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# U.S. NAVY LITTORAL COMBAT SHIP PROGRAM: LESSONS LEARNED IN STRATEGIC VISION AND FORCE DEVELOPMENT

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# U.S. NAVY LITTORAL COMBAT SHIP PROGRAM: LESSONS LEARNED IN STRATEGIC VISION AND FORCE DEVELOPMENT

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# U.S. NAVY LITTORAL COMBAT SHIP PROGRAM: LESSONS LEARNED IN STRATEGIC VISION AND FORCE DEVELOPMENT

## AIM

1. The aim of this service paper is to examine naval strategic vision and force development using the U.S. Navy's (USN) Littoral Combat Ship (LCS) program as the case study. The LCS was meant to be part of the USN's larger vision of fleet transformation. A small combatant, with a combination of high speed, lethality, and multi-mission capability would be an optimal platform to realize the Navy's vision of a *Total Force Battle Network* and distributed maritime operations.[1]

2. The LCS program was announced in 2001. The concept of operations (CONOPS) at the time was, "Envisioned for use primarily in major combat operations, LCS was intended to be a self-sufficient combatant designed to fight and win in shallow waters and near-land environment, often independently, without risking larger combatants in constricted areas."[2] The future of naval warfare was not going to be fought exclusively on the high seas between capital ships and a fleet of escorts; the Navy needed a door-kicker, a *Streetfighter* that could be employed in large numbers to deliver a devastating blow to the enemy.[3]

3. However, the LCS program has been accompanied by unforeseen program and technical controversy from its inception. Issues with the program have led to cost overruns, operational ineffectiveness, and multiple changes to its concept of operations. The Navy could not reconcile operationally or technically how it was going to independently employ an LCS that was modular, fast, and minimally manned.

## INTRODUCTION

4. The LCS was delivered as a basic platform (known as the LCS sea frame) purposed for littoral operations. It would be an affordable replacement for frigates, minesweepers, and patrol boats. An LCS sea frame could embark and swap various mission packages to optimize for specific areas of warfare. 55 LCS sea frames and 64 LCS mission packages (16 anti-submarine warfare, 24 mine countermeasures and 24 surface warfare)[4] were planned. However by 2019, the Navy procured only 35 hulls and did not intend to procure any additional ships.[5] What's more, four LCS

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[1] Robert O. Work, "Naval Transformation and the Littoral Combat Ship." CSBA. February 18, 2004, i-ii. https://csbaonline.org/research/publications/naval-transformation-and-the-littoral-combat-ship/publication/1.

[2] Department of Defence, *Director, Operational Test and Evaluation redacted/unclassified input for the report required by Section 123 of H.R. 3979, National Defense Authorization Act for Fiscal Year 2015* (Washington, D.C.: Office of the Director, Operational Test and Evaluation, April 29, 2015), 2. https://www.esd.whs.mil/Portals/54/Documents/FOID/Reading%20Room/Science_and_Technology/16-F-0250_(REPORT)_Unclassified_Report_on_the_Littoral_Combat_Ship_(LCS)_req_by_Sec_123_of_HR_3979_NDAA_for_FY15.pdf

[3] Gregory V. Cox, "Lessons Learned from the LCS," *U.S. Naval Institute*, January 2015. https://www.usni.org/magazines/proceedings/2015/january/lessons-learned-lcs

[4] Ronald O'Rourke, *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress 2012*, (Washington, DC: Congressional Research Service, 2012), 2.

[5] Ronald O'Rourke, *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress 2019*, (Washington, DC: Congressional Research Service, 2019).

hulls are planned to be decommissioned in March 2021, with one ship being commissioned just six years ago.[6] Owing to accumulating fewer LCS vessels than originally planned, the USN's goal of reaching 355 ships is expected to be made up by the Navy's newest *Constellation*-class frigate, of which the Navy expects to be delivered in 2026.

## DISCUSSION

5. **Survivability:** The Navy intended the LCS to have a survivability standard between that of a frigate and a patrol vessel, the types of ships that the LCS was replacing. However, deficiencies in self-protective measures (mainly anti-air) did not meet the intent of the initial CONOPS to operate independently. Survivability was re-assessed to be a function of employability, not capability. In 2011, the Navy revised its CONOPS to specify that single LCS brings limited warfighting capability and would have to be employed in an LCS surface action group and under the air-defence umbrella of another platform.[7] In April 2011, the Navy briefed the Congressional Research Service and the Congressional Budget Office on survivability concerns. In that brief, the Navy highlighted that its intent was to operate the LCS as a part of a networked battle force in high-threat operations and independently in low-to-medium threat environments[8], which was a departure from the original vision. Despite the linkage of LCS survivability to employment, the Navy's initial CONOPS still could not be realized over the years. A Government Accountability Office report in December 2015 concluded that the Navy was re-defining its concept of operations to meet its survivability standards, which remained unproven six years after the delivery of the lead ships.[9] The Navy failed to adequately link its initial CONOPS to its operating environment and was forced to amend how the LCS would be used, consequently limiting its operational effectiveness.

6. **Manning**: The LCS was envisioned to employ a core crew of 40 sailors to operate the sea frame, plus an additional 15 personnel to support an embarked aircraft and 25 to operate mission packages.[10] The initial crewing model was a 3-2-1 system: three crews for two ships. The Navy described the system as "(3 rotational crews: 2 rotational ships: 1 ship deployed) rotational crewing concept provides twice the forward presence than other surface combatants, at a fraction of the cost of other platforms."[11] While cost savings may have been realized in terms of sailors per ship (in relation to a destroyer for example), the Navy failed to appreciate how the model would impact personnel, maintenance, and training.

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[6] David B. Larter, "US Navy's first 4 littoral combat ships to leave the fleet in 9 months," Defence News, July 1, 2020. https://www.defensenews.com/naval/2020/07/01/the-us-navys-first-4-littoral-combat-ships-are-out-of-the-fleet-in-9-months/#:~:text=The%20littoral%20combat%20ships%20Freedom,shipbuilding%20bills%20and%20upgrade%20costs

[7] Department of Defence, *Director, Operational Test and Evaluation*, 2.

[8] O'Rourke, *Navy LCS Program: Background Congress 2012*, 25.

[9] United States Government Accountability Office, *LITTORAL COMBAT SHIP Knowledge of Survivability and Lethality Capabilities Needed Prior to Making Major Funding Decisions* (Washington, D.C.: US Government Accountability Office, December 2015), GAO Highlights. https://www.gao.gov/assets/680/674367.pdf.

[10] Ibid, 5.

[11] Trevor Welsh, "LCS Mission Readiness," Naval Surface Force U. S. Pacific Fleet, Public Affairs, June 15, 2015, https://www.public.navy.mil/surfor/lcsron1/Pages/lcs-mission-readiness.aspx.

7. In 2016, the Navy adjusted its crewing model. Citing reasons such as improved training, employment of junior ranks, and better crew stability, the Navy combined the LCS core crew and its mission package crew into a single core crew of 70 sailors.[12] The 3-2-1 system was also abandoned and changed to a Blue/Gold system, where two crews rotate every 4-5 months. A Government Accountability Office report in 2017 further amplified some of the underlying issues leading to the Navy revising its crewing model. "Optimal manning" (as it was called in the USN) had negative consequences on ship readiness. The report found that maintenance costs increased as a result of fewer sailors to maintain the equipment, which was linked to a fundamental miscalculation of a manpower-to-workload ratio.[13] Additionally, operating with the absolute minimum crew to sail the vessel does not provide personnel redundancy. The ship's ability to continue to fight could be impacted if the crew suffered casualties during an attack.[14]

8. Optimal manning incurred additional costs to training as well. As noted in Rear Admiral Samuel Perez's executive summary on LCS readiness, minimum manning requires sailors to qualify and certify on their watch station before arriving on board.[15] The report estimates that between 18-24 months of lead time is needed before a sailor reports to an LCS hull.[16] What the Navy lost was the ability to complete training at sea, thereby putting more strain on its training system. Moreover, that sailor who trained for two years is essentially branded for that class of LCS. The Background and Issues for Congress report of 2012 remarked, "with dozens of different systems on each design, sailors qualified to serve on one LCS or the other are no more qualified to serve on the other LCS class than an amphibious sailor."[17]

9. **Modularity**: The concept for modularity in LCS was one of flexibility, but ultimately the vision could not meet the realities. The initial vision for swapping out mission packages was advertised at the tactical level, but that concept proved too much a of challenge logistically than initially thought.[18] The mission packages required an augmentation to the crew; the idea of ships rapidly making tactical and in-theatre swaps was at odds with the crew required to operate the equipment. The Congress report of 2012 noted that the vision of taking days would likely take weeks.[19] Because of the unforeseen logistical challenges, the Navy abandoned modularity as envisioned; the result was a 2016 decision to turn the first four LCS into training ships and the rest

[12] Christopher P. Cavas, "LCS Crewing, Operating, Basing Schemes Are Changing," Defence News, September 11, 2016, https://www.defensenews.com/naval/2016/09/12/lcs-crewing-operating-basing-schemes-are-changing/

[13] United States Government Accountability Office, *Navy Force Structure: Actions Needed to Ensure Proper Size and Composition of Ship Crews* (Washington, D.C.: US Government Accountability Office, May 2017).

[14] James Holmes, "The U.S. Navy's Littoral Combat Ship: A Beautiful Disaster?" Real Clear Defence, February 18, 2020, https://www.realcleardefense.com/articles/2020/02/18/the_us_navys_littoral_combat_ship_a_beautiful_disaster_115049.html

[15] Perez, "Executive Summary…'Perez Report'," 

[16] Ibid

[17] O'Rourke, *Navy LCS Program: Background Congress 2012*, 46.

[18] Perez, "Executive Summary…'Perez Report'," 

[19] O'Rourke, *Navy LCS Program: Background Congress 2012*, 17.

of the fleet when deployed would only be equipped with a single mission package.[20] This decision was a complete divergence from the original strategic vision for LCS.

10. **Need for Speed**: In its later configuration, (single-mission deployed LCS), the requirement for high speed has mostly been nullified. LCS can no longer race back to a port to quickly swap mission modules and return to the fight in a different warfare arrangement. Notwithstanding the shift to permanent mission packages, the high-speed requirement and its capability trades off do not align well with its proposed mission packages. The only mission module that absolutely needs high speed for a tactical advantage is its surface warfare package designed to counter small boats and fast-attack craft. The LCS does not need high speeds when conducting mine countermeasure operations and anti-submarine warfare. Dr. Milan Vego, a professor at the Naval War College in Rhode Island, added additional context as to why LCS speed does not provide an overwhelming tactical advantage: "But 47-50 knots does not improve chances of an LCS surviving an attack by sea-skimming Mach 1 ASCMs and 60- or 70-knot heavyweight anti-ship torpedoes"[21] The requirement for a high speed engine would have higher construction costs, require more maintenance, reduce range and increase fuel consumption. For what speed offers practically, it does not seem to outweigh the tradeoffs for operational effectiveness.

11. **Maintenance/Technical Concerns:** One of the largest technical omissions from the LCS program was a land-based engineering and testing site for both the *Freedom*- and *Independence*-class vessels. Land-based testing de-risked other classes of combatants including *Oliver Hazard Perry*-class, *Ticonderoga*-class, *Arleigh Burke*-class, and *Zumwalt*-class.[22] The LCS has experienced engine issues from the onset that has contributed to reduced operational effectiveness and costly repairs. In 2016 alone, four LCS experienced engine failures that led to a fleet-wide stand down to investigate the issue and subsequently re-train crews on how to deal with the issues. Recently, it was reported that there is a design flaw in the hybrid propulsion system of the *Freedom*-class LCS. Lockheed Martin is trying to expedite repairs as the Navy has suspended delivery of the class until the issue is resolved. These embarrassing and costly repairs could have been avoided had the USN established an LCS land-based engineering and test site.[23]

12. Additional technical issues with the ship were uncovered during unmanned aircraft systems (UAS) testing aboard *Freedom*-class LCS. In a technical report concerning launch and recovery considerations of the Fire Scout, it was noted that *Freedom*-class' "…shallow draft and streamlined hull without traditional rudder or stabilizing surfaces, the LCS can be made to roll without much wave energy."[24] The same report also highlights that, "The LCS can be subject to

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[20] Giovanni de Briganti, "US Navy Drops LCS Plans, Concept After Latest Failures," Defence-Aerospace, September 9, 2016, http://www.defense-aerospace.com/article-view/release/176873/us-navy-drops-lcs-plans,-concept-after-latest-failures.html.

[21] Milan Vego, "No Need for High Speed." *United States Naval Institute. Proceedings* 135, no. 9 (09, 2009): 46-50, https://search-proquest-com.cfc.idm.oclc.org/trade-journals/no-need-high-speed/docview/205985492/se-2?accountid=9867.

[22] David B. Larter, "Citing littoral combat ship failures, Congress pushes the US Navy to get FFG(X) right," Defence News, December 4, 2020, https://www.defensenews.com/naval/2020/12/04/citing-littoral-combat-ship-failures-congress-pushes-the-us-navy-to-get-ffgx-right/

[23] Ibid

[24] Dr. B. Ferrier and Dr. Robert Ernst, "Fire Scout Launch and Recovery Consideration in Unexpected Ship Roll Motion Conditions," Naval Engineers Journal, 2017, Vol. 129, No 4. Arlington, 1.

larger than expected rolling because there are very few roll damping appendages such as bilge keels and rudders.[25]. Not only did the ship's design cause unanticipated motion issues, but the autopilot and third party software may also have played a role in unusual ship motion. A Naval Air Command presentation from 2019 noted that a stern shimmy was observed and thought to be caused by the autopilot.[26] The autopilot operates water slews and when engaged were unpredictable from start to stop. Unexpected ship motion will increase the need for extensive experimentation when integrating UAS, which can extend an already lengthy release to service process.

## CONCLUSION

13. The LCS program was portrayed as an inexpensive addition to the fleet that would provide the Navy with flexibility and firepower in littoral waters; it was anything but. The program suffered from a gap between strategic vision and force development, which led to reduced operational utility and increased costs. Each LCS was expected to cost around $220 million, but in 2019 estimates more than doubled to $550 million per ship.[27] Due to rising costs and operational and technical challenges, the LCS never matured to reach its original purpose. As the Navy is so deeply vested in LCS, one could expect these classes to continue to draw spiralling costs for a marginal return of investment.

## RECOMMENDATION

14. The Royal Canadian Navy (RCN) is in the midst of the largest fleet re-capitalization in its history. While the strategic need for the LCS in the USN differs from the Canadian Surface Combatant, Arctic Offshore Patrol Ship, and Joint Support Ship for Canada, there are still lessons that can be applied to the Canadian program. It is recommended that the RCN apply the following lessons learned from the LCS program to its acquisition of new classes of ships:

a. Ensure a clear link exists between the strategic vision, CONOPS, and capability requirements;
b. Understand and be ready to account for maintenance costs and training costs when selecting a class-wide manning plan;
c. Maximize commonalities between all new classes of ships; and
d. Leverage the existing Type 26 design to avoid unforeseen technical issues regarding maintenance and ship motion characteristics.

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[25] Ibid, 4.

[26] Dr. B. Ferrier and Dr. Robert Ernst, "Resolving the Conflict Between Ship Design and UAV Launch & Recovery Deck Limits," NAVAIR Public Release SPR-2016-819, 8.

[27] Sebastien Roblin, "The Navy spent $30B and 16 years to fight Iran with a littoral combat ship that doesn't work," NBC News, July 19, 2019. https://www.nbcnews.com/think/opinion/navy-spent-30b-16-years-fight-iran-littoral-combat-ship-ncna1031806

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