CANADIAN SHIP DISPOSAL
By Tony Thatcher

With the prospect of many new vessels being built for the Royal Canadian Navy and the Canadian Coast Guard there will be large number of vessels that will need to be disposed of. Historically Canada has utilized various courses of action such as dismantling, selling, sinking or retaining as a museum. After the Second World War the Navy disposed of a large number of vessels, a good number of which continued as warships or were converted to commercial uses. With the introduction of the Halifax Class ships and the Victoria Class submarines there has been another surge of disposals. Since 1991 about 27 warships have been disposed of. All of the traditional disposal options are not likely to be available to the government during the next 20 years mainly as a consequence of changes in international law and public opinion. This is further complicated as, it is suggested, that the government has an obligation to be a good example in disposing of the vessels safely and with high regard to the environment. This paper outlines the methods the Canadian Navy has used to dispose of surplus vessels and explore what options may be available to the Navy and Coast Guard in the future.

Currently the Navy has five ships more than 40 years old - the two AORs and the three DDH 280s. It is anticipated that about 17 ships will be decommissioned with the arrival of the Joint Support Ships and Canadian Surface Combatant after 2020. The Coast Guard currently has 22 large vessels over 30 years old and these are expected to be disposed of during the 2020's as their various renewal projects come to fruition (Ref 1). To ensure they can be disposed of in a safe and economical manner for the government many factors have to be taken into consideration.

All vessels tend to have some environmentally toxic materials, contents or coatings. For instance naval vessels could have cadmium; halon, R11 refrigerants; PCBs in radar transformers, paint and cabling; lead in paint; asbestos in lagging, deck tiles, windlass brake linings and joiner panels; copper in hull coatings and the usual oily waste. These could be safety hazards to remove or make harmless when vessels are being prepared for and during dismantling. Some of these hazards may not exist in the current vessels; however there will still be significant hazardous waste to be controlled during disposal activity. If vessels are inactive with minimal inspections and maintenance over an extended period of time additional hazards could be introduced such as animal waste, mould, hull penetrations, hull wastage, loss of hull coatings into the water and potential vessel instability. Towing vessels under these conditions pose the greatest risk for an unwanted incident, particularly an accident or environmental spill.

International and National Regulations

Two international conventions influence the disposal of ships. The first is the 1989 UN Basel Convention which is an international treaty that was designed to reduce the movements of hazardous waste between nations. Secondly the 2009 Hong Kong IMO Convention on the recycling of ships addressed all the issues around ship recycling, including the fact that ships sold for scrapping may contain environmentally hazardous substances such as asbestos, heavy metals, hydrocarbons, ozone-depleting substances and others. It also addressed concerns raised about the working and environmental conditions at many of the world's ship recycling locations.

Regulations in the IMO Convention cover: the design, construction, operation and preparation of ships so as to facilitate safe and environmentally sound recycling without compromising the

safety and operational efficiency of ships; the operation of ship recycling facilities in a safe and environmentally sound manner; and the establishment of an appropriate enforcement mechanism for ship recycling, incorporating certification and reporting requirements.
Under the IMO convention the Guidelines on Ship Recycling also introduced the concept of a "Green Passport" for ships. It was envisaged that this document, containing an inventory of all materials used in the construction of a ship that are potentially hazardous to human health or the environment, would accompany the ship throughout its working life. Produced by the shipyard at the construction stage and passed to the purchaser of the vessel, the document would be in a format that would enable any subsequent changes in materials or equipment to be recorded. Successive owners of the ship would maintain the accuracy of the Green Passport and incorporate into it all relevant design and equipment changes, with the final owner delivering it, with the vessel, to the recycling yard (Ref 1). This will be a great help to ensure proper disposal of environmentally sensitive materials in the ships.
Warships usually contain equipment and technology that need to be controlled and kept secure. Under the Controlled Goods program certain equipment must be removed before disposal by the Navy or controlled and destroyed properly during ship disposal. The Navy normally removes Controlled Goods beforehand, but this can be an extensive and relatively costly exercise.

Methods to Dispose of Vessels

Over the years navies have found many ways to dispose of vessels. The methods are Reuse or Sale, Scrap or Recycle, Artificial Reef or SINKEX, Museum or Memorial. Each has a certain appeal, depending on the constraints or requirements. Generally the prime aim is to obtain the best cash value of the vessel if it has one, or alternatively find the cheapest method to get rid of it. Several times disposal activities have resulted in some interesting press such as when *HMCS BONAVENTURE* was sold to Hong Kong interests in 1971 for scrapping and the press reported that it may have been transferred to India instead during the tow. Since 1980, two steam destroyers have sunk under tow after leaving Canada for disposal.
Table 1 summarizes the various methods used to get rid of surplus Canadian Naval vessels over the years. The table is divided into two timeframes to show how disposal options have evolved. Ships that were scrapped have been sold both to Canadian and overseas companies. Since 1990, in Canada one shipyard and a recycling facility have received vessels for dismantling. Some vessels find a temporary use by providing access to their equipment for operational or training use, where they may continue to go to sea or stay in harbour. Reuse by another government department after the Second World War was presumably done in part in exchange for vessels commandeered by the Navy during hostilities. Reuse for commercial purposes is more popular for smaller vessels, such as minesweepers; although two frigates were made into notable yachts (Presidential yacht for the Dominican Republic and a private yacht for Aristotle Onassis). A few corvettes and frigates were transferred to other navies after the War and in the 1950's several minesweepers were transferred to European navies. A number of surplus frigates were sunk as breakwaters in various communities in BC and recently vessels have been sunk for recreational and tourist purposes as artificial reefs. Canada has sunk two vessels at sea as targets and received the benefit of an operational weapons exercise. Ships have continued to be transferred to museums and although there are probably more museums, such as the Canadian War Museum and the Military Museums of Calgary that would like one, the difficulty transporting the vessels to the museum location is prohibitive.

Table 1 Summary of Ships Disposed of by the Navy

Disposal Method of Major Warships	Before 1990 (some nos. approx)	Notes		After 1990	Notes
Scrap	At least 250			10	
Scrap –Out of Country	U/K	USA, Japan, UK, Italy, Hong Kong		5	USA, China (Steam destroyers)
Scrap – in Canada	U/K	BC, Ontario, Quebec, Nova Scotia		5	Ontario, Nova Scotia (Steam destroyers and Oberon submarines)
Reuse – Canadian Navy	10	Depot Ships/tenders Fleet Maintenance Facilities Harbour Training Vessels Diving Tenders			
Reuse – Canadian Government	16	RCMP vessels Weather Ships Oceanographic vessels Hydrographic vessel			
Reuse - Commercial	25	Private, charter yachts Fishing boats Merchant vessels Ferry, tugs, offshore oil exploration		2	*HMCS CORMORANT* *HMCS PROVIDER* – alongside oiler, later scrapped
Sold as Warships	24	Frigates Corvettes, Minesweepers for Chile, Belgium, France, Turkey, Uruguay, Venezuela		0	
Artificial Reefs	7	Breakwaters in BC		11	Diving Artifacts BC, QC, NS (Steam destroyers, *HMCS CAPE BRETON*)
SINKEXs	2	U190 (1947) - off Halifax *HMCS KAPUSKASING* (1978) - off Halifax (?)		1	*HMCS HURON* (2007) - 100 Km West of Vancouver Island
Museums/ Memorials	4	Located in Ontario, Quebec, Nova Scotia (*HMCS HAIDA*, BADDECK, *HMCS BRAS D'OR, HMCS SACKVILLE*,)		3	Located in Ontario, Quebec, Nova Scotia (POGO, *HMCS ONONDAGA, HMCS OJIBWA*) Note: POGO is not preserved.
Total	**336**			**26**	
Refs: 19 to 27					

Reviewing the disposal options:

1. **Reuse/Sale.** Reuse includes transferring the vessel to another navy or Coast Guard for an operational role or for parts. Resale implies the vessel has a value as a working ship. It can also be sold for conversion into a vessel with a different role. Canadian naval vessels have been converted for use as personal yachts, weather ships, research vessels, merchant vessels, training establishments, barracks, machine shops and hulks. Economically this is the best method as the government either gets the cash value or the continued use of the vessel. This could also generate good publicity as well. Some vessels have been sold for nominal value (*HMCS ONONDAGA* was sold for $4 plus tax (Ref 23)), while others for more substantial amounts. It is reported that the 18 disposals of major warships that took place between 1991 and 1998 most sold in the $150,000 to $200,000 range (Ref 27). It was not reported whether the government incurred any disposal preparation costs for these vessels.

   It is only possible to sell a vessel when it still has sufficient life in the vessel to make it cost effective. In recent years various laws, conventions and regulations have been put in place which make it more difficult to reuse naval vessels as hazardous materials are present and they must at least be identified and possibly removed, prior to a transfer. It is expected that the advanced age and obsolescence of the Naval and Coast Guard vessels means they are not marketable to other navies or practical for conversion to other uses and most of them will be scrapped.

2. **Scrap/Recycle.** In Canada this has been carried out both by shipyards and recyclers. In recent years specialized ship recyclers have been set up to handle marine vessels, such as in US (about 7 approved facilities in number), UK (one facility) and Canada (one facility) (Refs 8 to 11). Also, Pictou Shipyard has recently dismantled two Canadian steam destroyers. In the US recyclers are favoured over shipyards as they have demonstrated that they can offer environmentally safer and more cost-effective recycling as a result of the recent competitive market both in the US and internationally. They can handle hazardous wastes and conduct primary re-processing of metals and other materials such as batteries, which makes the whole activity more cost effective. They also have waste containment areas for ship dismantling. Some ship recyclers in Bangladesh and India have acquired bad press for unsafe and environmentally unsound practices; however, they are taking steps to improve.

   Ship recycling still has problems and there needs to be careful management and oversight to ensure recycling truly results in maximum environmental benefits, particularly as the Basel Convention restricts transshipments of PCBs and the IMO Convention governs the working and environmental conditions at recycling locations. For instance, to make use of international recyclers the US requires an exemption from the US Environmental Protection Agency to export ships that have components containing PCBs, which includes the majority of obsolete naval ships, at least. The US government experience has found that although the recycling costs may initially be slightly greater than other options it becomes much more economical as the number of ships increases. The US experience has found that their cost for recycling was about $US1000/ton in 2000, and in 2010 and 2011 was just “pennies” per ship (quote from Ref 5). Canada’s cost for recent contracts is believed to be about $1000/ton.

When all the factors line up in the right way (competition, scrap prices, location of plant, minimal ship preparation, etc.) recycling may even become a profitable endeavour. The US current ship disposal strategy is to focus on recycling as the most expeditious option, although all other disposal options are also pursued (Ref 7).

3. **Sink as an Artificial Reef or as a SINKEX target.** Sinking vessels for artificial reefs has been a very popular method and as it provides a recreational diving artifact and a safe haven for fish. However, it has been criticized by environmentalists in Australia and the United States who claim the benefits to sea life are transitory and toxic waste still finds its way into the fish population. It is not always a cost-effective method as many hazardous materials must be removed first which can be very costly. This includes the removal and disposal of liquid hydrocarbons, loose debris, floatable materials, and regulated Polychlorinated Biphenyls (PCB) containing materials (such as cables), asbestos and lead paint. Preparing a vessel may include the removal of superstructure and weapons. Exporting vessels for artificial reefing can involve problems. For instance, towing a vessel from Canada to a Caribbean nation would have to avoid passing through US territorial waters in order not to convene with US law and this would significantly increase the risk and towing cost. Once the vessel is sunk there are costs associated with monitoring and managing the vessel as an artificial reef. These have to be borne by the government or association responsible for its management. There is potential for unforeseen costs during reefing, for example some vessels have not ended up in the desired orientation when sunk and became navigational hazards initially. In addition, there may be lingering doubts that a vessel has been adequately cleaned before being sunk such as the current delays regarding the planned sinking of ex-*HMCS ANNAPOLIS* in Howe Sound, BC.

   SINKEX's where the ship is sunk in deep water by torpedo or naval gun have been and continue to be used by countries as a convenient disposal method. From 2000 to 2010 it accounted for 65% of all US Navy disposals (Ref 29). The US has found that the cost to prepare a vessel for a SINKEX is comparable to artificial reefing (Ref 7). Canada is known to have conducted at least three SINKEXs; the surrendered German submarine U190 in 1947, *HMCS KAPUSKASING* in 1978 and *HMCS HURON* in 2007. On the downside SINKEXs have been viewed by some as taking advantage of loopholes in the law and not in keeping with the spirit of international conventions (Ref 2 and 29). Unless the PCBs and other hazardous materials, such as lead paint, are removed prior, a SINKEX is considered detrimental to marine life and sustainable fish populations. Cleaning up the vessels in preparation for artificial reefing and SINKEXs is costly and can make these options uneconomical compared to others. The cost to prepare *HMCS HURON* for its SINKEX was purported to be $7M with the environmental cleanup costing $4.4M (Ref 21).

4. **Retain as a Museum or Memorial.** Every country probably has used this method at least once. From a consideration of preserving history it is very appealing. It can be a cost-effective answer if the owner can find another government department, province or museum to assume the costs. In one case the ship reverted back to the navy when the new owner was not able to find the funds necessary to continue as a museum. Only so many vessels can be

made into museums and the current demand in Canada is probably close to saturation as there are 6 vessels preserved as museums/memorials in Ontario, Quebec and Nova Scotia.

Conclusions

All of these options would probably require the vessel to be towed somewhere for its final disposition. Vessels are usually stripped of equipment and fluids first and ride high in the water. Towing is a risky operation and vessels towed overseas have sometimes capsized and sunk on the way to their final destination as a consequence of poor stability and being unmanned and unpowered.

There is a general belief that the government is obliged to take a responsible role in setting up the right structure to make sure surplus vessels can be disposed of safely, economically, security consciously and environmentally responsibly. While there is every indication that this is what will transpire, it does take careful planning, oversight and some costs. This is the only way that the government can set a good example and avoid bad publicity and perhaps even make money.

From this discussion above it can be concluded that the likely option for Canada for most vessel disposal for the foreseeable future will be by recycling.

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Overall Concluding Statement

What has become increasingly clear over the past few years is that governments everywhere are recognizing the benefits — both environmentally and in dollars — of designing their ships with disposal as one of the factors to be aware of during design due to the complexities of disposal. For example, this could have some influence on the selection of materials and the area of materials research. Research and development may be what makes 'a ship a ship' from the beginning, but it is also the first defining aspect of a ship's retirement profile.

Fostering a spirit of innovation among those charged with designing modern vessels is a key to ensuring that, when the time comes, a ship's final voyage will unfold in a planned, responsible and cost-effective way so that it can go 'honourably into the good night'.