanent’ crew. The USN notes that it can change modules in 96 hours, but that this is only part of the equation. The bigger challenge is getting the mission package personnel to work together with the crew, and that takes time.

Another question pertaining to modularity is what happens when a ship is out at sea configured for a certain
mission and the mission changes? If a ship is thousands of kilometres from home port, can modules economically and efficiently be changed? Can they be forward or sea based, or air delivered? The answer is yes, but it might negate the cost savings to do so. The Royal Danish Navy does not change modules in overseas operation areas, although it is possible. The Danish navy, which operates mainly in the North Atlantic, but also the Indian Ocean, the Caribbean and the Mediterranean, deploys its ships in the configuration needed for operations which can last up to 12 months. For Denmark, the configuration of the modules is decided in the preparation phase of a deployment, and the configuration stays the same until the ship returns to home port. As noted, there is no reason why the modules couldn’t be changed while a ship is at sea, but Denmark for one chooses not to do so. In extreme circumstances, the decision might be different.

Two other challenges that arise with modularity are weight and power. What if the different ‘mission packages’ are significantly different in terms of weight? That will affect the amount of power the ship will need, so these factors have to be calculated in the design of the ship. As well you need to have a certain size of ship that allows the weight to be added and subtracted and still maintain stability, and that has enough deck space.

Clearly, the world has lessons to teach Canada about modularity and naval shipbuilding, but how well do those lessons apply to the Canadian context? While its experience is not as extensive as the Royal Danish Navy with StanFlex, or as ambitious as the US Navy with the Littoral Combat Ships, the Royal Canadian Navy is certainly familiar with modularity. The 12 Canadian Kingston-class Maritime Coastal Defence Vessels (MCDVs), introduced in the 1990s, were designed to carry modular mine warfare payloads. The first modules to enter service were designed for route survey and mine-sweeping missions. The plan was to change from one role to another by swapping containers, which are literally standard, 20-foot ISO containers. According to Vice Admiral (ret’d) Ron Buck who was Project Manager for the MCDVs, “[i]t was what I would call classic or basic modularity, because in theory, anyway, you can change roles simply by changing boxes.”

Modular technology has the potential to support a range of missions across civilian and military platforms, increasing capability and sharing costs under a ‘whole of government’ approach. For example, ThyssenKrupp Marine Systems offers modules for public authorities such as the navy, police, coast guard and customs agencies to use in ‘operations other than war.’ This includes weapons, medical facilities/equipment, sensors, oil recovery equipment and even a jail.

As Marc Levinson makes clear in his book The Box, the standard container only had an impact when companies and seaports learned how to use it. However, once one company began to use it and discovered its benefits, then the world changed very quickly. The more companies adopted the containers, the more the costs fell, and the more companies used the containers. And this meant that shipping goods by sea became both much cheaper and much easier.

With dozens of military and government ships to be built under the National Shipbuilding Procurement Strategy, modularity offers designers and shipbuilders an opportunity and a challenge to shape Canada’s maritime future.

Notes
4. Email conversation, Per Bigum Christensen, Technical Director, Danish Navy, December 2012.
5. Interview with Vice-Admiral (ret’d) Ron Buck, Project Manager for the MCDVs, December 2012.