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THESIS

**U.S. NAVY BLOODHOUNDS: ESTABLISHING A NEW
MARITIME SECURITY COMBATANT**

by

Ryan P. Donohue

June 2016

Thesis Advisor:

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**U.S. NAVY BLOODHOUNDS: ESTABLISHING A NEW MARITIME SECURITY
COMBATANT**

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Lieutenant, United States Navy
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Submitted in partial fulfillment of the
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ABSTRACT

To protect the United States' 4.5 million miles of Economic Exclusion Zone, maritime forces are directed to conduct homeland defense missions and support civil authorities as far from U.S. shorelines as possible to protect the country from transnational threats. In order to protect the United States from transnational organized crime regimes and their continued maritime narcotics trafficking, the U.S. Navy requires a surface combatant to fulfill these interdiction missions. Therefore, with the Navy's decommissioning of its patrol frigates, should the Navy plan development of a new vessel, rebuild the Oliver Hazard Perry class frigates, or refocus the LCS program to replace the current frigate's capabilities in combating narcotic trafficking? In turn, the Oliver Hazard Perry class was a sound platform that performed well, the LCS is a troubled program facing severe financial, stability, and lethality issues, while the design and construction of a new frigate is entirely too costly and time consuming. With these considerations in mind, this thesis proposes the reconstruction of the Oliver Hazard Perry class frigate for maritime security operations, as a result of its illustrious multirole career, survivability, and relatively cheaper price point than the increasingly expensive and unproven LCS ship class.

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LIST OF ACRONYMS AND ABBREVIATIONS

AOR	Area of Responsibility
APCU	Average Production Cost Unit
ASW	Anti-Submarine Warfare
CODAG	Combined Diesel and Gas
CSG	Carrier Strike Group
CTOC	Countering Transnational Organized Crime
CY	Constant Year
D&M	Detection and Monitoring
DHS	Department of Homeland Security
DOD	Department of Defense
EEZ	Economic Exclusive Zone
ESG	Expeditionary Strike Group
FAA	Federal Aviation Administration
FFG	Fast Frigate Guided
FMSO	Foreign Military Studies Office
FSV	Fully Submersible Vessels
FY	Fiscal Year
HADR	Humanitarian Aid and Disaster Relief
HVU	High Value Unit
I&A	Interdiction and Apprehension
ISR	Intelligence Surveillance and Reconnaissance
JIATF	Joint Interagency Task Force
LCS	Littoral Combat Ship
LEDET	Law Enforcement Detachment Team
MCM	Mine Counter Measure
MOTR	Maritime Operational Threat Response
OHP	Oliver Hazard Perry
SOF	Special Operations Forces
SUW	Surface Warfare
TCO	Transnational Criminal Organization

USCG	United States Coast Guard
USMC	United States Marine Corps
USSOUTHCOM	United States Southern Command
UV	Unmanned Vehicles

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I. INTRODUCTION

A. MAJOR RESEARCH QUESTION

With the ongoing emphasis on monitoring narcotic trafficking into the United States, the U.S. Navy has been very proactive in using its Oliver Hazard Perry class frigates to deter and stop drug traffickers from transporting their product using the seas. These converted maritime security vessels were pivotal in drug interdiction operations, humanitarian efforts, as well as joint international naval training exercise platforms. However, the Navy accelerated the decommissioning schedule of its frigates to be completed by end of the year 2015, and there is not a clear action forward to replace these assets. Additionally, the Littoral Combat Ship (LCS) program, the supposed platform to replace the frigates, is stagnant, contains many development issues, has no clear mission for drug interdiction, and faces reduction in procurement.¹ Considering these issues and an unclear future of 4th fleet United States Southern Command (USSOUTHCOM) operations, this thesis examines the question: Should the Navy plan development of a new vessel, rebuild the Oliver Hazard Perry class frigates, or refocus the LCS program to replace the current frigate's capabilities in combating narcotic trafficking?

B. SIGNIFICANCE OF RESEARCH QUESTION

President Barack Obama's 2010 *National Security Strategy* legitimizes maritime transnational threats and irregular challenges as primary threats to the U.S. homeland.² However, though the United States has the world's largest Exclusive Economic Zone (EEZ) of 95,000 miles of coastline and 10,000 miles of navigable waters,³ the assets to protect its maritime security from illicit drug trafficking are drastically diminishing or are

¹ Christopher P. Cavas, "Pentagon Cuts LCS to 40 Ships, 1 Shipbuilder," *Defense News*, December 17, 2015, <http://www.defensenews.com/story/defense/naval/2015/12/16/littoral-combat-ship-lcs-navy-budget-fighter-super-hornet-joint-strike-fighter-lockheed-martin-fincantieri-austal/77452734/>.

² White House, *The National Security Strategy* (Washington, DC: White House, 2010), 4, https://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf.

³ U.S. Department of Homeland Security, *One Team, One Mission Securing our Homeland, Maritime Port Operations Handbook* (Washington, DC: Office of Operations Coordination Planning, 2009), 9, <https://www.fdle.state.fl.us/Content/getdoc/67e98737-3bf6-4cff-bda1-78ee2061b2c3/DHSSstrategicPlan2008-2013.aspx>.

no longer available.⁴ This presents a serious concern for homeland security and the safety of U.S. citizens. Former U.S. Representative Mark E. Souder argued, “For the first time, our actionable intelligence exceeds our interdiction capabilities in transit zones...we know of specific boatloads of drugs heading north that we cannot intercept because of the lack of interception assets in the Caribbean and Eastern Pacific.”⁵ Additionally, the reduction of these assets results in damaging effects for U.S. foreign policy and increased partnerships with foreign nations in this region, where traffickers are exploiting the United States’ drawback.⁶ In turn, the increased need for U.S. Navy and Coast Guard vessels, along with law enforcement detachment teams, is vital to securing U.S. borders from transnational organized crime.⁷

C. LITERATURE REVIEW

There is a significant amount of literature concerning the U.S. Navy and U.S. Coast Guard involvement in narcotic interdiction on the high seas. A number of sources regarding narcotic interdiction and tactical assets come from various official U.S. Department of Defense (DOD), State, Department of the Navy, and Coast Guard publications; numerous Congressional Research Service reports; and U.S. Naval Proceedings articles. According to the *International Narcotics Control Strategy Report* published in March 2014 by the U.S. Department of State, the U.S. Navy and Coast Guard assets are imperative in the war on drugs because close to 90 percent of all illegal narcotics heading for United States originates in South America and is smuggled through the seven Central American countries using vast sea lanes.⁸ The most important official

⁴ *Interrupting Narco-Terrorist Threats on the High Seas: Do We Have Enough Wind in Our Sails?: Hearing before the Subcommittee on Criminal Justice, Drug Policy, and Human Resources, House of Representatives, 109th Cong., (2005)* (statement of U.S. Representative Mark E. Souder), <https://www.gpo.gov/fdsys/pkg/CHRG-109hhr24892/html/CHRG-109hhr24892.htm>.

⁵ Ibid.

⁶ *Posture Statement of General John F. Kelly, United States Marine Corps, Commander, United States Southern Command: Before the 113th Congress House Armed Services Committee* (2014), 33, http://www.southcom.mil/newsroom/Documents/2014_SOUTHCOM_Posture_Statement_HASC_FINAL_PDF.pdf.

⁷ *Interrupting Narco-Terrorist Threats on the High Seas.*

⁸ United States Department of State, “International Narcotics Control Strategy Report,” *Bureau for International Narcotics and Law Enforcement Affairs*, vol. 1 (March 2014): 9, <http://www.state.gov/j/inl/rls/nrcrpt/2014/vol1/index.htm>.

reports concerning these missions and the need for naval surface assets are delineated in *Cooperative Strategy for 21st Seapower, Naval Operations Concept*, and *Posture Statement of Commander, United States Southern Command*. These joint publications direct the U.S. Navy, Coast Guard, and Marine Corps to collaborate strategically and tactically to maintain maritime security.⁹

1. IMPORTANCE OF MARITIME SECURITY

The *Cooperative Strategy for 21st Seapower* provides direction and maritime strategy for “mission-tailored maritime forces to be globally distributed in order to contribute to homeland defense-in-depth, foster and sustain cooperative relationships, and to prevent or mitigate disruptions and crises.”¹⁰ Furthermore, maritime forces are directed to conduct homeland defense missions and support civil authorities as far from U.S. shorelines as possible to protect the country from transnational threats, such as terrorists and other extremists; weapons of mass destruction proliferation; piracy; trafficking of drugs, people, and weapons; and other criminals.¹¹ Additionally, within this strategy, the document outlines key core capabilities such as forward presence, deterrence, sea control, power projection, and maritime security. Within maritime security, it maintains that the United States highly prioritizes use of maritime forces to mitigate and enforce illegal narcotics trafficking, and other seaborne illegal enterprises.¹²

Similar to the *Cooperative Strategy for 21st Seapower* document from 2015, the *Naval Operations Concept*, completed in 2010, stresses the importance of maritime security for the United States and its national security and economic prosperity.¹³ This document highlights the Maritime Operational Threat Response Plan (MOTR), which establishes protocols that allow various agencies operating under the maritime security

⁹ U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, *A Cooperative Strategy for 21st Century Seapower* (Washington, DC: Department of Defense, March 2015); U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, *Naval Operations Concept 2010: Implementing the Maritime Strategy* (Washington, DC: 2010), 36–39, <http://www.navy.mil/maritime/MaritimeStrategy.pdf>.

¹⁰ U.S. Navy, *A Cooperative Strategy for 21st Century Seapower*, 7.

¹¹ *Ibid.*, 11.

¹² *Ibid.*, 13.

¹³ U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, *Naval Operations Concept 2010*, 35.

umbrella to coordinate and effectively operate.¹⁴ Furthermore, the United States Naval Service (which includes the Navy, Coast Guard, and Marine Corps) is the lead agency/entity for the MOTR plan,¹⁵ and the Department of Defense is the “single lead agency of the Federal Government for the detection and monitoring of aerial and maritime transit of illegal drugs into the United States”¹⁶ Additionally, the *Naval Operations Concept* specifically argues that maritime security is only achieved when government assets, private sectors, multinational organizations such as naval and maritime security forces, and others coordinate together to combat illegal activity. It further touches on the naval service’s assets of U.S. Navy and Coast Guard vessels, aircraft, and law enforcement detachment (LEDET) teams playing critical roles in “conducting unilateral assistance at sea, law enforcement, and maritime interception operations to multinational counter-piracy operations.”¹⁷

2. MARITIME SECURITY ASSETS

To carry out the missions laid out in the naval publications mentioned earlier and to continue maritime security capabilities regarding illegal drug interdiction, the *Posture Statement of General John F. Kelley, USMC Commander, U.S. Southern Command to the 113th Congress House Armed Services Committee* argues that budget cuts, reduction of service deployments, and depleting U.S. Navy and Coast Guard surface vessels are seriously impairing the ability to protect the U.S. homeland.¹⁸ Furthermore, it highlights that USSOUTHCOM bears the full responsibility for distributing assets to intercept the majority of all heroin and cocaine sold in the United States. However, without valuable assets such as the U.S. Navy’s Oliver Hazard Perry frigates and U.S. Coast Guard High Endurance Cutters, now being decommissioned, the missions cannot be accomplished.

¹⁴ U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, *Naval Operations Concept 2010*, 37.

¹⁵ *Ibid.*

¹⁶ By power under Section 124 of Title 10 in the National Defense Authorization Act of 1990–91. *Interrupting Narco-Terrorist Threats on the High Seas*.

¹⁷ U.S. Navy, *Naval Operations Concept 2010*, 36–38.

¹⁸ *Posture Statement of General John F. Kelly*, 2–3.

These diminished assets caused Joint Interagency Task Force South (JIATF) the ability to miss out on 74 percent of actionable drug trafficking events.¹⁹

a. *Oliver Hazard Perry Frigate*

Since the end of the Cold War, the Oliver Hazard Perry FFG (Fast Frigate Guided Missile) class frigate has been an extremely valuable asset for homeland defense missions. After their original weapons systems were removed, they became the lead platform for conducting counter narcotic, trafficking, proliferation, and piracy missions. The Congressional Budget Office publication, *Options for Combining the Navy's and the Coast Guard's Small Combatant Programs*, highlights the success of the 51-ship program for their role in homeland defense for over 30 years.²⁰ However, numerous articles such as Janette Steele's "Farewell, Frigates," reveals that the steady decline of the fleet's frigate force is being stepped up because of the LCS program coming online, and because they "lack the multi-mission capability that the Navy now requires for modern combat."²¹

b. *LCS Program*

To replace the decommissioning frigates of the U.S. Navy, the Littoral Combat Ship was designed and built to be a multi-mission ship much like its predecessor, with the ability to have removable mission packages. However, according to Congressional Research Service reports, numerous construction problems, heavy corrosion, mission module failures, cost increases, and set multi-year building contracts have severely degraded the program and production.²² These reports, along with articles published in *Naval Proceedings* magazine, give insight into the failures and blunders of the LCS

¹⁹ *Posture Statement of General John F. Kelly*, 19.

²⁰ Congressional Budget Office (CBO), *Options for Combining the Navy's and the Coast Guard's Small Combatant Programs* (Washington, DC: CBO, 2009).

²¹ Jeanette Steele, "Farewell, Frigates," *San Diego Union Tribune*, September 24, 2014, <http://www.utsandiego.com/news/2014/sep/24/gary-mcclusky-frigate-navy-deployment-decommission/>.

²² Ronald O'Rourke, *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress* (CRS Report No. RL33741) (Washington, DC: Office of Congressional Information and Publishing, December 24, 2014); Ronald O'Rourke and Moshe Schwartz, *Multiyear Procurement and Block Buy Contracting in Defense Acquisition: Background Issues for Congress* (CRS Report RL41909) (Washington, DC: Office of Congressional Information and Publishing, July 30, 2014).

program.²³ Most notably, by 2007, the LCS unit cost increased almost 80 percent from its initial design cost.²⁴

c. New Small Surface Combatant

A recent Congressional Research Service report addresses the issues of the LCS program and sub-par performance of existing ship designs and capabilities, and gives insight to the current and future plan for the LCS program. In response to former Secretary of Defense Chuck Hagel's restructured plan for the LCS program and the development of a new small surface combatant, the Navy plans to replace the LCS ships with a new small combatant based on the current LCS hull designs.²⁵ Furthermore, this report proposes a combination of 52 LCS's and new frigates that could meet the Navy's plan for a small surface combatant force. This plan calls for a ship to be lethal and survivable like those of current frigates.²⁶ The report also presents issues and concerns for the design and survivability of the new small surface combatant being built on the existing LCS hull. Naval expert Norman Polmar further discusses the benefits and concerns for this LCS transition to a frigate for hull numbers after the originally funded 32 ships, arguing that principal candidates for a new small surface combatant will likely become another abomination in becoming an official ship designation.²⁷ Additionally, Sydney J. Freedburg questions the U.S. Navy's motive for developing a new small surface combatant based on the current LCS design.²⁸ This transition to a proposed, more lethal combatant based on the current problematic design suggests that defense leaders

²³ Neil A. Pettigrew, "When Quality Slips," *Proceedings*, January 2015, 58; Gregory V. Cox, "Lessons Learned from the LCS," *Proceedings*, January 2015, 36; Jim Griffin, "A More Flexible Fleet," *Proceedings*, January 2015, 30.

²⁴ Griffin, "A More Flexible Fleet," 31.

²⁵ Ronald O'Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background and Issues for Congress*, (CRS Report No. RL33741) (Washington, DC: Office of Congressional Information and Publishing, January 30, 2015).

²⁶ *Ibid.*

²⁷ Norman Polmar, "LCS Frigate Options," *Proceedings*, January 2015, 86–87.

²⁸ Sydney J. Freedburg Jr., "McCain Warns Navy on LCS Upgrade," *Breaking Defense* (March 10, 2015), <http://breakingdefense.com/2015/03/mccain-warns-navy-on-lcs-upgrade/>.

and contractors have surpassed the law of diminishing return on the current LCS platform, and have no clear path to separate from its design advocacy.

D. POTENTIAL EXPLANATIONS AND HYPOTHESIS

Maritime security is vital to the homeland defense strategy to secure our shorelines and harbors from illicit drugs and organized crime. This mission requires numerous vessels to operate within the confines of littoral waters as well as blue water defense. These ships must be simple, multi-capable vessels that can operate in conjunction with the Coast Guard and foreign navies while conducting counter-drug operations in the Caribbean and Eastern Pacific oceans, as well as possess the ability to forward deploy with other nations for maritime security training and operational missions. As the JIATF Deputy Director Brigadier General Steve DePalmer argues, “They don’t need to be destroyers, they don’t need to be fancy, they just need to be something that floats, that can trundle along, maybe launch a helicopter, and also launch a Coast Guard law enforcement detachment.”²⁹

Based on the research thus far, it is possible to make a few hypotheses for future development or purchase of a much-needed small surface combatant for maritime security and drug interdiction:

- Stop construction of the LCS program after the 24 ships that are currently under a block buy contract of \$538 million (excluding costs for mission packages) per vessel. Operate these to be strictly small surface combatants with their (Surface Warfare) SUW module in place for drug interdiction.³⁰ The Surface Warfare module gives the platform extensive offensive power with its surface weaponry and large security boat deployment from the aft end of the vessel for boarding team operations. However, this option does not give the Navy the ability to use them as multi-mission vessels because of their documented lack of survivability, which will increase the \$538 million price significantly to engineer construction change orders.
- Rebuild a modern version Oliver Hazard Perry Frigate. These ships, at \$600 million procurement cost (in 2015 dollars), would be a cheaper option to the LCS if their technical weapons systems were removed (reducing the \$600 million price tag) and refit for basic maritime security

²⁹ Meghann Meyers, “Official Seeks Larger Counter Drug Fleet,” *Navy Times* (April 21, 2014): 22.

³⁰ O’Rourke, *Navy Littoral Combat Ship (LCS) Program*.

operations. Additionally, their survivability has been battle tested (no further action needed, unlike the LCS) and they were the lead patrol vessels for JIATF and USSOUTHCOM drug interdiction missions since that program's inception.³¹

- Procure a multi-mission frigate such as the National Security Cutter the U.S. Coast Guard currently uses. At \$684 million per unit cost they have the ability to conduct any mission that the current U.S. Navy destroyer does, minus launching anti-air missiles, at a fraction of the cost of the destroyer (over \$1.6 Billion).³²
- Procure a similar multi-capable frigate or corvette from a foreign Navy, such as the Israeli Eilat class frigate (which the United States currently builds for Israel) or the German Braunschweig (K130) class corvette. At a procurement cost of \$260 million, the Eilat class frigate is a cheap and simple surface combatant that fills every capability of modern day frigates.³³ The sportier Braunschweig corvette was designed to be a modular type vessel to be constructed cheaply with a high degree of customization for the buyer. This allows the buyer to insert their sensors or weapons systems during construction to meet specific mission capabilities.³⁴

E. RESEARCH DESIGN

This thesis conducts a comparative case study examining the capabilities, limitations, pros and cons of the current Oliver Hazard Perry platform, the LCS program, or possible production of a new Small Surface Combatant for maritime counternarcotic operations. First it will examine the development of the Oliver Hazard Perry Frigate illustrated in Figure 1 (USS *Rodney M. Davis* FFG-60) and its illustrious campaign as a bargain workhorse and as an anti-narcotics sea baron. Then it will analyze why the current war on maritime counternarcotic trafficking resulted in the Perry's transformation to a counter drug patrol platform. Then the analysis will shift toward the Perry's

³¹ "FFG-7 Oliver Hazard Perry Class," Newsletter, accessed October 7, 2015, <http://www.globalsecurity.org/military/systems/ship/ffg-7.htm>.

³² Ronald O'Rourke, *Coast Guard Cutter Procurement: Background and Issues for Congress*, (CRS Report R42567) (Washington, DC: Office of Congressional Information and Publishing, October 31, 2012), 3-4.

³³ "Sons of Sa'ar? Israel's Next Generation Frigates," *Defense Industry Daily*, accessed March 17, 2013, <http://www.defenseindustrydaily.com/an-lcs-for-israel-04065/>.

³⁴ Blohm + Voss Naval, "Corvette Class 130," accessed February 10, 2013, <https://www.blohmvoss-naval.com/en/corvette-class-130.html>.

replacement, the uncertain and highly criticized Littoral Combat Ship, for future anti-narcotic operations. Furthermore, the analysis will then introduce the possibility of procuring a completely different vessel and their possible advantages, followed by a comparison of each platform to determine which one of the vessels is better suited for the counternarcotic mission set.

The analysis uses government publications such as Congressional Research Service reports, Armed Services Committee reports, current presidential and agency strategies, as well as current and former military expenditures reports within the United States' federal budget. This is important because the current mission of narcotic interdiction is vital to the homeland defense model and current maritime security strategies. In addition, it is important to analyze government expenditures toward programs, such as the LCS, and their effectiveness to achieve their designed capabilities. If they are not achieving these capabilities, it is important to recognize these shortfalls, correct them, or allocate funds and resources toward other programs or assets for the counternarcotic mission.

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II. OLIVER HAZARD PERRY FRIGATE



Figure 1. USS *Rodney M. Davis* (FFG-60)³⁵

A. U.S. NAVY WORKHORSE IS BORN: HISTORY OF THE OLIVER HAZARD PERRY FRIGATE

In the peak of the Cold War, United States defense leaders (abruptly sensitive to possible ballistic missile attacks following the Cuban Missile Crisis of 1962) yearned for a small, capable, and inexpensive multi mission surface combatant to replace retiring World War II destroyers. Early replacements were expensive, big, sluggish, and required extensive crew sizes for everyday operations. However, urgency for quick, strong, and nimble platforms capable of protecting maritime shipping, screening enemy missile attacks, and Anti-Submarine Warfare defense³⁶ grew exponentially. Focusing on keeping the cost and size down of its surface combatants, the U.S. Navy workhorse was born.

³⁵ Source: Stephen Saunders, “Oliver Hazard Perry Class,” *Jane’s Fighting Ships*, 116th revised ed. (Englewood, CO: IHS Global Inc., 2015), 945.

³⁶ John Keller, “A Once Proud Class of U.S. Navy Surface Warships Is Quickly Fading Away,” *Military and Aerospace Electronics* (December 2, 2014), <http://www.militaryaerospace.com/articles/print/volume-25/issue-12/news/trends/a-once-proud-class-of-u-s-navy-surface-warships-is-quickly-fading-away.html>.

Forecasted to be the inexpensive “backbone of the Navy’s sea control fleet,”³⁷ the Oliver Hazard Perry frigate facilitated a stout open-ocean escort of large amphibious ships and aircraft carriers, underway replenishment groups, and convoys, while also conducting undersea warfare protection against the Soviet Union.³⁸ Moreover, its design capabilities packed two multi-mission helicopters as an additional critical asset to maritime and anti-submarine warfare. The United States Department of Defense stressed the need for these vessels as an “Emergency solution to cost effectively cope with the mushrooming early 1970s Soviet underwater warfare menace in the face of the attrition of the antiquated World War II era anti-submarine destroyer escort types.”³⁹ Based on these mission capabilities, the Perry would preserve logistical sustainment and sea-line communication effectiveness for the United States and allied forces abroad.⁴⁰ However, negotiations and arguments between defense officials yielded disdained views for the need of the inexpensive single screwed vessel for those operations.⁴¹

Many naval admirals and defense officials’ contempt for the Perry came at a time of limited shipbuilding funds and acquisition complications. These officials objected on the basis that the Navy required fewer, more sophisticated ships.⁴² Furthermore, they argued that, “these less capable ships would hinder, not help, the fleet.”⁴³ Fearing this interpretation would impair current and future naval fleets with insufficient hulls for mission effectiveness, Chief of Naval Operations Admiral Elmo Zumwalt ordered the inexpensive Perry class vessel into production.⁴⁴

³⁷ Jerome H. Stolarow, *Navy’s FFG-7 Class Frigate Shipbuilding Program and Other Ship Program Issues* (Washington, DC: U.S. General Accounting Office, 1979), 2, <http://archive.gao.gov/f0302/108301.pdf>.

³⁸ “FFG-7 Oliver Hazard Perry Class.”

³⁹ Jim Bloom, “Bargain Basement Workhorse: The Amazing Career of Perry-Class Frigates,” *Sea Classics*, November 2008, <http://search.proquest.com.libproxy.nps.edu/docview/236084503/citation/7546591D082C4D1BPQ/1>.

⁴⁰ Stolarow, *FFG-7 Shipbuilding Issues*.

⁴¹ Kit Bonner, “Search for the Perfect Frigate,” *Sea Classics*, December 2003, <http://search.proquest.com.libproxy.nps.edu/docview/236050569/citation/8E5416FD21364A23PQ/1>.

⁴² Bloom, “Bargain Basement Workhorse.”

⁴³ *Ibid.*

⁴⁴ *Ibid.*

B. COST/MISSION/DESIGN/PERFORMANCE-SPECIFICATIONS

In May 1973, Congress authorized \$202 million for lead ship (FFG-7) designers to develop the Perry's initial hull.⁴⁵ In October 1973, the lead ship construction contract was awarded to Bath Iron Works Corporation for \$94.4 million as a single hull test platform.⁴⁶ Two years later in March 1975, construction began, delivering the lead ship in November 1977.⁴⁷ Prior to the delivery of the lead ship in February 1976, the U.S. Navy awarded two different shipbuilding companies contracts: Bath Iron Works and Todd Shipyard Corporation in construction of the 50 proposed Perry Frigates, including three purchased by the Australian Navy.⁴⁸

1. Cost

DOD officials estimated the total program cost for 50 Perry frigates to be \$3.2 billion, averaging \$64.8 million per vessel. However, by September 30, 1978, that number rose significantly to \$10.1 billion for 52 ships, averaging \$194 million per vessel. This significant increase was by virtue of unexpected shipbuilding costs and additional equipment such as towed sonar, fin stabilizers, and electronic equipment not quoted in original estimated price to be added.⁴⁹

2. Mission Design and Specifications: Workhorse Empowerment

Post design and production of the Perry yielded high expectations for the relatively inexpensive multi mission platform. Built for speed, agility, and multi-mission operations, these steel hulled, aluminum super structured vessels exceeded their designers' expectations in air, surface, and subsurface defense.⁵⁰ Moreover, the combatant excelled during numerous independent and counter-drug operations, maritime

⁴⁵ Stolarow, *FFG-7 Shipbuilding Issues*, 3.

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Ibid

⁴⁹ Ibid.

⁵⁰ Keller, "A Once Proud Class," 2.

interception operations, and multi-lateral exercises with foreign navies.⁵¹ These strengths of power by a surface combatant were achievable through their design, weapon distribution, and crew manifestation.

The Perry's lethal design, engineering plant, and weapon load out made its mission effectiveness comparable to its larger counterparts at a fraction of their size. Early vessels in the illustrious program: FFG 7, 9–35, and 44 had a length of 445 feet (133.5 meters) and a beam of 45 feet (13.5 meters); whereas the updated long hull OHP (Oliver Hazard Perry) frigates had a length of 453 feet (135.9 meters) and a beam of 45 feet (13.5 meters).⁵² The longer-hulled Perry frigates were extended to accommodate the SQQ-89 Anti-Submarine Warfare suite and communication capability with the new LAMPS III equipped SH-60 Seahawk helicopters.⁵³ Both variants of the Perry had shallow navigational drafts of 25 feet six inches, the capability of reaching in excess of 30 knots in speed, and an endurance capability of 4,500 nautical miles cruising at 20 knots.⁵⁴

The Perry's speed and agility were remarkable tools in their ability to achieve maritime dominance. Topping speeds comparative to their larger cruiser and destroyer counterparts; yet, two less engines and shallower drafts than those, allowed the OHP to travel and maneuver in shallower seas (littoral waters), giving unprecedented value to the U.S. Navy, especially in maritime security operations. As Jim Bloom writes, "The patrol frigate may have been built to 'economy-car' standards, but it would move on Corvette engines: twin HP General Electric LM2500 gas turbine engines."⁵⁵ Considered sports cars of the current Navy, gas turbine ships were easier to maintain, required fewer engineers, accelerated faster than steam driven ships, and could start and stop much faster than their predecessors.⁵⁶ Their modern engineering plants and smaller crew sizes were

⁵¹ "FFG-7 Oliver Hazard Perry Class."

⁵² Saunders, *Jane's Ships*, 945.

⁵³ *Ibid.*

⁵⁴ *Ibid.*

⁵⁵ Bloom, "Bargain Basement Workhouse."

⁵⁶ *Ibid.*

unparalleled in design and concept compared to similar foreign vessels of their size, and in addition to their contemporary construction and performance, the Perry’s other specifications (see Table 1) were even more impressive:

Table 1. Oliver Hazard Perry Frigate Specifications (FFG-7)⁵⁷

Power Plant	(2) General Electric LM 2500 Gas Turbine Engines 1 Shaft (CPP Propeller): 41,000 shaft horsepower
Length	Short Hull: 455 Feet (133.5 Meters) Long Hull: 453 Feet (135.9 Meters) LAMPS Mod.
Beam	45 Feet (13.5 Meters)
Displacement	4,100 Tons (Full Load)
Speed	29 Plus Knots (Classified)
Range	4,200 Nautical Miles @ 20 KTS 5,000 Nautical Miles @ 18 KTS
Fuel	587 Tons + 64 Tons of Helicopter Fuel
Aircraft	(2) SH-60 Seahawk Helicopters
Crew Size	13 Officers; 287 Enlisted
Armament	MK 13 Mod 4 Standard Missile Launcher (Removed) (36) Standard Missiles (Removed) (4) Harpoon (Anti-Ship Missiles) (Removed) (6) MK-46 Torpedos (1) 76mm (3-inch)/62 Caliber MK 75 Rapid Fire Gun (1) Phalanx CIWS (Close In Weapon System) 20 mm Gatlin Gun (1) 25mm Chain Gun
Combat Systems	AN/SPS-49 Air Search Radar AN/SPS-55 Surface Search Radar MK92 Fire Control System AN/SLQ-32 Electronics Warfare System AN/SQS-56 Sonar MK36 SBOC Decoy System AN/SQR-19 Towed Array Sonar System AN/ SQQ-89 ASW Integration Suite

3. Survivability: True Testament of a Workhorse

The Perry’s undeniable speed, agility, and employment of weapons served as a testament to its designers and operators alike. However, the class’s true value comes from its substantial survivability. The Perry’s designers focused heavily on curtailing vulnerabilities to the “cheap kill.” According to defense leaders, a cheap kill, “Occurs when a damaged system on a ship prevents the ship from completing its mission even though there is little or no physical damage to the ship’s structure.”⁵⁸ These commonly

⁵⁷ Adapted from specifications table on Oliver Hazard Perry class frigates. Saunders, *Jane’s Ships*, 945.

⁵⁸ Stolarow, *FFG-7 Shipbuilding Issues*, 13.

occur when fragmentations from proximity-fused weapons destroy exposed under armored vital systems and as result of shock waves from subsurface explosions damaging installed vital systems.⁵⁹ To diminish concerns of cheap kills and other fragmentation damage, designers placed 19-mm aluminum-alloy armor around the Perry's weapons magazines spaces, surrounded main engine spaces with 16-mm steel, and installed 19-mm Kevlar armor throughout significant electronic and command spaces.⁶⁰ This fortification was put to test during early operation in the late 1980s.

On May 17, 1987, and April 15, 1988, U.S. Navy workhorses USS *Stark* (FFG-31) and USS *Samuel B. Roberts* (FFG-58) became a testament of the Perry's superior design, survivability, toughness, and tenacity of their crews. Early afternoon on May 17, 1987, two Iraqi Exocet anti-ship missiles fired from Iraqi jets struck the USS *Stark* in the Persian Gulf, in a case of mistaken identity.⁶¹ The attack punched a hole 10–15 feet in diameter into the superstructure of the Perry class frigate, and her ship's crew worked diligently and tirelessly for over 24 hours before bringing blazing fires and flooding under control.⁶² Moreover, approximately a year later on April 15, 1988, the USS *Samuel B. Roberts* struck an Iranian mine in the Persian Gulf, blowing a 15 feet hole into the hull, snapping the keel, knocking its two gas turbines off of their mounts and flooding the main engine room.⁶³ Despite structural damage that would be fatal to most ships, the Perry frigates defied all critics, withstanding overwhelming damage and staying afloat. In turn, as a result of the Perry class's relative stable armor, system redundancy, and crew size, both vessels were quickly repaired and returned to the fleet, further corroborating their robust and extremely tough platform capabilities.

⁵⁹ Stolarow, *FFG-7 Shipbuilding Issues*, 13.

⁶⁰ "FFG-7 Oliver Hazard Perry Class."

⁶¹ *Orlando Sentinel*, "Iraq Attacks U.S. Frigate—1 Dead Pentagon Says Hit Was Case of Mistaken Identity," May 18, 1987, <http://search.proquest.com.libproxy.nps.edu/docview/277067717/abstract/3671898E08EE4777PQ/1>.

⁶² *Ibid.*

⁶³ David Larter, "Saving Sammy B: A Frigate's Heroic Legacy," *MilitaryTimes*, accessed January 23, 2016, <http://www.militarytimes.com/story/military/2015/05/22/samuel-b-roberts-frigate-legacy-1988-mine-report/27593135/>.

C. NEW MISSION: ANTI-NARCOTIC THOROUGHbred

The culmination of the Cold War left naval and defense leaders craving something more high tech than inexpensive combat workhorses. Based on this assumption, the Perry class' high-end technological AEGIS cruiser and destroyer big brothers eclipsed the frigates. Starved of funding, manning, and general guidance, the Perry class became a mission-less platform. As Jim Bloom asserts, "The frigate was considered to remain in service as a valuable 'utility infielder.'"⁶⁴ As a result, the Navy refocused its Perry class frigates away from large "blue water" operations to more shoreline eccentric maritime security operations missions.⁶⁵

During the Perry's refocus, U.S. naval officials began cutting funding and its operational time at sea. As a cost cutting measure, the U.S. Navy eliminated the Perry's air defense capability by removing its unsustainable SM-1R/Harpoon missile launcher and aging fire control combat system.⁶⁶ Based on this approach, further funding was not allocated to the program and the missile launchers welded shut for placement of a 25mm chain gun. As deputy director of Surface Warfare Division of the CNO, Admiral Mark J. Edwards illustrated, "The missile-less Perry ships retained 'tremendous war fighting capability,' had access to areas where other ships could not go, and worked well with Navies and Coast Guards of other Nations."⁶⁷ As this focus made headway, the Navy's workhorse established a new formidable mission in anti-narcotic operations.

1. Anti-narcotics Operations

In the wake of the Cold War, U.S. officials were still grappling with the war on drugs and transnational organized crime. After stringent FAA regulations were imposed, the flow of narcotics transitioned from air trafficking to more sea borne lanes. In light of this, defense leaders and law enforcement officials discovered that the Perry frigates possessed the perfect solution of endurance, size, and capability to conduct anti-narcotics,

⁶⁴ Bloom, "Bargain Basement Workhorse."

⁶⁵ Keller, "A Once Proud Class."

⁶⁶ Bonner, "Search for the Perfect Frigate."

⁶⁷ Bloom, "Bargain Basement Workhorse."

anti-piracy and joint task force operations in the fight against transnational organized crime.⁶⁸ In particular, these vessels proved invaluable in USSOUTHCOM/ 4th Fleet operations in countering narcotics trafficking in and around the AOR. As Rear Admiral Samuel Perez, former JIATF South Deputy Director, writes, “The FFG’s are our mainstay. FFG’s have legs so they can remain on station, good speed to get where we need them, and a good sensor suite. They have well trained crews who know how to search a body of water. Plus the frigates have helicopters. They are great platforms!”⁶⁹As a result, the Perry’s have conducted 16.3 percent of naval operation days in support of counternarcotic missions,⁷⁰ maintaining high levels of mission effectiveness for threats against U.S. homeland security.

⁶⁸ Edward H. Lundquist, “Frigates—Obsolete in the Current Geopolitical Situation?” *Naval Forces*, (2010), 24.

⁶⁹ *Ibid.*

⁷⁰ “FFG-7 Oliver Hazard Perry Class.”

III. SEABORNE NARCOTICS TRAFFICKING: NEED FOR SURFACE SECURITY WORKHORSE

Maintaining homeland security, in particular the immense illegal seaborne trafficking missions along the United States' vast oceanic Economic Exclusive Zone (EEZ), is a multi-level issue. Drug interdiction missions in the eastern Pacific and Caribbean are highly increasing in volume; yet, they are becoming a lesser priority among government officials in the current geopolitical security environment. Those officials, in the defense budget and asset acquisition realm, opted to sever ties with the Oliver Hazard Perry frigate because of its aging platform and its failed attempts to keep up with technology. Once well renowned workhorses in the fight against counternarcotic movements in blue and littoral waters, the OHP frigates have been scrapped or sold off to the highest foreign bidder. Today the frigate is gone, and the United States Coast Guard is struggling to pick up the immense counternarcotic interdiction workload advocated for in numerous security strategies and law enforcement directives.

The counternarcotic mission is essential in preserving homeland security. U.S. government officials concur with this urgency emphasizing, "Illegal drug trafficking continues to threaten the safety, security, and public health of the U.S. society. Illegal drugs also place significant strain on our Nation's health care and criminal justice systems, costing U.S. taxpayers hundreds of billions of dollars annually."⁷¹ Furthermore, drug trafficking is believed to be accountable for 80 percent of violent crimes and murders, social problems, and drug abuse within Puerto Rico, U.S. Virgin Islands and Mexico.⁷² However, maritime interdiction of this trafficking is complex and always evolving. Based on this notion, this chapter focuses on the critical need for maritime security frigates in the fight against ocean borne narcotic trafficking delineated in various government/military strategies.

⁷¹ Subcommittee Staff on Coast Guard and Maritime Transportation, "Subcommittee Hearing on Western Hemisphere Drug Interdiction Efforts" (Washington, DC: U.S. House of Representatives, June 12, 2015), 1, http://transportation.house.gov/uploadedfiles/2015-06-16_coast_guard_hearing_ssm.pdf.

⁷² White House, The, *Caribbean Border Counternarcotics Strategy* (Washington, DC: White House, January 2015), 4, <https://www.whitehouse.gov/sites/default/files/ondcp/policy-and-research/caribbeanstrategy5.pdf>.

A. SMUGGLING ON THE HIGH SEAS

The oceanic interdiction mission puts a great strain on law enforcement and military agencies. This is most prominent because as Rodrigo Nieto-Gomez, professor of National Security Affairs at Naval Postgraduate School, points out, “Criminal agents create technology responses that are simple and cost-effective, and consistently defeat actions of government agents.”⁷³ This is most evident in the Caribbean region where maritime cocaine flow from South America “has doubled over the past four years from 42 metric tons in 2010 to 95 metric tons in 2013, and now represents approximately 15 percent of total documented cocaine flow in the Western Hemisphere.”⁷⁴ This growth in trafficking is evidence that the drug trade is increasing not only in the Caribbean theater, but also most importantly in the deeper blue waters of the Eastern Pacific where the largest portion of the U.S.’s Economic Exclusive Zone lies.

The Eastern Pacific comprises an extensive portion of the 4.5 million square miles of U.S. coastline or EEZ.⁷⁵ Along this coastline lies the largest allocation of illegal drug trafficking on the high seas. According to *the International Narcotics Control Strategy Report* of 2014, roughly 90 percent of all illegal narcotics smuggled into the United States from Colombia, travel through one or more of the seven Central American countries via the Eastern Pacific.⁷⁶ Figure 2 illustrates the seven million square miles of Drug Transit Zones used by oceanic traffickers, depicting the flow of narcotics out of Columbia and Venezuela into the Eastern Pacific and Caribbean regions of the U.S. EEZ.

⁷³ Rodrigo Nieto-Gomez, “Stigmergy at the Edge: Adversarial Stigmergy in the War on Drugs,” *Cognitive Systems Research*, vol. 38, ed. Ted G. Lewis and Leslie Marsh (Philadelphia, PA: Elsevier, 2016), 1.

⁷⁴ *Caribbean Counternarcotics Strategy*, 19

⁷⁵ U.S. Navy, *A Cooperative Strategy for 21st Century Seapower*, 26.

⁷⁶ United States Department of State, “Drug and Chemical Control,” *International Narcotics Control Strategy Report* (Washington, DC: Bureau for International Narcotics and Law Enforcement Affairs, March 2014), 9, <http://www.state.gov/documents/organization/222881.pdf>.



Figure 2. Drug Transit Zones⁷⁷

Drug Transit Zones are highly valuable for narcotic traffickers because they use these sea-lanes as transportation of their products—undetected. Nieto Gomez asserts this ideological movement as,

How to optimize the transport of a series of stable banned chemical products to minimize risk, from a territory where they are produced and manufactured but have little market value, to another one where they are highly appreciated by a consumer market, avoiding the deadly predatory opposition of law enforcement agents, military, and other adversarial forces.⁷⁸

This feat is accomplished by using go-fast boats (or Pangas) and semi/fully submersible submarines. The next section describes these different types of drug smuggling vessels.

1. Narco-Submarines

Narco-submarines are highly vital assets in the narcotic trafficking trade because they carry immense payloads and are difficult to detect. The U.S. Foreign Military Studies Office (FMSO) report on “Narco-Submarines” reveals that nearly 80 percent of

⁷⁷ Source: “Subcommittee Hearing on Western Hemisphere Drug Interdiction Efforts.”

⁷⁸ Nieto-Gomez, “Stigmergy.”

narcotics smuggled into the United States are transported via maritime lines.⁷⁹ Of that 80 percent, 30 percent were transported via narco-sub.⁸⁰ These subs “Are custom made, self-propelled vessels built by drug traffickers to smuggle their goods. Over the years, their engineering, design and technology have improved, thus making them more difficult to detect and capture.”⁸¹ These vessels typically come in three different variants and can carry upwards to seven metric tons of cocaine per run: Low profile Vessels (LPV)/Self Propelled Semi-Submersibles, Submersibles/Submersible Vessels (FSV), and Narco-Torpedoes (which are towed vessels).⁸² Though these vessels require an immense amount of time, money, and secrecy to build, they yield a great deal more in return when a successful shipment arrives. Figure 3 demonstrates an example of a narco-sub (Semi-submersible).



Figure 3. Narcotic Semi-Submersible⁸³

2. Panga “Go Fast” Boats

Narco-subns carry a great deal of product and bear a large price tag. However, another form of trafficking vessel used, called Pangas (or “go-fast boats”), presents a

⁷⁹ Byron Ramirez and Robert J. Bunker, “Narco-Submarines: Specially Fabricated Vessels Used for Drug Smuggling Purposes” (Washington, DC: InSight Crime & Small Wars Journal, May 2014), 6, <http://fmsso.leavenworth.army.mil/Collaboration/Interagency/Narco-Submarines.pdf>.

⁸⁰ Ibid., 7.

⁸¹ Ibid., 14.

⁸² Ibid.

⁸³ Source: Ramirez and Bunker, “Narco-Subs,” 14.

cheaper, less costly approach for transportation. These are normally used in Caribbean trafficking, but are also lucrative in the Eastern Pacific transit zones. Pangas are simple wooden fishing vessels that are much smaller than subs, semi-narrow in nature, and are very fast (usually containing multiple outboard engines). According to Department of Homeland Security officials, Pangas “Have no inside floor, no cockpit, and no extraneous markings... they are efficient, cost effective, have superior handling, and are difficult to detect and often travel at night in order to avoid detection.”⁸⁴ These particular vessels, like the one shown in Figure 4, carry a much lesser risk of being caught because of their speed and ability to jettison (throw overboard) their product if pursued.



Figure 4. Drug Panga “Go-Fast”⁸⁵

As a result of these narcotics (cocaine mostly) entering U.S. borders via the high seas, from 2000–2010 Americans consumed more than 2,867 metric tons (6.3 million pounds) of cocaine; in addition to accounting for more than 44.6 million arrests, and

⁸⁴ Peter T. Hedge, *Securing the Border: Understanding Threats and Strategies for the Maritime Border*, vol. 1 (Washington, DC: U.S. Immigration and Customs Enforcement, 2015), 2, <https://www.hsdl.org/?view&did=787381>.

⁸⁵ Source: USCG Public Affairs Office, “Coast Guard Interdicts 2 Pangas, 12,000 Pounds of Marijuana,” *United States Coast Guard Newsroom* (Washington, DC: U.S. Department of Homeland Security Public Affairs Office, August 1, 2014), <http://www.uscgnews.com/go/doc/4007/2217945/Imagery-available-Coast-Guard-interdicts-2-pangas-12-000-pounds-of-marijuana>.

contributing to over 335,000 drug-related deaths in the same 10-year span.⁸⁶ These overpowering statistics and growth of the drug trade further epitomize the need for maritime security combatants in the duel for transit zone dominance.

B. MARITIME NARCOTIC LEGAL/STRATEGIC FRAMEWORK

The United States has been at war with narcotics since the late 1980s. The ongoing threat of transnational organized crime, trafficking trade, and drug use continuously jeopardizes U.S. homeland security and the economy. For this reason, the United States made coastal security, interdiction, and drug deterrence a high priority in various strategies and policy objectives established by the Department of Defense, Department of Homeland Security, and other local and federal law enforcement agencies. These missions and blueprints are depicted in a number of sources including the president's *2014 Drug-Control Strategy*, the *2015 National Security Strategy*, the *2015 Caribbean Counternarcotics Strategy*, U.S. Code 124 of Title 10, the U.S. Navy's *2015 Maritime Security Strategy and Naval Operations Concept*, and the U.S. Coast Guard's *Maritime Homeland Security Strategy*.⁸⁷ In turn, these strategies and directives directly aim at the urgency of the U.S. acquiring and possessing adequate maritime patrol frigates to conduct these objectives.

In this section, the flowchart in Figure 5 will aid in demonstrating the governmental strategies and directives, which dictate the inherent need for maritime patrols and increased frigates and aircraft to complete them. This chart represents a two part directional flow diagram for analytical interpretation of the president's strategies and

⁸⁶ Figures based on Table 73. Domestic Drug Consumption (Sum of years 2000–2010), Table 53. Total Estimated Arrests and Drug Arrests (Total Percentage of Cocaine Arrests between 2000–2010 multiplied by total arrests for the same 10-year span to find estimated total arrests, and an estimate attribution to Table 40. Number of Deaths from Drug-Induced Causes from Both Sexes. White House, The, *National Drug Control Strategy Data Supplement 2014* (Washington, DC: White House, 2014), 56, 69, 87. https://www.whitehouse.gov/sites/default/files/ondcp/policy-and-research/ndcs_data_supplement_2014.pdf.

⁸⁷ White House, The, *2015 National Security Strategy* (Washington, DC: White House, February 2015), https://www.whitehouse.gov/sites/default/files/docs/2015_national_security_strategy.pdf; *2014 Drug Control Strategy*; U.S. Navy, *A Cooperative Strategy for 21st Century Seapower*; U.S. Navy, *Naval Operations Concept 2010*; *Caribbean Counternarcotics Strategy*; United States Coast Guard, *U.S. Coast Guard Maritime Homeland Security Strategy* (Washington, DC: U.S.C.G. Headquarters, 2002), <http://www.uscg.mil/history/articles/uscgmaritimestrategy2002.pdf>.

the armed forces strategies/directives to meet the overall goal of eradicating narcotics on the high seas.

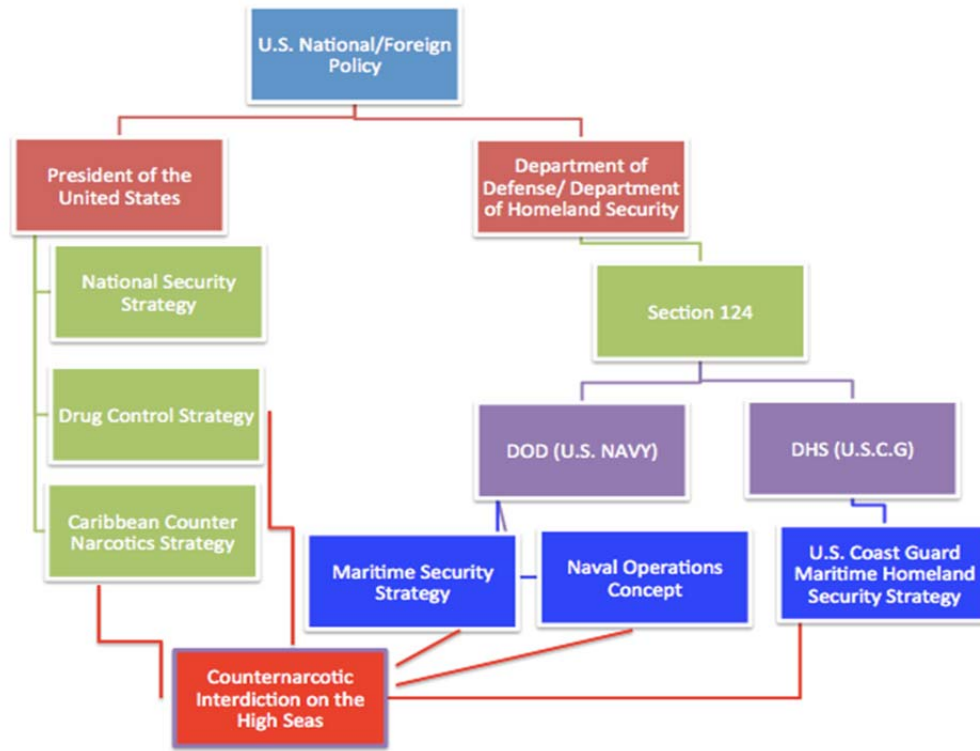


Figure 5. Maritime Security Strategic Framework Model

1. Presidential Strategies: National Security Strategy

President Obama justifies in his *2015 National Security Strategy* that economic strength and growth is the basis for maintaining American national security. Based on this approach, illegal drug trafficking threatens the safety of the American people and its economic growth; we must be exceptionally guarded against terrorism, its associated illicit networks, and transnational organized crime regimes, through intensified maritime interdiction and border security.⁸⁸ These close ties of illegal drug trafficking in Latin American regions to organized crime, such as money laundering, weapons trafficking, human trafficking, spread of corruption, and potential funding of terrorism,⁸⁹ greatly pose

⁸⁸ *2015 National Security Strategy*, 8.

⁸⁹ Max Manwaring, *U.S. Security Policy in the Western Hemisphere: Why Columbia, Why Now, and What Is to Be Done?* (Carlisle, PA: The Strategic Studies Institute, 2001), 7.

serious threats to U.S. national and regional stability. As a result, increased law enforcement is critical for maintaining security on land and in the maritime realm.

2. Presidential Strategies: Drug Control Strategy

The *2014 National Drug Control Strategy* provides emphasis and procedures on counteracting transnational organized crime and domestic drug usage. Specifically, it asserts that Transnational Criminal Organizations (TCO) use illegal narcotics as primary means to gain wealth, power, and influence.⁹⁰ To combat these TCOs, this strategy explicitly states using the maximum allowable federal support and interagency collaboration for intelligence sharing and drug interdiction, “Along Drug Trafficking Corridors via ‘Gateway/Destination’ initiatives.”⁹¹ This advocacy is important because TCOs evade traditional land based borders, smuggling metric tons of marijuana and cocaine via maritime routes, making conventional land based interdiction problematic. Therefore, “targeting bulk shipments of illegal drugs before they reach U.S. borders has the greatest effect on reducing their flow toward the U.S.”⁹² by means of increased maritime patrols by frigates and intelligence aircraft.

3. Presidential Strategies: Caribbean Counternarcotics Strategy

The Caribbean Counternarcotics Strategy is based upon the Drug Control Strategy philosophy of containing drug movement before it hits American soil. This particular strategy illustrates the “interdiction continuum” as the procedure for interrupting narcotics at the point of entry, or along their scheduled maritime routes (transit zones) by virtue of prior evidence and intelligence gathering. United States Southern Command (USSOUTHCOM) and its operational commanders, use this interdiction continuum to augment “air and maritime detection and monitoring, interdiction and apprehension, and domain awareness capabilities.”⁹³

⁹⁰ White House, The, *2014 Drug Control Strategy* (Washington, DC: White House, 2014), 53, https://www.whitehouse.gov/sites/default/files/ndcs_2014.pdf.

⁹¹ Ibid., 38.

⁹² Ibid., 58.

⁹³ *Caribbean Counternarcotics Strategy*, 20.

The Interdiction Continuum is a self-sustaining cycle, which requires a great deal of interagency cooperation and assets to be successful. Here, DOD and Homeland Security agencies use increased air and maritime (frigates) assets for detection/monitoring, interdiction, captures, and maritime dominance against narcotic traffickers.⁹⁴ Based on this strategy, U.S. government and law enforcement officials assert that a successful continuum is achieved using “Seizures, disruptions, and prosecutions [which] produce new intelligence and advance investigations into major transnational criminal networks, leading to more actionable intelligence on future events and producing follow on seizures.”⁹⁵ This concept is best illustrated in Figure 6, where each link of the continuum chain represents core critical elements for counter-narcotic missions’ intelligence and operational effectiveness.

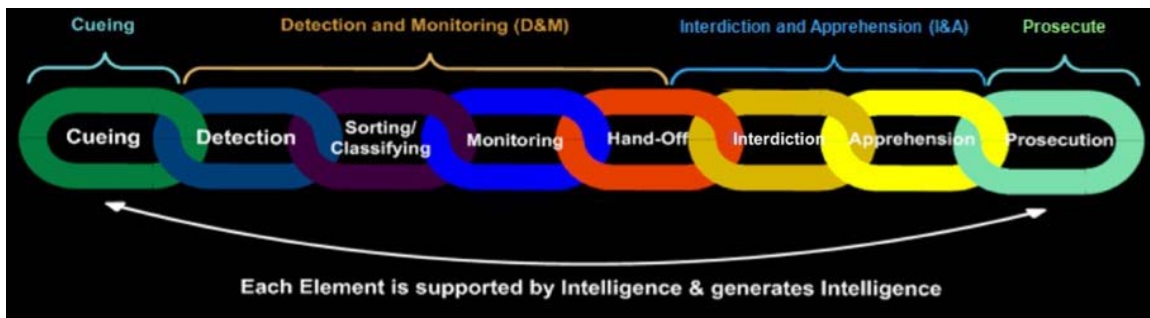


Figure 6. Interdiction Continuum Chain⁹⁶

Intelligence and operational effectiveness rely heavily on maritime patrol frigates and air assets. These assets require systematic and precise coordination from their joint operations commanders. In turn, coordination enables Cueing, Detection and Monitoring (D&M), Interdiction and Apprehension (I&A), and Prosecution to operate seamlessly. However, according to the Caribbean Counternarcotics Strategy, this coordination chain cannot function properly unless there are adequate maritime patrol vessels and aircraft

⁹⁴ Ibid.

⁹⁵ Ibid.

⁹⁶ Source: *Caribbean Counternarcotics Strategy*, 20.

with enhanced air interdiction capabilities, continued investments in maritime assets/capabilities, or constant expansion in air and maritime domain awareness.⁹⁷

4. Department of Defense/Department of Homeland Security Strategies

Under Section 124 of Title 10 of the United States Code, the Departments of Defense and Homeland Security have critical sections of their maritime security objectives specifically designated for using maritime patrol vessels in countering illegal narcotic trafficking on the high seas. This section of the legal code specifically states that

The Department of Defense shall serve as the single lead agency of the Federal Government for the detection and monitoring of aerial and maritime transit of illegal drugs into the United States. Department of Defense personnel may [also] operate equipment of the Department to intercept a vessel or an aircraft detected outside the land area of the United States.⁹⁸

Based on this law, the DOD is responsible for detection and monitoring of illegal trafficking, but the Department of Homeland Security (specifically the Coast Guard) is the lead agency for interdiction efforts. Nonetheless, DOD is the secondary agency for interdiction and has the authority to use its resources (i.e., frigates) and aircraft for interception. In turn, the Departments of Defense and Homeland Security delineate their efforts and focus on this mission in their strategic frameworks.

a. U.S. Navy Maritime Security Strategy/Naval Operations Concept

The DOD achieves the National Security Strategy's goals throughout its Maritime Strategy and Naval Operations Concept in regard to maritime security interdiction. Both documents specifically illustrate the military's role in preserving maritime security, and how the military protects U.S. economic interests and sovereignty by promoting the laws, rules, and seaborne sanctions that police the maritime trade and transportation domain.⁹⁹ Additionally, both documents clearly assert that in order to protect these interests and

⁹⁷ *Caribbean Counternarcotics Strategy*, 20.

⁹⁸ Armed Forces, 10 USC § 124 (2010), <https://www.gpo.gov/fdsys/pkg/USCODE-2010-title10/pdf/USCODE-2010-title10-subtitleA-partI-chap3-sec124.pdf>.

⁹⁹ U.S. Navy, *A Cooperative Strategy for 21st Century Seapower*, 26; U.S. Navy, *Naval Operations Concept*, 35.

supremacy, the Navy and Marine Corps must maintain a layered defense using patrol vessels to achieve and maintain maritime dominance for the, “support of free and open seaborne commerce, counter[ing] weapons proliferation, terrorism, transnational organized crime, piracy, illegal exploitation of the maritime environment, and unlawful seaborne immigration.”¹⁰⁰

b. U.S. Homeland Security/Maritime Security Strategy

The Department of Homeland Security was established to protect the U.S. homeland and its citizens from terrorism and other threats. The DHS’s strategy focuses on using all of its resources including: law enforcement, financial influence, intelligence, and military assets to deter and disrupt such events from occurring.¹⁰¹ Under DHS’s strategic umbrella, the U.S. Coast Guard Maritime Homeland Security Strategy states (with direct assistance and aid of DOD) that the Coast Guard is responsible for all law enforcement capabilities in the realm of protecting the U.S. and its adjacent waterways from narcotic trafficking.¹⁰² Furthermore, this strategy portrays its game plan of patrolling these waterways (Drug Transit Zones) in the Eastern Pacific, Caribbean Sea, and the Gulf of Mexico, based on these seven principles:

(1) The Coast Guard is the lead federal agency (LFA) for Maritime Homeland Security; (2) the Department of Defense acts primarily as a supporting agency to the Coast Guard for Maritime Homeland Security; (3) the Department of Defense acts as the LFA for Maritime Homeland Defense, employing traditional military missions, with the Coast Guard acting as a supported or supporting commander; (4) securing the homeland requires the sharing of responsibilities among agencies; (5) securing the homeland also requires unprecedented information sharing by all agencies; (6) maritime security operations will be focused to meet essential threat-based requirements and conducted within the rule of law; and (7) forces for implementing this Strategy will be derived by leveraging the Coast Guard’s multi-mission assets, by acquiring new resources, and through partnering with both public and private stakeholders.¹⁰³

¹⁰⁰ Ibid.

¹⁰¹ Department of Defense, *National Strategy for Homeland Security* (Washington, DC: Government Printing Office, October 2007), http://www.dhs.gov/xlibrary/assets/nat_strat_homelandsecurity_2007.pdf.

¹⁰² U.S.C.G., *U.S. Coast Guard Maritime Homeland Security Strategy*, 6.

¹⁰³ U.S.C.G., *U.S. Coast Guard Maritime Homeland Security Strategy*, 6.

With powerful maritime counternarcotic strategies in place, the United States Coast Guard and United States Navy have the abilities to operate effectively as long as they have adequate patrol frigates and aircraft available to achieve the objective.

C. COUNTERNARCOTIC INTERDICTION ON THE HIGH SEAS

Maritime counternarcotic interdiction operations fall under the umbrella of Joint Interagency Task Force South (JIATFS) and its military command, United States Southern Command (SOUTHCOM). JIATFS is made up of 34 representatives from 15 different federal and military agencies, and it is deemed the distribution hub for narcotic trafficking destined for the U.S.¹⁰⁴ JIATF's mission is to eliminate the primary flow of narcotics in and around the joint operating area, and to achieve 100 percent domain awareness of all trafficking as a whole.¹⁰⁵ Furthermore, JIATFS specifically conducts the interagency and intelligence detection/monitoring operations and facilitates interdictions of narco-terrorist threats.¹⁰⁶

As a result of JIATFS and SOUTHCOM interdiction efforts, (when interdiction assets are available) the amount of cocaine entering the United States has decreased each year since 2006.¹⁰⁷ When SOUTHCOM and JIATFS have sufficient U.S. Navy frigates or Coast Guard cutters on patrol conducting intelligence, detection, and interdiction operations, transnational organized crime (TOC) networks move shipments into deeper waters of the Eastern Pacific (where they are less successful). Based on this evidence, JIATF's monitoring, detection, and interdiction efforts revealed a decrease of around 45 metric tons between 2011 and 2012 in the littoral waters around Central America.¹⁰⁸ This overall steady decrease, FMSO report "Narco-Subs" reports, "Indicates an impact on the traffickers caused by the presence of U.S. ships and aircraft, the efforts of our law

¹⁰⁴ *Posture Statement of General John F. Kelly*, 18.

¹⁰⁵ United States Southern Command, "JIATFS," *Joint Interagency Task Force South*, accessed October 7, 2015, <http://www.jiatfs.southcom.mil/index.aspx>.

¹⁰⁶ *Ibid.*

¹⁰⁷ Ramirez and Bunker, "Narco-Subs," 14.

¹⁰⁸ Ramirez and Bunker, "Narco-Subs," 147.

enforcement partners and those of our allies and partner nations in the region.”¹⁰⁹ As traffickers look to continue shifting operations to deeper waters, the U.S. Navy becomes more valuable for its maritime assets to thwart future threats.

1. Maritime Counternarcotic Success

The success of interagency cooperation between U.S. Navy and U.S. Coast Guard ships and aircraft in littoral and blue waters has proven critical against the narcotic trafficking trade. This is most notable in the success of one particular Countering Transnational Organized Crime (CTOC) mission, Operation Martillo. Operation Martillo encompasses 14 participating countries in the fight against CTOC (Counter Transnational Organized Crime) and narcotic trafficking: Belize, Canada, Colombia, Costa Rica, El Salvador, France, Guatemala, Honduras, the Netherlands, Nicaragua, Panama, Spain, United Kingdom, and majority contributor, United States.¹¹⁰ From 2012 until March 2015, over 400 metric tons of cocaine has been intercepted at sea by the U.S. Navy and USCG, worth an estimated \$8 billion in secondary markets.¹¹¹ In fiscal year 2012 and 2013 alone, U.S. assets interdicted 284 metric tons of cocaine in their sea transit lanes.¹¹²

U.S. involvement in Martillo operations produces results, as assets are available. For example, the USCG seized 25 metric tons of cocaine from 24 trafficking vessels and two bale recoveries between July and November of 2015 totaling \$765 million in street value.¹¹³ In addition, U.S. forces were successful in interdicting 27 narco-submersibles between 2005 and 2013, using their imposing air and maritime assets.¹¹⁴ But, present day interdiction operations are sharply declining as a result of reduced U.S. Navy maritime and air assets. Severe budget constraints and decommissioned ships have hindered these

¹⁰⁹ Ibid., 148.

¹¹⁰ *Posture Statement of General John F. Kelly*, 20–24.

¹¹¹ “Hearing on Western Drug Interdiction.” 4.

¹¹² *Posture Statement of General John F. Kelly*, 17.

¹¹³ USCG Public Affairs San Diego, “Coast Guard Offloads 25 Tons of Cocaine Seized in Eastern Pacific Drug Transit Zone,” *United States Southern Command* (November 20, 2015), <http://www.southcom.mil/newsroom/Pages/Coast-Guard-offloads-25-tons-of-cocaine-seized-in-Eastern-Pacific-drug-transit-zone.aspx>.

¹¹⁴ Data collected via totaling up total number of vessels shown in Exhibit 1 (Narco Vessels’ Interdictions) from 2005–2013. Ramirez and Bunker, “Narco-Subs,” 14.

U.S. led efforts to the point where U.S. Coast Guard assets cannot keep up with the workload nor does the Coast Guard obtain the budget required for these missions. In turn, the trafficking trade goes unscathed because there is more intelligence available than there are forces available for interception.¹¹⁵

D. BUDGET SHORTFALLS AND NEED FOR MORE ASSETS

Severe reduction in interdiction missions and success is a direct result of the loss of U.S. Navy ships and aircraft assets. These U.S. Navy platforms, dubbed by SOUTHCOM officials as “invaluable to the region’s security,”¹¹⁶ have been critical in counter-narcotics operations. The effectiveness of Operation Martillo and other oceanic interdiction missions is now diminished because of the decommissioning of the entire Oliver Hazard Perry frigate fleet at the end of 2015.¹¹⁷ Additionally, the Perry frigate’s replacement, Littoral Combat Ship (LCS), is slated for other missions because of great demand in the Asian and Middle Eastern regions.¹¹⁸ In 2013, Rear Admiral Sinclair M Harris, Commander of U.S. Fourth Fleet and U.S. Naval Forces SOUTHCOM, spoke about this problem, claiming that,

When the U.S. Navy (USN) re-established the U.S. Fourth Fleet in 2008, it was part of an effort to revitalize its support to U.S. Southern Command (SOUTHCOM) with ship and air assets for maritime security operations, drug interdiction, theatre security co-operation, and humanitarian aid and disaster relief (HADR) missions in the Caribbean and Latin America. However, five years on, U.S. budget cuts have forced the USN to reduce ship deployments to the region...the ship deficit is driving the commander... to re-examine the future and to figure out ways to bridge the gap in the near-term.¹¹⁹

In FY2013 alone, budget sequestration had a compelling impact on interdiction missions for SOUTHCOM and JIATF. During that time, much of USCG and U.S. Navy

¹¹⁵ *Interrupting Narco-Terrorists*.

¹¹⁶ Jean Grace, “Rear Admiral Sinclair M Harris, Commander U.S. Fourth Fleet and U.S. Naval Forces Southern Command,” *Jane’s Navy International* 118, no. 6 (August 1, 2013), <http://search.proquest.com.libproxy.nps.edu/docview/1370042205/abstract/A3544DAE43494FD3PQ/1>.

¹¹⁷ “Hearing on Western Drug Interdiction,” 4.

¹¹⁸ *Ibid*.

¹¹⁹ Grace, “Rear Admiral Sinclair M Harris.”

assets training, operating, and maintenance funds were cut significantly.¹²⁰ Over the past three years, the DOD (Navy) and DHS (USCG) budget cuts represent a drastic decrease for DOD, and a steady decrease for DHS. Table 2 represents the decrease in budgeting from FY2013 to FY2015 for both agencies’ anti-narcotic operations and assets.

Table 2. Budget Authority for Counternarcotics Resources¹²¹

Agency	FY2013	FY2014	FY2015
Department of Defense (DOD)	\$1,599,139.00	\$1,538,780.00	\$1,144,979.00
Department of Homeland Security (DHS)	\$1,332,752.00	\$1,305,271.00	\$1,205,039.00

Harsh budget cuts and lack of defense official’s willingness to back the drug interdiction mission has damaged America’s homeland security. By virtue of slim to no maritime vessels and air assets, JIATF and SOUTHCOM are incapable of targeting three quarters of possible interdiction operations identified by their intelligence teams.¹²² Of the 1,426 maritime known narcotic shipments in FY2014, JIATF-South was only able to take action on 383 (27 percent) of them due to reduced availability of ship and air assets.¹²³ Furthermore, in February 2015, the USCG Commandant revealed to the Subcommittee on Coast Guard and Maritime Transportation that his agency was only able to interdict 20 percent of the known narcotics being transported in drug Transit Zones because of severe lack of assets.¹²⁴ One step further, in 2014’s FMSO report on “Narco-Subs,” it states that the DOD’s detection and monitoring assets are scarce as well, arguing that, “Currently, we are unable to target 74 percent of high confidence events. Of the 26 percent that we are able to target the principle impediment to successful detection

¹²⁰ “Hearing on Western Drug Interdiction,” 4.

¹²¹ Adapted from using statistics and figures given for DOD and DHS budget allocations for counternarcotic resources, page 51 (DOD) and page 143 (DHS: Coast Guard). White House, The, *National Drug Control Strategy: FY 2015 Budget and Performance Summary* (Washington, DC: July 2014), 51, 143, https://www.whitehouse.gov/sites/default/files/ondcp/about-content/fy2015_summary.pdf.

¹²² Olga Belogolova, “DOD Official: Resources Slim for Drug Interdiction Mission,” *Inside the Pentagon’s Inside the Navy* 26, no. 21 (May 27, 2013), <http://libproxy.nps.edu/login?url=http://search.proquest.com.libproxy.nps.edu/docview/1355669783?accountid=12702>.

¹²³ “Hearing on Western Drug Interdiction,” 4.

¹²⁴ “Hearing on Western Drug Interdiction,” 4.

and monitoring, is the lack of necessary sensors to generate persistent wide area surveillance and precision geo-location.”¹²⁵

High volumes of maritime patrol vessels play a critical role in maintaining the high levels of maritime security called for in U.S. government strategies. Moreover, these patrol vessels are essential in covering the seven million mile area of drug transit zones. On May 22, 2013, then JIATF Commander Rear Admiral Charles Michel argued at a Defense Writers Group event that, “The joint operating area the task force patrols is about 12 times the size of the continental United States, encompassing the entire continent of South America as well as Central America, Mexico and the water spaces surrounding the region... [This] task force has just three to four ships and four to five aircraft to cover that entire area.”¹²⁶ Furthermore, based on this tremendous amount of ocean to cover, on March 12, 2015, SOUTHCOM’s Commander General John Kelly supported this notion before the Senate Armed Services Committee, arguing that to have successful seaborne interdiction missions, “It takes 16 flight-deck equipped ships to meet the mission needs in the Transit Zones.”¹²⁷ Flight deck enabled ships have the capability to launch U.S. Navy or USCG helicopters for surveillance, tracking, and support of boarding teams on the surface.

Numerous circumstances have affected the ability of JIATF and SOUTHCOM to achieve successful anti-narcotic interdictions, from traffickers changing their posture, tactics, and seaborne lanes, to the inability to produce actionable intelligence. Nonetheless, the problem most impeding prosecution of known narcotic shipments is the lack of surface interdiction vessels.¹²⁸ To comply with official maritime and narcotic strategies/missions regarding narcotic interdiction on the high seas, it is imperative for the U.S. government to appropriate, fund, and build the replacement for the Oliver Hazard Perry Frigate’s role in maritime interdiction operations. Its renounced replacement, the Littoral Combat Ship, is in line to fill big shoes and the hole left behind

¹²⁵ Ramirez and Bunker, “Narco-Subs,” 148.

¹²⁶ Belogolova, “Resources Slim.”

¹²⁷ “Hearing on Western Drug Interdiction,” 5.

¹²⁸ “Hearing on Western Drug Interdiction,” 4.

by its predecessors in the maritime interdiction realm. The billion-dollar question is: Does the LCS have the capability of fulfilling the maritime security combatant requirement its older brother filled for over 30 plus years?

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IV. LITTORAL COMBAT SHIP—SHIP OF THE FUTURE

The Littoral Combat Ship (LCS) was once lauded as the future of the U.S. Navy's surface warfare fleet. The LCS program's pure objective was to provide inexpensive, stealthy, and modular small combatants to operate in the littorals, or close to the coast, using a shallow draft and high speed capabilities, in conjunction with multi-mission packages and launching unmanned vehicles (UV's).¹²⁹ The ship was intended to leverage advances in technology to minimize crew size, maximize its functionality by employing different mission packages, and use water jets to increase maneuverability without sacrificing speed. However, the program encountered immense design problems and concept limitations that brought it under scrutiny and possible eradication.

A. HISTORY OF LCS: WARGAME-CONCEPT-REALITY

During the mid-1990s, as the Cold War was ramping down, a series of war games yielded the birth of the Littoral Combat Ship (LCS) concept. The key game was the Joint Multi-warfare Analytical Game (JMAG), centered on what Captain Robert Carney Powers described as “the developmental cutting edge of modeling, simulation, and a ‘decision-maker in the loop’ process.”¹³⁰ Based on this war game model, the Navy used a decision making process to develop a central concept based on new and emerging technical platforms such as unmanned aerial, underwater, and surface vehicles, mine countermeasure systems, ship concepts, as well as system and weapon concepts as they pertained to an external threat in the littorals (shallower coastal waters).¹³¹ This process used computer models in various scenarios to compare these competing systems and platforms in their ability to work simultaneously with each other in futuristic conflicts.¹³² The result was the development of a maritime platform, capable of employing various manned and unmanned systems quickly and swiftly. For this reason, the LCS program

¹²⁹ Duncan Long and Stuart Johnson, *The Littoral Combat Ship: From Concept to Program* (Center for National Security Policy, March 2007), <http://ctnsp.dodlive.mil/files/2006/12/Case-7-LCS.pdf>.

¹³⁰ Robert Carney Powers, “Birth of the Littoral Combat Ship,” *Proceedings*, September 2012, 42–47.

¹³¹ Powers, “Birth of the LCS.”

¹³² *Ibid.*

did not begin like traditional ship platforms where the platform is developed and then is evaluated for the use in battle; rather, the LCS platform/program was built based on emerging futuristic scenarios.¹³³

Based on the criteria conceptualized from the JMAG war game series, the understanding was that during maritime joint operations, the Littoral Combat Ship would eliminate the inconsistent proficiencies within the littoral Mine Countermeasure (MCM), littoral Surface Warfare (SUW) and littoral Anti-Submarine Warfare (ASW) areas.¹³⁴ These ships were to be an expendable fleet composed of numerous small, less expensive ships so that if one were lost in battle, only a small portion of the Navy's aggregate combat power was lost.¹³⁵ Their original design expectations were that they would be the size of a WWII destroyer (2,222-2,600 ton displacement), able to deploy individually with an extended range exceeding 3,000 nautical miles, have a shallow draft, contain stealth-like features to reduce radar signature, be helicopter capable, and capable of reaching 50 knots in speed.¹³⁶

1. Mission Need for LCS

The need for a new stealth-like surface combatant capable of reaching high speeds and launching a helicopter emerged from defense leaders, questioning: what mission are these vessels critical for? The new LCS mission, detailed by defense leaders, quoted and illustrated that

The Littoral Combat Ship (LCS) will be optimized for flexibility in the littorals as a system of systems that are both manned and unmanned, mission reconfigurable, and deployed in LCS. It will focus on three primary anti-access mission areas: Littoral Surface Warfare operations emphasizing prosecution of small boats, mine warfare, and littoral antisubmarine warfare. Its high speed and ability to operate at economical loiter speeds will enable fast and calculated response to small boat threats, mine laying and quiet diesel submarines. LCS employment of networked

¹³³ Powers, "Birth of the LCS."

¹³⁴ Ibid.

¹³⁵ Long and Johnson, *The Littoral Combat Ship: From Concept to Program*, 4-5.

¹³⁶ Powers, "Birth of the LCS"; Long and Johnson, *The Littoral Combat Ship: From Concept to Program*, 8.

sensors for Intelligence, Surveillance, and Reconnaissance (ISR) in support of Special Operations Forces (SOF) will directly enhance littoral mobility. Its shallow draft will allow easier excursion into shallower areas for both mine countermeasures and small boat prosecution. Using LCS against these asymmetric threats will enable Joint Commanders to concentrate multi-mission combatants on primary missions such as precision strike, battle group escort and theater air defense.¹³⁷

In particular, the Mine Countermeasure (MCM) Warfare areas of the LCS will provide a “first response” mine hunting capability which includes the ability to detect, localize, classify, identify and neutralize in deep water through the beach zone.¹³⁸ Here the vessels are necessary to allow forces to maneuver safely through a potentially mined area in a timely manner and provide mine cleared areas for transit, sea lines of communication and large operating groups. For Anti-Submarine Warfare (ASW), the LCS will fill the need to locate, identify, and prosecute adversarial submarines. This protects Carrier Strike Groups (CSG) and Expeditionary Strike Groups (ESG) by establishing ASW barriers and aiding in escorting of High Value Units (HVV) in and around established areas of responsibility.¹³⁹

Finally, in Surface Warfare (SUW) the LCS will detect, classify and neutralize attacking small craft. This is necessary to protect larger naval forces transiting through potentially hostile choke points and conducting operations in or around the littorals.¹⁴⁰ Particularly, these small ships were expected to, “relieve highly capable ships of the need to perform such tasks as maritime interdiction operations that made poor use of their considerable potential combat power and stretched the current fleet thin.”¹⁴¹ Thus, the LCS was slated to replace the successful Oliver Hazard Perry Frigates’ mission load of countering maritime narcotics trafficking and other multi mission objectives in coastal waters worldwide.

¹³⁷ Department of Defense, “Littoral Combat Ship (LCS) Selected Acquisition Report (SAR),” *Acquisition Report* (Washington, DC: United States Department of Defense, December 31, 2010), <https://fas.org/man/eprint/LCS-SAR.pdf>.

¹³⁸ Powers, “Birth of the LCS.”

¹³⁹ *Ibid.*

¹⁴⁰ *Ibid.*

¹⁴¹ Long and Johnson, *The Littoral Combat Ship: From Concept to Program*, 5.

B. LCS PLATFORMS: SHIPS OF THE FUTURE

Like most new defense platform concepts in the United States military, LCS designers developed two different platforms for a series of tests to decide which platform would roll into production. On May 27, 2004, the U.S. Navy awarded manufacturers—Lockheed Martin and General Dynamics—to design and produce one prototype (with an option to build one more).¹⁴² In turn, each manufacturer produced two completely different prototype designs—the Lockheed Martin (Freedom Class) design is a monohull design featuring a steel hull and aluminum superstructure, while the General Dynamics’ (Independence Class) design features an all-aluminum trimaran hull. In addition, both ship designs are built in separate shipyards, and feature two completely different engineering systems and combat systems suites containing various models and versions of sensors, computers, displays and software patches.¹⁴³ In November 2010, in lieu of proclaiming a manufacturing design victor, the Navy approached Congress for permission to build 10 vessels of both designs.¹⁴⁴

1. Freedom Class (LCS -1)

The Freedom class (LCS-1) Littoral Combat Ship’s design incorporates traditional ship building techniques with newer stealth technology. The LCS-1 class uses the same design structure utilized on the Oliver Hazard Perry frigate by incorporating a steel hull (for increased strength) with an aluminum superstructure to reduce weight. Though its monohull design, illustrated on the USS *Freedom* in Figure 7, is similar to traditional ship designs, its sharp angle characteristics and less protruding sensors differ from those designs to reduce its radar signature.

¹⁴² Ronald O’Rourke, *Navy Littoral Combat Ship (LCS) Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, December 24, 2014), 3.

¹⁴³ CRS, *Navy LCS Program*, 3.

¹⁴⁴ Powers, “Birth of the LCS.”



Figure 7. USS *Freedom* (LCS 1)¹⁴⁵

Additionally, the ship spans 378.3 feet in length, has a beam of 57.4 feet, and a staggering shallow draft of 13.5 feet.¹⁴⁶ To complement its relatively small size, its engineering plant uses a Combined Diesel and Gas (CODAG) propulsion system—powered by twin Rolls Royce MT-30 gas turbine engines (96,500 HP), in addition to twin Fairbanks Morse Colt-Pielstick 16PA6B diesel engines (17,160 HP).¹⁴⁷ Using this hybrid propulsion system, the ship is propelled through the water using four Rolls Royce Kameawa 153SII water jets, enabling the *Freedom* to operate on either gas turbine or diesel engines at a maximum of 40 plus knots.¹⁴⁸ In addition to its high-powered engineering plant, Table 3 illustrates the *Freedom* class’ armament and sensors (without a specified module):

¹⁴⁵ Source: Saunders, “Freedom Class LCS,” *Jane’s Fighting Ships*, 946.

¹⁴⁶ Saunders, *Jane’s Fighting Ships*, 946.

¹⁴⁷ *Ibid.*

¹⁴⁸ *Ibid.*

Table 3. Freedom Class (LCS-1) Ship Specifications¹⁴⁹

Power Plant	CODAG: 2 Rolls Royce M1-30 gas turbines (96,550 hp); 2 Fairbanks Morse COIT-Pielstick 16PA6B diesels (17,160 hp) 4 Rolls Royce Waterjets
Length	378.3 Feet
Beam	57.4 Feet
Displacement	3,360 tons (Full Load)
Speed	40 Plus Knots (Classified)
Range	3,500 Nautical miles at 14Kts
Aircraft	1MH-60 Seahawk Helicopter or 2 Firescout VTUAV's
Crew Size	50 Crew Members (Estimated)
Armament	SAM: 1 Raltheon RAM RIM-116 21-Cell MK 99 launcher SSM: Lockheed Martin Longbow Apache Hellfire (AGM 114L) 1 BAE Systems 57mm/MK110 Gun (4) 12.7 mm Machine Guns
Combat Systems	Lockheed Martin COMBATSS-21 2 Terma SKWS Decoy Launching Systems ESM: Argon ST WBR 2000 Electronic Countermeasures EADS TRS-3D Air and Surface Search Radar Sperry Bridgemaster Navigation Radar FABA DORNA TV/IR Fire Control Radar

2. Independence Class

The Independence class (LCS-2) Littoral Combat Ship design completely shies from traditional shipbuilding techniques, design, and construction. This particular sea frame, like the USS *Independence* illustrated in Figure 8, is based on a trimaran hull used on the Fred Olsen Line of fast commercial ferries, in order to reduce water friction and increase speed.¹⁵⁰ This design also incorporates a large flight deck for operations with heavy-lift helicopters. Unlike the Freedom class LCS, the Independence class hull and superstructure are composed entirely of aluminum—reducing weight; yet, sacrificing strength and durability.

¹⁴⁹ Adapted from specifications table on Freedom Class LCS. Saunders, *Jane's Fighting Ships*, 946.

¹⁵⁰ Saunders, *Jane's Fighting Ships*, 948.



Figure 8. USS *Independence* (LCS 2)¹⁵¹

These vessels span 421 feet in length; their beam at the widest breadth is an astounding 103.7 feet, and they have a shallow draft of 14.6 feet.¹⁵² Powering this wide aluminum vessel, the Independence class utilizes a CODAG propulsion system much like its Freedom class counterpart; however, it packs two of its predecessor's (Oliver Hazard Perry frigate) LM2500 gas turbine engines (59,005 HP) in conjunction with two MTU 20V 8000 diesels (25,748 HP), thus propelling it to speeds in excess of 50 knots.¹⁵³ Additionally, Table 4 illustrates the Independence class' armament and sensors (without a specified module):

¹⁵¹ Source: Saunders, "Independence Class LCS," *Jane's Fighting Ships*, 948

¹⁵² Saunders, *Jane's Fighting Ships*, 948.

¹⁵³ *Ibid.*

Table 4. Independence Class (LCS-2) Ship Specifications¹⁵⁴

Power Plant	CODAG: 2 GE LM2500 gas turbines (59,005 hp); 2 M TU 20V 8000 diesels (25,748 hp) 4 LIPS Steerable Waterjets; 1 Steerable Thruster
Length	421.6 Feet
Beam	103.7 Feet
Displacement	3,188 (Full Load)
Speed	50 Plus Knots (Classified)
Range	3,500 Nautical miles at 14Kts
Aircraft	2 MH-60 Seahawk Helicopters or 2 Firescout VTUAV's
Crew Size	40 Crew Members (Estimated)
Armament	SAM: 1 Raltheon SeaRAM RIM-116ab 11-Cell launcher SSM: Lockheed Martin Longbow Apache Hellfire (AGM 114L) 1 BAE Systems 57mm/MK110 Gun (4) 12.7 mm Machine Guns
Combat Systems	Northrup Grumman Electronic Systems Integrated Combat Management System (ICMS) Decoys: 4 Loral/Hycor SRBOC 6-barreled fixed launchers ESM: Exelis ES-3601 AN/SPS-77 (Saab Sea Giraffe AMB) 3D Air/Surface Search Radar Sperry Bridgmaster Navigation Radar Seastar Safire III Optronic Director Fire Control System/Radar

C. MODULAR TECHNOLOGY: MISSION MODULES

The LCS was conceptualized to be modular, especially considering its speed and capability to get in and out of a fight. This modular concept is intended for the LCS platform to incorporate the “plug and play” mentality, allowing the specific vessel to pull into port, swap out its warfare mission module in one to four days, and head out to sea for its follow-on mission.¹⁵⁵ These modules, using substantial “manned and unmanned off-board systems,”¹⁵⁶ encompass three exclusive mission packages: the Anti-Submarine Warfare (ASW) module, the Mine-Countermeasure (MCM) module, and the Surface Warfare (SUW) module. Each module consists of various weapons, sub platforms (vehicles), aircraft, additional sensors, and personnel that enable the ship to complete its specified mission.¹⁵⁷

¹⁵⁴ Adapted from specifications table on Independence Class LCS. Saunders, *Jane's Fighting Ships*, 948.

¹⁵⁵ Long and Johnson, *The Littoral Combat Ship: From Concept to Program*, 11.

¹⁵⁶ Ibid.

¹⁵⁷ U.S. Navy, “Littoral Combat Ships – Mission Modules,” accessed March 3, 2016, http://www.navy.mil/navydata/fact_display.asp?cid=2100&tid=406&ct=2.

1. Anti-submarine Warfare (ASW) Module

The ASW mission module furnishes Joint Force Commanders the opportunity to utilize “detect-to-engage” capabilities in the fight against modern enemy diesel-electric and nuclear submarines within coastal waters.¹⁵⁸ The U.S. Navy contends that such, “specific ASW capabilities include protecting forces in transit, protecting joint operating areas, and establishing ASW barriers.”¹⁵⁹ In turn, this module encompasses variable depth sonar, a multi-function towed array, launching and recovery equipment for both sonar systems, signal processing systems, torpedo defense module, MH-60R Helicopter w/ALFS, and a Vertical Takeoff Unmanned Aerial Vehicle.¹⁶⁰

2. Mine-Countermeasure (MCM) Module

The MCM module is designed to provide Joint Force Commanders the ability to detect and subdue enemy minefields for safe passage of maritime shipping and transit. While the LCS platform sits out of range of enemy minefields, the mine countermeasures package deploys, “various aviation assets and unmanned surface, semi-submersible and submersible vehicles that together are equipped with an array of sensors and systems to detect, localize, neutralize and, sweep mines.”¹⁶¹ This package utilizes various manned and unmanned aircraft/vehicles within its sub-modules: the Remote Minehunting Module, the Near Surface Detection Module, the Airborne Mine Neutralization Module, the Coastal Mine Reconnaissance Module, the Unmanned Mine Sweeping Module, and the Buried Mine Hunting Module for detection and destruction of enemy mines.¹⁶²

3. Surface Warfare (SUW) Module

The SUW module is designed to give Joint Force Commanders the ability to combat small boat threats, and supports maritime security operations. This module is

¹⁵⁸ U.S. Navy, “Littoral Combat Ships – Anti-Submarine Warfare (ASW) Mission Package,” accessed March 3, 2016, http://www.navy.mil/navydata/fact_display.asp?cid=2100&tid=412&ct=2.

¹⁵⁹ Ibid.

¹⁶⁰ Ibid.

¹⁶¹ U.S. Navy, “Littoral Combat Ships - Mine Countermeasures (MCM) Mission Package,” accessed March 3, 2016, http://www.navy.mil/navydata/fact_display.asp?cid=2100&tid=437&ct=2.

¹⁶² Ibid.

specifically intended for counternarcotics interdiction missions, as well combating against terrorists and high seas piracy.¹⁶³ This module, the Navy argues, “augments the core Littoral Combat Ship sensor and weapons capabilities with gun, missile, and aviation systems, providing a layered defense capable of rapidly detecting, tracking, and prosecuting small boat threats.”¹⁶⁴ In the fight against small boat threats and maritime counternarcotics missions, the SUW module deploys: a Gun Mission Module containing a MK 46 Gun Weapon System with MK 44 MOD 2 30mm Automatic Cannon; a Surface-to-Surface Missile Module (SSMM) containing a Longbow Hellfire surface-to-surface missile system; an Aviation Module containing a MH-60R Helicopter, MK299 MOD 2 launchers with 8 Hellfire missiles, GAU21 .50 caliber machine gun, M240 7.62mm machine gun, and a Vertical Takeoff Unmanned Aerial Vehicle; and a Maritime Security Module containing two 11m Rigid Hull Inflatable Boats (RHIBs) with cradles and parts; Visit, Board, Search, and Seizure (VBSS) gear, and Boarding teams.¹⁶⁵

4. Mission Module Cost

The mission module technology is complicated in terms of cost and budget. According to the 2014 Government Accountability Office report, *Defense Acquisitions: Assessments of Selected Weapons Programs*, the LCS program office projected the total number of mission module packages to be approximately \$7.24 billion.¹⁶⁶ However, this evaluation fails to account for any modifications to the modules that occurred from the LCS program’s restructure in 2014.¹⁶⁷ Furthermore, an actual clear-cut price for each module has not been established. Instead as Congressional Research Service reports indicate, “The estimated Average Production Unit Cost (APCU) for all 59 OPN-funded

¹⁶³ U.S. Navy, “Littoral Combat Ships - Surface Warfare (SUW) Mission Package,” accessed March 3, 2016, http://www.navy.mil/navydata/fact_display.asp?cid=2100&tid=437&ct=2.

¹⁶⁴ Ibid.

¹⁶⁵ Ibid.

¹⁶⁶ U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapons Programs (GAO-14-340SP)* (Washington, DC: Government Printing Office, March 2014), 96, <http://www.gao.gov/assets/670/662184.pdf>

¹⁶⁷ Ronald O’Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background and Issues for Congress* (CRS Report No. RL33741) (Washington, DC: Office of Congressional Information and Publishing, September 23, 2015), 8.

mission packages...is \$68.9 million in Constant Year (CY) Fiscal Year 2010 dollars. This is the most accurate answer for ‘How much does it cost to buy a mission package?’”¹⁶⁸ Based on this assumption, the U.S. Navy estimates that the 59 mission modules are broken down into: 23 MCM modules at \$97.7 million per unit, 21 SUW modules at \$32.6 million per unit, 15 ASW modules at \$20.9 million per unit, and 59 sets of the Common Mission Package Equipment at \$14.8 million per unit. Though these estimates appear to establish consistent costs for the modules, their future price tags are unclear.

D. LCS BUDGET ACQUISITION AND COST: DUAL AWARD-BLOCK BUY STRATEGY

The LCS program’s budget and acquisition techniques (like those of its mission modules) are new. Upon completion of Lockheed Martin and General Dynamics’ development contracts for the initial Freedom class and Independence class platforms, in September of 2009, Congress approved a “Down Select” acquisition strategy for the new Littoral Combat Ship (LCS’s 1-4). Under this plan, the Navy would purchase four of each of the Freedom and Independence Class variants, conduct a testing phase, and decide on which variant would win the 52-ship procurement.¹⁶⁹ However, in November of 2010, the Navy convinced Congress to switch to a “Dual Award” strategy, procuring ten of each of the two proposed variants (LCS’s 5-24) in a “Block Buy” format. Here, each shipbuilder would produce “x” number of platforms at the same price (per unit) allotted in that fiscal year’s (FY) funding request, which also included a unit procurement cap for inflation purposes.¹⁷⁰ The Navy believed that shifting to a Dual Award program would sustain marketplace competition, increase the rate of procurement, decrease (per unit) costs, and that the strategy provided the ability to produce a variety of options for foreign military sales.¹⁷¹

Based on the Dual Award program with a block buy strategy, the Navy is operating on an incremental approach when purchasing LCS platforms. Here, blocks of

¹⁶⁸ O’Rourke, *Navy LCS/Frigate Program*, 8.

¹⁶⁹ *Ibid.*, 10.

¹⁷⁰ *Ibid.*

¹⁷¹ *Ibid.*

ships are procured according to adjustments made to structural and technological changes in the platform. Hence, in FY2010 when the block-buy strategy was awarded, the Navy determined that each vessel built had a target price of \$440 million and a ceiling (cap) price of \$538 million per unit for that block's fiscal year. For example, if the vessel's cost exceeded the target price of that fiscal year's (per unit) cost, the overage cost was shared by the Navy and the contractor (builder); however, if the unit cost exceeded the ceiling (cap) price, that coverage was fully absorbed by the contractor.¹⁷² Based on this notion, the President's recent budget request of FY2016 shows the Navy requested to build three LCS's in FY16 at a total cost of \$1,640.1 Million (\$479 Million per unit).¹⁷³ In each of the 4 subsequent years, the Navy is requesting: FY 2017 \$1,787.7 Million (3 units, 503.4 per unit); FY2018 \$1,759.8 Million (3 units, 514.7 per unit); FY2019 \$1,492.9 Million (3 units, 636.7 per unit); and FY2020 \$1,856.5 Million (2 units, 578 per unit).¹⁷⁴

The goal of the dual award program on a block buy strategy was to decrease production cost per each unit/vessel. From the beginning, U.S. Naval leaders vowed that the new LCS class ships would be approximately \$220 million to build; however, by 2007 that estimate had grown to over \$375 million.¹⁷⁵ In turn, after the initial cost of LCS 1 thru 4, Congress agreed to adjust the target and ceilings of the program. This change was necessary due to the cost increases from change orders, but the intended efficiency in production from two manufacturers quickly faded with the addition of a need for a new version of the LCS.¹⁷⁶ Moreover, increases to expand the lethality of the baseline ship without a mission module and to increase its survivability caused the average cost to rise from \$464 million per ship to \$473 million per ship.¹⁷⁷ Thus, according to the Navy's

¹⁷² O'Rourke, *Navy LCS/Frigate Program*, 7.

¹⁷³ U.S. Navy, "Department of the Navy Fiscal Year (FY) 2016 Budget Estimates: Shipbuilding and Conversions" (Washington, DC: Department of the Navy, February 2015), 10-1, http://www.secnave.navy.mil/fmc/fmb/Documents/16pres/SCN_Book.pdf.

¹⁷⁴ *Ibid.*

¹⁷⁵ Neil A. Pettigrew, "When Quality Slips," *Proceedings*, January 2015, 59.

¹⁷⁶ O'Rourke, *Navy LCS/Frigate Program*, 9.

¹⁷⁷ Congressional Budget Office, "An Analysis of the Navy's Fiscal Year 2015 Shipbuilding Plan" (Washington, DC: Congress of the United States Congressional Budget Office, December 2014), 26, <https://www.cbo.gov/sites/default/files/113th-congress-2013-2014/reports/49818-Shipbuilding.pdf>.

budget submission, the overall cost per ship is rising more dramatically over the next four years than predicted, and is projected to exceed the contracted ceiling price. In turn, the total cost of the program, per ship average through FY2020, is projected to be \$571.3 million per ship. This represents a \$67.4 Million per ship over budget analysis, or \$2.683 billion total over budget in the program.

E. PROGRAM ISSUES AND SETBACKS

The LCS program continues to endure strict criticisms based on their ever-increasing cost growth and design complications. As Gregory V. Cox argues, “The Navy writ large lacked a coherent vision for the LCS. Without clearly articulating what the vessel was supposed to do, the conflicting visions of survivability, lethality, modularity, speed, and manpower remained.”¹⁷⁸ Even after the first two vessels were built and commissioned, there were extreme complications with the platforms. Construction and testing found that these vessels were very susceptible to corrosion, steering problems, and their inability to locate mines.¹⁷⁹ This section illustrates the underachieving LCS platforms and their continuous complications with reduced manning and sub-par survivability/lethality.

1. Reduced Manning: No Accountability

The LCS relies heavily on sophisticated technology and automated equipment to fulfill normal day-to-day missions and evolutions. At the expense of this technology, designer’s reduced the amount of manning (crew size) required to run equipment and perform those duties of traditional ships. Their initial plans required only 40 sailors to man the entire crew; however, that number quickly grew to over 50 in a short amount of time.¹⁸⁰ In addition to the ship’s crew, another 38 sailors were needed to embark the aircraft detachment and mission module.¹⁸¹ This brought the grand total of approximately

¹⁷⁸ Cox, “Lessons Learned from the LCS,” 39.

¹⁷⁹ Pettigrew, “When Quality Slips,” 59.

¹⁸⁰ Ronald O’Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, December 24, 2015), 6.

¹⁸¹ *Ibid.*

88 sailors; whereas, traditional “frigate type” ships require approximately 200 plus.¹⁸² This appeared like a well-planned concept for the LCS; however, as a result of this considerable reduced manning instead of sailors performing most repairs and maintenance like those on traditional ships, these platforms were built to rely on contractors for maintenance and repairs.¹⁸³ In turn, there is little to no accountability for equipment, and often sailors are correcting mistakes made by contractor’s repairs.¹⁸⁴

2. Survivability and Lethality: LCS Cannot Sustain a Fight

Unlike the requirements of traditional larger combatants, the LCS platforms were not designed with unique features to sustain survivability in high-intensity combat situations and continue to carry out their mission.¹⁸⁵ Rather, these vessels were designed to have a “high ratio of lethality-to-survivability...In other words, modest survivability was acceptable to those espousing that vision.”¹⁸⁶ Situated on this vision, the Navy developed the LCS on what they standardize as a Level 1+ survivability rating based on a three level survivability-rating scale.¹⁸⁷ According to Navy standards, surface ships are designed based on one of three survivability ratings: Level I (low) vessels are mine warfare ships, patrol craft, and support ships; Level II (moderate) vessels are frigates, amphibious ships, and specialized resupply ships; Level III (high) vessels are aircraft carriers, cruisers, and destroyers.¹⁸⁸ The LCS designer’s concept was that they would be above current patrol craft (PC) and minesweeper (MCM) ships’ Level I survivability rating, yet less than the (Oliver Hazard Perry it replaced) frigates’ Level II rating.¹⁸⁹

In 2014, the U.S. Navy announced the LCS program’s mission effectiveness on survivability and lethality upon completion of a (SUW) Surface Warfare mission package

¹⁸² O’Rourke, *Navy LCS/Frigate Program*, 6.

¹⁸³ Pattigrew, “Quality Ships Fail.” 59.

¹⁸⁴ *Ibid.*

¹⁸⁵ Cox, “Lessons Learned from the LCS,” 38.

¹⁸⁶ *Ibid.*

¹⁸⁷ Sam Lagrone, “Navy Responds to Pentagon LCS Survivability Claims,” *USNI News*, January 17, 2013, <http://news.usni.org/2013/01/17/navy-responds-pentagon-lcs-survivability-claims>.

¹⁸⁸ *Ibid.*

¹⁸⁹ *Ibid.*

operational test aboard the Freedom Class LCS Platform. In turn, the Navy deemed the vessel capable of meeting the required lethal capability; however, their reports claimed that the platform did not fulfill an array of specifications.¹⁹⁰ Moreover, the Department of Defense’s Director of Operational Test and Evaluation team quoted:

There is insufficient data to provide statistical confidence that LCS can meet its lethality requirements in future testing or operations... The Navy also has not yet demonstrated that LCS will achieve its survivability requirements, and does not plan to complete survivability assessments until 2018—after more than 24 ships are either in the fleet or under construction.¹⁹¹

Based on the immense concern of these additional survivability assessments, the biggest issue facing the program is the unknown outcome of the Independence class’ aluminum hull in combat situations. Though the Freedom Class LCS was deemed effectively survivable, the Navy is unsure how the Independence will fare against an underwater explosion.¹⁹² Even during sea trials in 2010, the Independence sustained considerable damage to its hull during rough sea conditions.¹⁹³

Six years after the contractor’s delivery of the lead Freedom and Independence class hulls, their lethality and survivability are of extreme concern. Since those deliveries, the Navy has decreased numerous survivability and lethality requirements, as well as designers and contractors have truncated several design features, “making the ship both less survivable in its expected threat environments and less lethal than initially planned.”¹⁹⁴ In turn, the Navy is restructuring how the ship plans to operate on reduced capabilities.

¹⁹⁰ “Littoral Combat Ship: Knowledge of Survivability and Lethality Capabilities Needed Prior to Making Major Funding Decisions,” accessed March 10, 2016, <http://www.defense-aerospace.com/article-view/release/169942/.html>.

¹⁹¹ Ibid.

¹⁹² Ibid.

¹⁹³ Ibid.

¹⁹⁴ Ronald O’Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, January 5, 2016), 22.

On March 4, 2015, Secretary of the Navy Ray Maybus briefed Congress and lawmakers on potential and expected survivability and lethality upgrades to LCS platforms in response to former Secretary of Defense Chuck Hagel's February 2014 decision to restructure the LCS program for development of a new small surface combatant.¹⁹⁵ This brief identifies that, beginning with FY 2019 construction ships through LCS hull number 32, will undergo extensive survivability and lethality upgrades, adding that the proposed modifications would cost an additional \$65-\$70 million (20 percent of the actual cost of the ship) to the original ship price for those upgrades.¹⁹⁶ Furthermore, based on Secretary Hagel's announcement for the LCS restructure, Maybus stated that,

I am concerned that the Navy is relying too heavily on the LCS to achieve its long-term goals for ship numbers. Therefore, no new contract negotiations beyond 32 ships will go forward...The LCS was designed to perform certain missions—such as mine sweeping and anti-submarine warfare—in a relatively permissive environment. But we need to closely examine whether the LCS has the independent protection and firepower to operate and survive against a more advanced military adversary and emerging technologies...Additionally, at my discretion, the Navy will submit alternative proposals to procure a capable and lethal small surface combatant, generally consistent with the capabilities of a frigate.¹⁹⁷

Based on this direction, it is evident that the LCS program has not lived up to its expectations and though it continues to display ongoing complications, the 24 LCS ships currently under contract are still being pushed into service to fulfill important roles in the Navy force structure.

¹⁹⁵ Kris Osborn, "Navy Plans to Expand, Speed-Up LCS Modifications," *Military.com*, March 4, 2015, <http://www.military.com/daily-news/2015/03/04/navy-plans-to-expand-speed-up-lcs-modifications.html>.

¹⁹⁶ *Ibid.*

¹⁹⁷ Ronald O'Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, January 30, 2015), 22

V. ANALYSIS: OHP FFG 7 VS. LCS

The United States Department of Defense uses specific attributes to delineate effective criteria in weapon systems, tactics, training, and other military functions. Based on this approach, the DoD uses various measures of effectiveness to determine if those criteria are met based on “results achieved in the overall mission and execution of assigned tasks.”¹⁹⁸ Those criteria measures must meet or exceed three basic qualities: Validity, Reliability, and Practicality.¹⁹⁹ Validity demonstrates whether the system does what it is intended to do, reliability determines whether the system has been proven, and practicality measures whether the system is worth the associated price tag.²⁰⁰ This section will examine if the Oliver Hazard Perry Frigate or the LCS class ships meet the DOD’s criterion requirements as an effective maritime security combatant, and also determine which class of combatant is best suited for production in the maritime counternarcotics mission.

A. OLIVER HAZARD PERRY VALIDITY: DOES IT DO WHAT IT IS INTENDED TO DO?

The Perry class frigate rarely carried out its primary mission capabilities in Anti-Submarine Warfare and Air Defense; yet, it was indispensable in conducting maritime security operations. It was not that these vessels could not perform the certain tasks of anti-submarine warfare or air defense; rather, they were rarely in the position to perform such missions. Once the Perry’s primary role shifted to the maritime counternarcotics mission, this class excelled at eradicating the maritime drug trade, especially between 2012-2015, serving as the predominate interdiction vessels and capturing 400 metric tons of cocaine.²⁰¹

¹⁹⁸ Adapted from “Decision Elements” (United States Naval War College: College of Distance Education, May 2011), 4, <https://cle.nps.edu/access/content/group/c0814101-fdff-438e-891f-999a288f9/TSDM%2029/TSDM%2029-1%20Decision%20Elements.pdf> & Ronald E. Ratcliff, *Choosing Among Alternatives* (The United States Naval War College National Security Decision Making Department, January 2006), 9-1.

¹⁹⁹ Ibid.

²⁰⁰ Ibid.

²⁰¹ “Hearing on Western Hemisphere Drug Interdiction Efforts.”

The Perry class has capabilities that other smaller patrol craft do not possess. This frigate has the perfect size, weight, speed, weaponry, and aircraft deployment for the mission of countering the narcotic trade. As naval reports assert, “Global reach from these frigates completing this type of mission has proven to have positive effects for multinational relationships as well as national defense by slowing the flow of illegal drugs into the United States.”²⁰² Furthermore, slowing the flow of these illegal narcotics on missions such as the successful counternarcotics deployment of the USS Rodney M. Davis (FFG 60) in 2009 where it intercepted over 24 tons of cocaine and three tons of marijuana,²⁰³ demonstrates the Perry class’ combined validity to launch helicopters and UAV patrols, their speed in intercepting traffickers, and the robustness of their platforms while performing as a maritime security surface combatant.

B. OHP’s RELIABILITY: HAS IT PROVEN ITSELF?

The Perry class frigate’s multirole platform was designed and built to be cheap and dispensable after a 15-20 year service life. But the vessel’s robust and battle-tested hulls proved their capabilities in excess of 30 plus years. Serving as protectors of shipping, oil platforms in the Persian Gulf, and recently eradicating narcotics bound for the United States, the Perry class established an unparalleled reputation as one of the top surface combatants. These vessels reduced the need for larger operational combatants need to break away from normal operations to perform unconventional missions such as counternarcotics operations and humanitarian efforts. Kit Bonner writes that the Perry class, “Has supported Coast Guard operations against illegal drugs in the Eastern Pacific and Caribbean; embarked inspections teams for suspicious vessels in the Arabian Gulf; enforced economic sanctions; acted as escorts for tankers, and just been available for virtually every task the nation asked of it.”²⁰⁴ This workhorse class exemplified the

²⁰² U.S. Navy, “Rodney M. Davis Seizes, Disrupts Tons of Narcotics, Returns to Homeport,” *M2 Presswire*, April 24, 2009, <http://search.proquest.com.libproxy.nps.edu/docview/446146897/abstract/D7E3CDA0F87C4B8FPQ/1>.

²⁰³ *Ibid.*

²⁰⁴ Kit Bonner, “Search for the Perfect Frigate,” *Sea Classics*, December 2003, <http://search.proquest.com.libproxy.nps.edu/docview/236050569/citation/8E5416FD21364A23PQ/1>.

textbook role of a patrol combatant and their extended commitment to the maritime counternarcotics mission.

C. OHP's PRACTICALITY: IS IT WORTH THE ASSOCIATED PRICE TAG?

On the basis of delivering great products on time and under budget, the Perry class frigate program became the model program for future shipbuilding.²⁰⁵ Though the platform suffered setbacks (like many weapons systems do) during the design and production phase, the Perry's final \$194 million price tag²⁰⁶ remained a fraction of its larger destroyer and cruiser counterparts, giving the Navy the ability to build in mass quantities. Furthermore, experts convey,

The FFG-7 Oliver Hazard Perry class frigates comprise an interesting defense procurement case study. The ships are widely touted as a successful example of cost containment and escaping "requirements creep" —both of which have been major weaknesses in U.S. Navy acquisition. The result was a capable 3600-4100 ton anti-submarine platform, with secondary air defense and anti-ship capabilities.²⁰⁷

As a result, the Perrys were resilient, malleable, and surpassed any expectations that their original designers envisioned.²⁰⁸ These relatively inexpensive combatants remained highly vigilant and valuable to the current maritime security geopolitical situation, and thus, demonstrated that the price was worth the overall gain.

D. LITTORAL COMBAT SHIP VALIDITY: DOES IT DO WHAT IT WAS INTENDED TO DO?

The LCS concept, to date, has not successfully demonstrated its platform's intended mission capabilities. The steady struggle with the platform's survivability, robustness, manning, maintenance, and mission modules raises doubts for Congress, engineers, and the crewman who serve aboard them. The issue with the LCS program is that the combatant's capabilities and mission sets are consistently based on promises

²⁰⁵ Bloom, "Bargain Basement Workhorse."

²⁰⁶ Stolarow, *Navy's FFG-7 Class Shipbuilding Issues*.

²⁰⁷ Bloom, "Bargain Basement Workhorse."

²⁰⁸ *Ibid.*

from their designers. As reports show, “Supporters herald the ship type’s advantages. But eight years after construction began on the first ship, one inarguable fact remains—no LCS has yet been sent on a mission for which it was designed.”²⁰⁹

The LCS’s designed capability to incorporate the “plug and play” mentality regarding its mission modules is failing. The Freedom and Independence class platforms (in concept) were supposed to have the capability to interchangeably deploy three mission modules: SUW, ASW, and MCM. However, the SUW and ASW packages have never been tested or produced for the Independence class (LCS 2) variant, and the MCM package has never been tested aboard the Freedom class (LCS 1) variant.²¹⁰ Only the SUW package aboard the Freedom variant platform has successfully demonstrated mission modules’ designed parameters during its 2010 deployment to the Caribbean.²¹¹ Additionally, during operational tests of the ASW module for the Freedom class, engineers discovered that the module’s package is five tons too large for operations or placement within the ship’s stowage space.²¹² Based on this information and because both LCS variants cannot operate each of the mission modules, it is accurate to assess that the LCS in its 12-year development and testing phase has not proven its validity per its designed mission and capabilities.

E. LCS RELIABILITY: HAS IT PROVEN ITSELF?

The LCS program in its entirety is not proven. The problems involved in planning, developing, and constructing both LCS variants continue to prevent development of a replacement frigate in the U.S. Navy fleet force structure. As previously stated, the LCS program has only completed one deployment type mission

²⁰⁹ Christopher P. Cavas, “U.S. Navy’s LCS Yet To Fulfill Its Promise,” *Defense News*, April 16, 2012, <http://search.proquest.com.libproxy.nps.edu/docview/1010245923/abstract/7BF2591F3FF34F30PQ/1>.

²¹⁰ Ronald O’Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, June 12, 2015), 33-35.

²¹¹ “Navy Learning A Lot About Freedom’s Capabilities From First Deployment,” *Defense Daily*, March 23, 2010, <http://search.proquest.com.libproxy.nps.edu/docview/234068640/abstract/4D139A1C64F94C21PQ/1>.

²¹² *Ibid.*

(aboard the Freedom class variant) where it was deemed effective. Other missions and routine testing have proven unsatisfactory.

In recent events, the LCS has suffered multiple failures with its engineering and propulsion systems. Additionally, designers recently canceled testing and production of the unmanned Remote Multi-Mission Vehicle (RMMV),²¹³ which has been in development and testing since the beginning of the program. The engineering failures occurred aboard the new *USS Milwaukee* (LCS 5) during its transit from the shipyard in Marinette, Wisconsin. The *Milwaukee* had to completely lock its shafts/propellers (stop propulsion) as a result of multiple alarms and issues to its combining gear, leaving the vessel dead in the water.²¹⁴ The combining gear, according to engineers, is “the complex gearing that links the output of the ships’ Rolls Royce MT-30 gas turbine engines with its Colt-Pielstick diesel engines and then to the ships shafts that drive the water jets.”²¹⁵ Furthermore, a couple weeks after the *Milwaukee*’s incident, its sister ship *USS Fort Worth* (LCS 3), suffered similar issues with its combined gear, sidelining it indefinitely in Singapore until repairs are made.²¹⁶ Yet, even more troubling, prior to these two incidents, in January 2016 the *USS Freedom* LCS 1 (lead ship in its class) suffered combining gear issues during a shipyard period.²¹⁷ These engineering issues along with unproven mission modules show that the LCS has been unreliable both in combat situation and day-to-day operations.

F. LCS PRACTICALITY: IS IT WORTH THE ASSOCIATED PRICE TAG?

The LCS program and its dual award block buy strategy were intended to increase marketplace competition. Having two different variants built at two different shipyards

²¹³ Sydney J. Freedburg Jr, “Navy Scraps RMMV Mine Drone, Accelerates CBARS,” *Breaking Defense*, February 26, 2016, <http://breakingdefense.com/2016/02/navy-scraps-rmmv-mine-drone-accelerates-cbars/>.

²¹⁴ Sam Lagrone, “Littoral Combat Ship USS Fort Worth Sidelined in Singapore with Propulsion System Damage,” *USNI News*, January 21, 2016, <https://news.usni.org/2016/01/21/littoral-combat-ship-uss-fort-worth-sidelined-in-singapore-with-propulsion-system-damage>.

²¹⁵ *Ibid.*

²¹⁶ *Ibid.*

²¹⁷ *Ibid.*

was supposed to drive down the overall price of LCS ships. Benefits raised by the Navy in 2010 for shifting to a Dual Award program were sustaining marketplace competition, an increase in rate of procurement, a drop in per unit costs, and the ability to produce a variety of options for foreign military sales. However, the price has risen from its initial \$220 million price tag to nearly \$600 million (not including its mission modules) per ship under the Dual Award program,²¹⁸ and there have been zero military sales or any interest in the vessels outside of the U.S. Furthermore, the two shipyard's existing infrastructures were supposed to enable faster production, but neither has been able to keep up with the Navy's inventory strategy. As a result the *USS Coronado* (LCS-4) was delivered six months behind schedule, and U.S. naval leaders expect a serious delay in the next seven ships.²¹⁹

With the ongoing problems of the LCS program and its inability to prove its concept, mission modules, survivability issues, or daily ship operations, it is controversial that the Navy continues to procure these vessels. As congressional reports identify,

The Navy continues to procure LCS frames, even though the sub-systems necessary to meet full mission package requirements have not yet been fully developed, demonstrated, and integrated with either seaframe class. Integrating these systems on the LCS seaframe is challenging because of limitations on space and weight inherent in the seaframe designs. The Navy will not achieve the capability to meet full requirements for all three of the mission packages until 2020, by which time it plans to take delivery of 24 ships.²²⁰

Based on these facts and the LCS's tremendous degradations, limitations to combat ability, and soaring construction costs, the \$600 million plus price tag for these vessels is an insufficient use of defense spending for a new maritime security combatant.

²¹⁸ Brian Danielle, "POGO Letter: Congress Should Require That The Navy Give It More Time to Mull Littoral Combat Ship Acquisition Change," December 9, 2010, <http://www.pogo.org/our-work/letters/2010/ns-lcs-20101209.html>.

²¹⁹ Congressional Budget Office, *An Analysis of the U.S. Navy's 2015 Shipbuilding Plan* (Washington DC: Congressional Budgeting Office, 2015).

²²⁰ O'Rourke, *(LCS)/Frigate Program*, 32.

G. COMBATANT WINNER: OLIVER HAZARD PERRY FRIGATE (FFG-7)

The Oliver Hazard Perry class frigates are well proven surface combatants, which if reproduced and placed back into the U.S. Navy's fleet force structure would be an indispensable and cost effective solution for counternarcotics and other maritime security missions. The LCS class, because of its cost growth issues, survivability, and mission module uncertainties has failed to meet the capabilities and readiness gaps that the Perry class frigates maintained for 30 years. Moreover, former Secretary of Defense Hagel's 2014 statement "to submit alternative proposals to procure a more lethal and survivable small surface combatant with capabilities consistent with those of a frigate"²²¹ point directly to reviving the Oliver Hazard Perry's design and proven performance.

The Perry class frigate design is old and is consistent with 1970s architecture. Yet, the effectiveness of the hull and design is proven from 30 plus years of data and service accolades. To address the former Secretary's remarks of obtaining a more lethal and survivable combatant, it is more cost and time efficient to update and produce the Perry class.²²² To redesign, construct, and test a new frigate is not affordable for defense leaders at this time. That said, addressing the multi-mission role of a modern day frigate and the simple patrol/counternarcotics mission, I propose to begin construction of the Perry class frigate, but in two different variants to fulfill the Navy's dying need for strength in numbers. The two variants: Guided Missile Frigate (FFG) and a Fast Frigate (FF). These two variants demonstrate the ability for the U.S. Navy to supplement their fleet with numerous battle-proven and cost effective platforms (one variant with conventional guided missile capabilities and the other variant with patrol and law enforcement capabilities) to "count against the Navy's goal for achieving and maintaining a fleet of 308 ships"²²³ in its 30-year (FY2016-FY2045) shipbuilding plan.

²²¹ Ronald O'Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, January 30, 2015), 13.

²²² Norman Polmar, "Where Are the Frigates?" *Proceedings*, June 2013, 86-87.

²²³ Ronald O'Rourke, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress* (CRS Report No. RL32665) (Washington, DC: Office of Congressional Information and Publishing, June 9, 2015), 1.

1. Guided Missile Frigate (FFG)

The modern Perry class FFG would be essential in providing additional support to U.S. Navy cruiser and destroyer battle groups, and will alleviate the need for multiple high price assets deployed, resulting in more time for routine maintenance. The new FFG would be much similar to its predecessor. Its overall design and architecture, survivability standards, engineering plant, and aircraft capabilities should mimic the old Perry class entirely. The only changes would come to the combat systems suite where the old MK 13 missile launcher (formerly removed from the older Perrys), should be replaced with a small Vertical Launch System (VLS) to accommodate a surface guided anti-air defense missile like the SM2, as well as the offensive Harpoon anti-ship missile, and Evolved Sea-Sparrow Missiles.²²⁴ In addition, the combat systems controls should be updated with newer and smaller fire control radars, surface search radars, and an electronic warfare suite. To achieve this multi-role frigate, it does not require re-designing or restructuring the platform; rather, duplicating the Australians updated Perry (Adelaide) class frigates. These platforms already accommodate the proposed changes and are proving as a formidable asset to the Australian Navy.²²⁵

2. Fast Frigate (FF Patrol Frigate)

The maritime security/patrol frigate (FF) would be the essential patrol combatant for the counternarcotics mission, as well as aiding in humanitarian efforts. This variant's design, structural and engineering requirements are duplicates of the newly updated FFG. The major difference is that these vessels would be a guided missile-less version of the FFG, thus dropping the "G" from its designation to (FF). These patrol craft would not have missiles, fire control radars, or electronic warfare suites onboard, conserving weight and providing increased speed. Thus, the (FF) would be aircraft capable like that of its fellow FFG, and the ship's armament will be as those of the retired Perry class used in counternarcotics missions: multiple .50 and .247 caliber machine gun mounts, top

²²⁴ Sean Gallagher, "Why the Navy Needs More than Just More Ships," *Ars Technica*, September 30, 2015, <http://arstechnica.com/information-technology/2015/09/why-the-navy-needs-more-than-just-more-ships/>.

²²⁵ Ibid.

mounted 76-mm Mark 75 deck gun, and one aft mounted 20-mm Mk 15 Close in Weapons System (CIWS).²²⁶

Considering the immense surface weaponry and the centralized mission on counternarcotics, the FF would also be fitted with small additional upgrades essential for these missions. The forward location where the FFG's missile bay is located would be designed to accommodate a storage facility for seized narcotics. This capability would give ship's crew the ability to load the contraband from the top deck down, sealing it in the storage holding area until time to pull into port for offload. Additionally, the ship would be fitted with four small holding cells for those traffickers intercepted, and these vessels would have semi-upgraded helicopter hangars to accommodate the MH-60 helicopters and UAV MQ-8B Fire Scouts alike. These upgrades and aircraft launching capabilities give the FF patrol frigate an immense advantage in conducting search and seizure missions against the maritime narcotic trade.

3. FFG and FF Price

A key question when introducing any type of new or old weapons system is: what will the cost be? This particular case is interesting because the U.S. Navy has never retired a vessel class and brought it back. So, establishing a set production price is difficult. However, based on the Oliver Hazard Perry's previous production price tag, we can assert estimates close to modern production costs for both variants.

The original Perry class frigates presented the Navy with a highly capable surface combatant at a fraction of the price of other ships in the Navy. Their \$194 million per unit cost,²²⁷ as a result of inflation, carries an estimated \$708 million in 2016 dollars.²²⁸ Though this price appears higher than the LCS, the Perry class FFG is a proven capable platform not in need of significant research and development price increases like that of

²²⁶ Saunders, *Jane's Fighting Ships*, 945.

²²⁷ Stolarow, *FFG-7 Shipbuilding Issues*, 4.

²²⁸ Price calculation adapted using the U.S. Inflation Calculator. This U.S. Inflation Calculator uses the latest U.S. government Consumer Price Index (CPI) from 1913 to present. Data published on April 14, 2016 to adjust for inflation and calculate the cumulative inflation rate through March 2016, <http://www.usinflationcalculator.com>.

the LCS. Current LCS figures reach nearly \$600 million in recent years, not including their mission packages (needed for mission success), and the vessels have significant survivability issues which defense leaders expect an additional \$65-\$70 million²²⁹ in structural modifications on top of its current price point. At these estimations, the LCS is reaching in excess of \$700 million in price; but, one fact will continue to remain, will it be able to meet its designed specifications/mission sets, and it will it be as survivable as the Perry class FFG? The LCS program's 12-year history does not support these proposed notions.

The new Perry FFG and FF could be cost effective vessels that will exceed those expectations of the hopeful LCS. Similar to the planned shipbuilding contracts for the LCS (before multiple issues were discovered in the design and mission modules) and other previous naval platforms, the newly constructed Perry FFG is capable of staying below the \$600 million price tag with the aid of building the FF variant in the same shipyard. Based on this notion, building multiple baseline platforms in the same shipyard would create a bulk buy price tag, driving the per unit cost down. Additionally, because the FF variant would not have expensive technological weapons, weapons systems, and sensors installed on them, this variant's price tag would be a fraction of its guided missile variant counterpart. Thus, these FF variants can potentially be built around the \$400-\$500 million price point. In turn, consistently producing multiple baseline platforms at \$400-\$600 million (depending on the Navy's need for an FFG or more FF's), gives the U.S. Navy flexibility in determining its future fleet force structure. In conclusion, the Perry class frigates' historical operational capabilities, unforeseen major design changes, and expected price point demonstrates why it is a better option for use as a multirole and counternarcotics frigate over the LCS or a newly designed surface combatant.

²²⁹ Kris Osborn, "Navy Plans to Expand, Speed-Up LCS Modifications," *Military.com*, March 4, 2015, <http://www.military.com/daily-news/2015/03/04/navy-plans-to-expand-speed-up-lcs-modifications.html>.

VI. CONCLUSION AND RECOMMENDATIONS

The immense threat of transnational criminal organizations is severely detrimental to United States security and their neighboring economic and security partnerships. Most notably, these organizations threaten western regional stability and governmental legitimacy, propagate violent criminal activity, and promote terrorism.²³⁰ In turn, their primary income source—narcotics trafficking—must be eliminated from its main transportation routes on the high seas. This mission requires stable and proven interdiction ships, capable of employing weapons, launching helicopter reconnaissance operations, and deploying boarding teams to interdict those narcotics. In addition, when not engaged in such operations, these vessels must be malleable and easily adaptable for training with foreign navies and coast guards during other maritime security missions.

Maritime security operations do not require a great deal of technology or sophisticated weaponry to effectively conduct these missions. Often, the U.S. Department of Defense relies heavily on technology in modern day operations and not enough on what they know and consistently works well. The Oliver Hazard Perry frigate demonstrated this consistency for 30 plus years, and up to its final deployment of the last OHP frigate in service in 2015, proved to be a formidable asset in counternarcotics operations. The LCS however, does not demonstrate this consistency nor is it the answer for future maritime security operations. Their inconsistency, lethality, and survivability issues potentially pose complications to maritime security operations and the other missions. Department of Defense leaders and naval superiors alike are consistently searching for answers, hoping the LCS platform will achieve its designed mission capabilities; however, these chances appear to be unlikely given their plagued history.

²³⁰ Bob Killebrew and Matthew Irvine, *Security Through Partnership: Fighting Transnational Cartels in the Western Hemisphere* (Washington DC: Center for a New American Security, March 2011), 1.

Based on the research and finding of this thesis, it is important to consider a few recommendations based on the current narcotics threat to maritime security:

- Cease all construction and funding for the LCS program beyond the 24 vessels currently under contract in the dual strategy block buy format. Additionally, do not fund the research and development for lethality and survivability modifications to current and under contract vessels, and cease all future funding for procurement, research and development of the LCS's mission modules.
- Reinstigate the plans for constructing brand new (battle proven) Oliver Hazard Perry frigates. Utilize liaisons with Australian ship designers on making the required minimal modernized upgrades that exists on their current formidable upgraded OHP FFG frigates, and then begin design modifications for the less weaponized FF for counternarcotics and other maritime security operations.
- Cease all research and development of a new small surface combatant currently being developed based on the current LCS hulls. Utilizing these vessels, as a baseline design is inefficient and not effective based on existing issues. As O'Rourke criticizes, "Before you commit tax payer dollars to a weapons program, you traditionally take three steps: 1. Identify capability gaps and mission needs; 2. Compare potential general approaches for filling those capability gaps or mission's needs; 3. Refine the approach selected as the best or most promising."²³¹ The proposed redevelopment of a new surface combatant based on the LCS design disregards the initial two steps.²³²

It is imperative for future maritime security and counternarcotic operations to have a proven, stable, and lethal combatant. The most proven and logical candidate for those operations points toward reconstructing the retired Oliver Hazard Perry frigate class. However, because the less capable LCS ships are under contract for 24 vessels and construction stoppage unforeseeable, it is imperative for the LCS to fulfill maritime security and counternarcotic operations until construction of the new Perry is completed. Once construction is complete, the new Perry fast frigates will regain control of thwarting further narcotic trafficking on the high seas.

²³¹ Ronald O'Rourke, *Navy Littoral Combat Ship (LCS)/Frigate Program: Background, Issues, and Options for Congress* (CRS Report RL33741) (Washington, DC: Office of Congressional Information and Publishing, January 30, 2015), 20.

²³² Freedburg Jr., "McCain Warns Navy on LCS Upgrade."

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