Operational Employment of the Littoral Combat Ship in Great Power Competition

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The emergence of a peer competitor and the return to great power competition marks a significant shift in the global security environment. In this environment, the LCS is potentially positioned as the US Navy's most useful and economical warship. In order to leverage the capabilities offered by the LCS and create operational and tactical advantages, the US Navy should reconsider the operational employment of the LCS in the anti-access, area-denial (A2AD) environment. This paper examines LCS operational capabilities and ship characteristics that directly support distributed lethality operations against a peer competitor. It analyzes naval warfare theory to demonstrate the effectiveness and combat power of a small surface combatant in the A2AD environment. Finally, by applying naval warfare theory to LCS capabilities, this paper highlights and offers recommendations to the operational commander for future employment of the LCS against a peer competitor.

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INTRODUCTION

When conception and design began on the Littoral Combat Ship (LCS) in the early 2000s, the US Navy was undergoing a similar transformation as it is today. The end of the Cold War shifted the fleet's focus from blue water operations against the Soviet Union to power projection ashore. After 9/11, the military shifted its focus to fighting terrorism and combat operations in Afghanistan and Iraq. Program advocates advertised the LCS as a ship that could fight narco-terrorist traffic in shallow water while supporting future fleet-on-fleet battles in the open ocean.[1] Navy leaders envisioned a uniquely-versatile, modern warship capable of quickly changing mission packages to perform a variety of missions from anti-submarine warfare, to mine countermeasures, and even special warfare. The LCS concept was to have different capability packages that could "plug and play" into the ship depending on its mission.

While the first ship in the class, USS Freedom (LCS 1), was commissioned in 2008, the first mission package, the surface warfare (SUW) mission package, did not achieve initial operational certification until November 2014.[2] For six years, the Navy owned a commissioned warship but did not have a single certified mission package, let alone multiple mission packages, to employ on it. The LCS became the subject of intense scrutiny by Naval leadership and Congressional oversight committees, and it remains undervalued and underappreciated in the Surface Warfare community. In order to leverage the capabilities offered by the LCS and create operational and tactical advantage, the US Navy should reconsider the operational employment of the LCS in the anti-access, area-denial (A2AD) environment.

The emergence of a peer competitor and return to great power competition marks a significant shift in the global security environment. In this environment, the LCS is potentially

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[1] Robert O. Work and Office Of The Under Secretary Of The Navy Pentagon Washington DC, *The Littoral Combat Ship: How we Got here, and Why,* 2014, 13-14.

[2] Assistant Secretary of the Navy for Research Development and Acquisition, *Report to Congress for the Littoral Combat Ship Mission Modules Program Annual Report With President's Budget Fiscal Year 2019*, (Washington, DC: 2018), 5.

positioned as the US Navy's most useful and economical warship for three reasons. First, LCS operational capabilities and ship characteristics directly support distributed lethality operations against a peer competitor. Second, naval warfare theory demonstrates the effectiveness and combat power of a small surface combatant in the A2AD environment. Finally, applying naval warfare theory to LCS capabilities highlights the partial advantages offered by the LCS; recommendations are offered to the operational commander for future employment of the LCS against a peer competitor.

LCS SUPPORT TO DISTRIBUTED LETHALITY

Naval leaders and planners must shift their perspective in order to ensure the US Navy preserves its ability to gain and maintain sea control with the return to great power competition. In 2015, the Commander of Naval Surface Forces, Vice Admiral Thomas Rowden, introduced a new concept for Surface Warfare operations called "Distributed Lethality." He described the concept as combining powerful ships with new methods of employment to take advantage of their mobility and persistence for the purpose of deterring adversaries or fighting them if needed.[3] The LCS is ideally suited to contribute to this concept because its advanced weapons, sensors, and design grant it the capability to fully support distributed lethality operations. While there are two different classes of LCS, they will be commonly referred to as "LCS" herein. **Figure 1**, compiled from Jane's Fighting Ship's, describes the sensors, weapons, and general ship characteristics of each LCS class and provides a baseline for discussion of LCS capabilities going forward. The introduction of the LCS to the fleet has brought advantages that have yet to be exploited against a peer competitor. Specifically, the LCS design characteristics, SUW weapons, and air defense systems are critical strengths at the tactical level of war and can contribute to operational success.

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[3] Thomas Rowden, Peter Gumataotao, and Peter Fanta. "'DISTRIBUTED LETHALITY'," United States Naval Institute Proceedings 141, no. 1 (January, 2015), 23.

The LCS is similar in design to a corvette or large ocean patrol vessel used in foreign navies. It is the first ship constructed for the US Navy of its size since destroyer escorts were re-named frigates. **Figure 1** lists the top speed of the LCS as 40 knots, which is 33% faster than other large surface combatants (cruisers and destroyers), and with a draft less than 15 feet, it draws 50% less than the larger surface combatants. As its name implies, the LCS can more easily operate in the littoral regions of the world. This is significant, because the majority of naval battles throughout history have not been fleet engagements but were fought to achieve an objective in the littorals.[4] **Figure 1** shows the LCS is over 3,000 tons, which makes it one of the larger corvettes in the world and enables it to operate in higher sea states compared to smaller coastal patrol ships. Despite its size and speed, the LCS has a range of 3,500 nautical miles. These design characteristics, combined with its 40 person crew, achieve a unique balance of operational efficiency.

Second, the completion of the Surface to Surface Mission Module (SSMM) and the addition of four Naval Strike Missiles has significantly increased the LCS SUW capability. Small boat threats in littoral waters have proven to be difficult for large surface combatants to defend against. The SSMM increased the LCS's successful engagement rate to 83% against small boat threats, making it the most capable ship class in the US Navy to counter that threat.[5] Peer competition further increases the degree of difficulty, yet the LCS with the SSMM is more capable of defending itself against small boat swarms in littoral waters.[6] The data indicates the LCS SUW capability supports operational employment as conceptualized in the distributed lethality model against a peer competitor.

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[4] Wayne P. Hughes Jr and Robert Girrier, *Fleet Tactics and Naval Operations*, 3rd ed. (Annapolis, MD: Naval Institute Press, 2018), 25.
[5] Assistant Secretary of the Navy for Research Development and Acquisition, *Report to Congress for the Littoral Combat Ship Mission Modules Program Annual Report With President's Budget Fiscal Year 2019* (Washington, DC: 2018), 6.
[6] Ronald O'Rourke, *Navy Littoral Combat Ship (LCS) Program Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2019), 2.

Next, the LCS is capable of reliable anti-air point defense due to factors of space and force that enhance its air defense capability. First, the Rolling Airframe Missile (RAM) added to later LCS hulls provides a notable increase in ship air-defense capability. During developmental testing of the RAM Block 2, the missile intercepted 27 of 28 targets, including subsonic, supersonic, single and dual-threat presentations, low probability of intercept, and highly maneuverable targets.[7] Second, littoral operations further complicate adversary radar pictures due to the frequently-cluttered environment allowing the LCS to hide in the radar "noise." Finally, the physical countermeasures of its decoy launching system are historically more impactful than point defense systems.[8] These factors contribute to a layered air-defense system for the LCS, significantly improving its ability to defend itself from advanced anti-ship cruise missiles in the littorals.

When added together, each of the unique capabilities of the LCS mutually supports each other and cumulatively creates a highly-efficient, small surface combatant, which positions it to directly contribute to the concept of distributed lethality. However, capabilities alone do not translate into success during great power competition or in an A2AD environment. Sound naval warfare theory and naval tactics must be applied to these capabilities in order to employ the LCS effectively. The next section will draw from naval warfare theory, current examples, and naval tactics to demonstrate that the LCS is the ideal operational platform during great power competition.

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[7] Jane's International Defence Review, "Second coming: RAM ship self-defence system evolves to counter new threats," 5.
[8] Wayne P. Hughes Jr and Robert Girrier, *Fleet Tactics and Naval Operations,* 3rd ed. (Annapolis, MD: Naval Institute Press, 2018), 270-271.

	FREEDOM CLASS[9]	INDEPENDENCE CLASS[10]
DIMENSIONS AND WEIGHTS		
Full Load Displacement:	3360 tons (LCS 1)	3188 tons
	3462 tons (odd hull LCS 3-31)	
Draft:	14.1 ft	14.8 ft
PERFORMANCE		
Top Speed:	40 kts	40 kts
Range:	3500 nautical miles(nm) at 14 kts	3500 nm at 14 kts
CAPACITY		
Crew Size:	40	40
FIREPOWER		
Missiles:	SAM: 1 Mk 99 21-cell launcher (replaced by Raytheon SeaRAM 11-cell launcher on LCS 17 and up); Raytheon RIM-116 RAM	SAM: 1 Raytheon SeaRAM 11-cell launcher; Raytheon RIM-116B RAM
	SSM: 24 AGM-114L Longbow Hellfire; Raytheon/Kongsberg Naval Strike Missile to be fitted.	SSM: 24 AGM-114L Longbow Hellfire; 4 Raytheon/Kongsberg Naval Strike Missile (2 twin) (to be fitted on LCS 10 and up); 4 RGM-84D Harpoon Block IC (2 twin) (LCS 4 only).
Guns:	1 BAE Systems Bofors 57 mm Mk 110; 2 General Dynamics Mk 46 Mod 2 with Bushmaster Mk 44 30 mm; 4-12.7 mm machine guns.	1 BAE Systems Bofors 57 mm/70 Mk 110; 2 General Dynamics Mk 46 Mod 2 with Bushmaster Mk 44 30 mm; 4-12.7 mm machine guns.
Physical countermeasures:	Decoys: 2 Terma SKWS decoy launchers (LCS 1-3); 4 ALEX decoy launchers (LCS 5-31); Mk 53 Nulka to be fitted.	Decoys: 4 ALEX decoy launchers. Mk 53 Nulka to be fitted.
Electronic warfare:	ESM: Argon ST WBR 2000. SEWIP Block 2 to be fitted.	ESM/ECM: Exelis ES-3601. SEWIP Block 2 to be fitted.
Radars:	Air/surface search: EADS TRS-3D; Hensoldt TRS-4D from LCS 17.	Air/surface search: AN/SPS-77 Saab Sea Giraffe AMB.
	Navigation: Sperry Bridgemaster	Navigation: Sperry Bridgemaster
Sonars:	Can embark ASW mission package	Can embark ASW mission package
Helicopters:	2 MH-60R/S and 2 VTUAVs.	2 MH-60R/S and 2 VTUAV.

Figure 1

LCS COMBAT POWER

Examining LCS capabilities through the lens of naval warfare theory and tactics reveals its combat power in the A2AD environment. Naval Warfare Publication 5 defines combat power as "the total means of destructive or disruptive force that a military unit/formation can apply

[9] Jane's Fighting Ship's, "Freedom Class Littoral Combat Ship Flight 0."
[10] Jane's Fighting Ship's, "Independence Class Littoral Combat Ship Flight 0."

against the opponent at a given time."[11] Logically, maximizing combat power is the goal of any military unit. One of Professor Wayne Hughes' six cornerstones is to attack effectively first.[12] By this axiom, the ship or fleet with the greater combat power, which attacks effectively first, should win in any engagement. A peer competitor, by definition, has relatively the same level of technological development and capability, resulting in equal combat power. So how can the LCS leverage its capabilities to increase its combat power? Professor Hughes' Salvo Model offers a mathematical solution and demonstrates that all factors being equal, numerical superiority is the most valuable attribute a ship or formation can have in a naval engagement.[13] In other words, in a fight between two equally-matched ships or groups of ships, the force that can bring the most firepower to bear has a better likelihood of success. There are two possibilities to increase a fleet's combat power: add more weapons or build more ships. Both methods have advantages and disadvantages in terms of ship design, cost, and construction time, and trade-offs have to be made in a world of finite resources.

Consider the impact of weapon systems onboard small combatants. The destructive force and speed at which fires can be delivered with guided missile systems in modern warfare forced countries with smaller navies decades ago to re-think their strategy for maximizing combat power. When other navies around the world were unable to keep pace with the cost requirement of maintaining large fleets of surface combatants, they invested in smaller ship designs with more missiles. While a number of countries maintain a handful of highly capable corvettes with surface-to-surface missiles (SSM), Russia and India offer the best examples of countries with large fleets of corvettes. Designed during the Cold War, both countries' platforms carry a large number of SSMs. The Russian Gremyashchiy class carries an eight-cell vertical launch system

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[11] U.S. Navy, Office of the Chief of Naval Operations, *Navy Planning*, Navy Warfare Publication (NWP) 5-01. (Norfolk, VA: Department of the Navy, December 2013), 3-3.
[12] Wayne P. Hughes Jr and Robert Girrier, *Fleet Tactics and Naval Operations*, 3rd ed. (Annapolis, MD: Naval Institute Press, 2018), 17-18.
[13] Ibid, 274.

(VLS), the Steregushchiy class carries eight Kh-35 SSM, and the Nanuchka class carries 16 Kh-35 SSM; the Indian Khukri class carries 16 Kh-35 SSM, and the Veer class carries 16 Kh-35 SSM.[14] With the LCS only carrying four SSMs, which were back-fitted and deployed for the first time on USS Gabriel Giffords in October 2019, the US Navy is still at a numeric disadvantage against some platforms.[15] In the past, this weakness was offset by operating as part of a carrier strike group or within the coverage of land-based aviation, where aircraft dramatically increased the number of weapons brought to bear. However, with distributed lethality, surface ships may no longer operate close enough to an aircraft carrier or friendly airfield to rely on their support. Ships will need to rely more on their organic capabilities, especially in the A2AD environment.

The next option to increase combat power is to increase the number of ships available. Although this is not an analysis of shipbuilding policies, it would be naive not to include the construction cost of US surface combatants for comparison. The Arleigh Burke Flight III destroyers currently under construction cost over $1.8 billion per ship.[16] It is also worth noting that the Flight III destroyer is still under design and may or may not have an over-the-horizon SSM. The Ticonderoga cruiser's average cost was about $1 billion per ship.[17] While the construction cost of the LCS is somewhat of a controversy, in 2016, the Government Accountability Office estimated each ship cost $478 million, more than double the initial advertised price of $220 million.[18] Despite the increased cost, the LCS is still less than one third the cost of a destroyer. Looking to grow to 355 ships, the US Navy can buy three LCS or one

[14] Jane's, "Weapons: Naval - SS- N- 25 'Switchblade' (3M- 24 [Kh- 35] Uran)/SSC- 6 ('Sennight')."
[15] Caitlin Doornbos, "USS Gabrielle Giffords fires 'sea-skimming' Naval Strike Missile in Indo-Pacific for first time," *Stars and Stripes*, 2 October 2019.
[16] Ronald O'Rouke, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress* (Washington, DC: Congressional Research Service, 2019), 5.
[17] U.S. Navy, "Cruisers - CG," *U.S. Navy Fact File*, 9 January 2017.
[18] U.S. Government Accountability Office, *LITTORAL COMBAT SHIP AND FRIGATE Congress Faced with Critical Acquisition Decisions* (Washington, DC: GAO, 2016), 6.

destroyer. Translating this to combat power, three LCS can carry 12 SSMs, whereas one destroyer or cruiser can only carry eight SSMs, if it carries any.

Finally, consider the objective of a high-intensity naval engagement between two peer competitors. The purpose of any engagement is to gain or maintain some degree of sea control, chokepoint control or denial, establish or expand bases or deny the same to the enemy, or conduct maritime trade warfare.[19] Dr. Milan Vego defines a naval raid as, "a covert and swift penetration of the enemy held coast, and destruction or neutralization of the assigned objective, followed by a planned and swift withdrawal."[20] The speed and lethality of a raid enables the desired degree of sea control required for a follow-on objective. Raids are usually carried out by a weaker force at sea, and the force selected for such an operation is usually small but has the potential for high combat power.[21] Operating in an A2AD environment means the US Navy does not possess even limited sea control; it is contested. If sea control is contested, naval raids are the ideal method for operating in the A2AD environment, and the LCS is best suited for a naval raid in the littorals due to its speed, reduced radar cross section, and addition of the Naval Strike Missile. Using tactics that are traditionally for a weaker navy or from asymmetric warfare offers the maximum amount of combat power while protecting the force from destruction.

LCS RECOMMENDED EMPLOYMENT

The great power competition and A2AD environment create an operational challenge to the employment concept of surface combatants in use for the last 30 years. Taking advantage of the LCS's critical strengths and employing them asymmetrically or unexpectedly can exploit the critical weaknesses of a peer adversary in an A2AD environment. Admiral Scott Swift, Commander of the Pacific Fleet, argued that naval combat is not about what you can kill;

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[19] Milan Vego, "Fundamentals of Surface Warfare." Newport, RI: Naval War College, Joint Military Operations Department, 2016, 11.
[20] Milan Vego. "Naval Tactical Actions." Newport, RI: Naval War College, Joint Military Operations Department, August 2015, 11.
[21] Ibid, 11.

instead, it is about how fast you can do it, because the quicker you kill the enemy, the less time the enemy has to attack you.[22] Admiral Swift advocates for the importance of speed in combat, which is true across all levels of war. Through speed, combat power, and effective emissions control, the LCS has the potential to create the conditions required to attack effectively first. For a surface combatant, the question becomes, "How long can a platform stay in the fight before needing to re-load ammunition?" Hughes' Salvo Model demonstrates the importance of the number of missiles carried onboard at the tactical level. At the operational level, more missiles equate to less time off station for re-loading or more targets engaged prior to re-loading. This increases the rate of attack, and if done effectively, eliminates the enemy faster.

When Vice Admiral Rowden introduced distributed lethality to the fleet, he envisioned "hunter-killer" surface action groups (SAGs) made up of a LCS, a Flight III Arleigh Burke destroyer, and Zumwalt class destroyer. [23] While these platforms are highly capable and mutually support each other, the reality is that limited budgets have prevented the implementation of that vision. Zumwalt class production has been limited to just three ships, and Flight III destroyers carry the hefty price tag of $1.8 billion. Professor Hughes argues that it's illogical at any time to send our most-expensive, largest, and most-capable ships into contested waters against numerous torpedo boats, coastal submarines, and minefields.[24] The "hunter-killer" SAGs Vice Admiral Rowden envisioned would be better comprised entirely of LCS specifically assembled for naval raids or harassing attacks.

In the A2AD environment, networked operations are at risk of being denied or degraded, which means ships or squadrons will need to rely on their organic ability to scout, maneuver, and attack the adversary. The speed and endurance of LCS SAGs could be used to conduct naval

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[22] Scott H. Swift, "A Fleet Must Be Able to Fight," United *States Naval Institute Proceedings* 144, no. 5 (2018), 7.
[23] Thomas Rowden, Peter Gumataotao, and Peter Fanta. "'DISTRIBUTED LETHALITY'," *United States Naval Institute Proceedings* 141, no. 1 (2015), 20.
[24] Wayne P. Hughes Jr and Robert Girrier, *Fleet Tactics and Naval Operations*, 3rd ed. (Annapolis, MD: Naval Institute Press, 2018), 284.

raids or harassing attacks in support of specific and limited objectives. Moreover, organic unmanned aerial vehicles (UAVs) could be used to gain valuable targeting and battle damage assessment information in regions where air superiority is not established. Any raids would need to be carefully planned and coordinated prior to departure, because communications and data networks may be limited or unavailable in an A2AD environment. Two or three groups of LCS SAGs (6-12 ships) operating in dispersed formations can attack with multiple missile salvos from multiple directions creating what is known as a stream raid to attrite adversary air defense systems. After stream raids from SAGs, additional operations could be conducted by aircraft or larger surface combatants with more advanced weapons.

RECOMMENDATIONS

The efficient employment of naval platforms to achieve effective tactical and operational results is necessary more than ever in the new great power competition. Operational commanders and planning staffs should ask themselves, with which tactics or capabilities does the surface navy currently struggle? The possible list of answers could be quite long. However, it's reasonable that a peer competitor would likely struggle against these same tactics. Three ideas stand out as recommendations for improving the future operational employment of the LCS: complete the remaining mission packages as quickly as possible, increase LCS firepower, and explore an increase to the number of UAVs carried onboard.

The modular mission packages were intended to provide the operational commander flexibility and speed to respond to the most challenging threats in the littorals. The LCS's full utility will not be seen until the remaining mission packages achieve initial operational certification. While the SUW mission package has provided credible combat power to the LCS, there will be no shortage of skeptics who continue to discount the effectiveness of the LCS. A

concerted effort should be made to complete the anti-submarine warfare and mine countermeasure mission packages.

The LCS is more cost-effective than a destroyer or cruiser, considering all the resources that go into its construction and operation. Due to the LCS's cost-effectiveness, it is a better platform to conduct offensive operations of greater risk in the A2AD environment. The addition of the Naval Strike Missile to the LCS was a marked leap forward, but more is needed. In order to take full advantage of the platform's role in a naval raid or harassing attack, increasing its missile capacity from four to sixteen would dramatically increase the combat power of a LCS SAG. SAGs of LCSs, each equipped with sixteen missiles, could change the game against a peer competitor by holding their forces at persistent risk of attack from multiple missile salvos.

Similarly, having only one or two UAVs onboard limits their capability in a combat environment where losses should be expected. As UAV technology continues to improve, it is worth exploring the feasibility of deploying large numbers of UAVs on the scale of an air squadron onboard the ship. The more unmanned future warfare becomes, the more important it will be to quickly replace UAVs onboard. The increased number of UAVs would dramatically increase redundancy in air assets, thereby improving the ship's organic scouting capability or combat power if the UAVs are armed. Additionally, UAVs working in coordination with other assets in the SAG could gather information more quickly and amplify LCS combat power, similar to increasing the missile capacity.

CONCLUSION

When the United States emerged from the Cold War as the only superpower, the Navy was challenged to project power ashore. The emergence of a peer competitor and A2AD marks a significant shift in the operational environment. During a new great power competition, the LCS is the first step in renewing offensively-oriented surface operations. It is incumbent on the US

Navy and Surface Warfare community to embrace the LCS for the critical capabilities it offers against a peer competitor. Applying the theories of naval warfare and tactics to the capabilities inherent of the LCS results in an effective employment concept for the A2AD environment. Although the LCS is not without its challenges, it can create operational and tactical advantages for the US Navy in a new great power competition.

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