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ACQUIRING THE TOOLS OF GRAND STRATEGY:

THE US NAVY'S LCS AS A CASE STUDY

by

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## ABSTRACT

### ACQUIRING THE TOOLS OF GRAND STRATEGY: THE US NAVY'S LCS AS A CASE STUDY

Sean P. Murphy  
Old Dominion University, 2017  
Director: Dr. Regina Karp

Grand strategy is about how states allocate resources and employ these resources to achieve desired political conditions. In examining the match between desired ends and available ways and means, an often-overlooked subject is how the specific tools of grand strategy are forged. One of these tools is the Littoral Combat Ship (LCS), a Major Defense Acquisition Program (MDAP) that started in 2000. LCS remains a controversial and often unpopular program with many stakeholders to this day. This study examines how the means of grand strategy, in this case a new ship class, are acquired. It also looks at how these means are employed (ways) to achieve the desired outcomes (ends) and the feedback loop between means, ways, and ends. The initial portion of the study examines how the U.S. Department of Defense and Department of the Navy formally acquire systems or “systems of systems.” The second portion of the study examines the design, construction, and fielding of the LCS class or the attainment of Initial Operational Capability (IOC). The final portion analyzes the design, construction, and introduction of the LCS into the fleet in terms of the three models used by Graham Allison and Philip Zelikow in *Essence of Decision*; the Rational Actor Model (RAM), Organizational Behavior, and Governmental Politics – Models I, II, and III respectively. The hypothesis is that individual personalities may have more influence than any of these models account for and that instances of individual impact may offer more nuanced insights into these models of state behavior. This study reveals that the process of evolutionary acquisition and spiral development caused increased risk in the time-line for achieving Final Operational

Capacity (FOC) of LCS. It also provides insight into the reaction and adaption of a large organization to changes in its environment. This study does not however reveal strong evidence to support the hypothesis of individual personalities significantly influencing decision making or action taking compared to organizations in Models I-III. The details of individual participation and internal deliberations are obscured by security and proprietary rules which privileges models I and II in the analysis.

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This thesis is dedicated to my parents and especially to my Mom for giving me the tools and support to succeed and for teaching me the determination to work at it. I also need to acknowledge the academic debt I owe to Tulane University, my undergraduate alma mater; many of the academic skills needed for this dissertation were inculcated in me there. To the late Dr. Blake Touchstone, who served as the director for my history department honors thesis and the inimitable Dr. Kenneth W. Harl, who was and still is my academic idol and inspiration; I also owe a debt of appreciation – thank you gentlemen. I also need to thank my fellow GPIS students for their academic interest and expertise, I often learned more from discussions with my classmates than any of the assigned reading or other scholarly works to which we were exposed. Last but most certainly not least, I need to thank my blushing young bride of 20 years for her support and motivation, especially during the research and writing of this work. Thank you Janeth.

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There are indeed many people who have contributed to the successful completion of this dissertation. I need to thank the various fellow contractors, naval officers, and government acquisition professionals who must remain anonymous but were willing to answer my questions about the Littoral Combat Ship (LCS) and spared their time to do so. The consummate professionals at Old Dominion University's Perry Library also earned my appreciation for their research support, Inter-Library Loan program, and workshops on Endnote and other esoteric facets of academe. I also need to thank all of the professors in Old Dominion University's Graduate Program in International Studies (GPIS) notably Dr. Kurt Gaubatz, Dr. Steve Yetiv, Dr. David Earnest, and Dr. Simon Serfaty. I also very much need to extend my gratitude to the members of my dissertation committee; Dr. Jesse Richman, Dr. Patrick Hester, and most all to my dissertation director, Frau Doktor Professorin Regina Karp – Vielen Dank!

## NOMENCLATURE

## ACRONYMS

A2AD	Anti-Area Access Denial
ABS	American Bureau of Shipping
ACAT	Acquisition Category
AoA	Analysis of Alternatives
ASN (RD&A)	Assistant Secretary of the Navy for Research, Development, and Acquisition
ASROC	Anti-Submarine Rocket Thrown Torpedo
ASuW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
BAE	British Aerospace and Engineering
C2	command and control
C3	Command, control, and communication
CAD	Computer-Aided Design
CAE	Component Acquisition Executive
CARAT	Cooperative Afloat Readiness and Training
CDC	Centers for Disease Control
CDD	Capability Development Document
CFFC	Command, Fleet Forces Command
CJCS	Chairman of the Joint Chiefs of Staff
CLIN	Contract Line Item Number
CNAN	Capabilities of the Navy After Next
CNO	Chief of Naval Operations



COBRA	Coastal Battlefield Reconnaissance and Analysis system
COCOM	Combatant Commander
COMOPTEVFOR	Commander, Operational Test and Evaluation Force
CONOP	Concept of Operations
CONUS	Continental United States
COTS	Commercial off the Shelf
CPSU	Communist Party of the Soviet Union
CR	Continuing Resolution
CSBA	Center for Strategic and Budgetary Studies
DAS	Defense Acquisition System
DDG	guided missile destroyer
DFARS	Defense Federal Acquisition Regulations Supplement
DNS	Director Navy Staff
DoD	Department of Defense (U.S.)
DON	Department of the Navy
DOTMLPF-P	Doctrine, organization, training, materiel, leadership & education, personnel, facilities, and policy
DRPM	Direct Reporting Program Managers
EBO	Effects Based Operations
EMD	Engineering and Manufacturing Development
EU	European Union
EVMS	Earned Value Management System
EWG	Expeditionary Warfare Grid
FAR	Federal Acquisition Regulations
FBE	Fleet Battle Experiment

FF	fast frigate
FFP	firm-fixed price
FHA	Foreign Humanitarian Assistance
FMS	Foreign Military Sales
FOC	Final Operational Capability
FRPDR	Full Rate Production Decision Review
GAO	Government Accounting or Accountability Office
GDIT	General Dynamics Information Technology
HM&E	Hull, mechanical, and electrical
HSV	High-speed Vessel
HUBZones	Historically Under-utilized Business Zones
HVAC	heating, ventilation, and air conditioning
HVU	high-value unit
IA	Information Assurance
IAMD	Integrated Air and Missile Defense
IBR	Integrated Baseline Review
ICD	Initial Capability Document
IDIQ	Indefinite Delivery Indefinite Quantity
IED	improvised explosive device
IJN	Imperial Japanese Navy
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
ISAR	Intelligence, Surveillance, and Reconnaissance
IT	Information Technology
IWS	Integrated Warfare System

JCIDS	Joint Capability Integration Development System
JFCOM	US Joint Forces Command
JMWAG	Joint Multi-Warfare Analytical Game
JROC	Joint Resources Oversight Committee
JSF	Joint Strike Fighter (F-35 Lightning II)
KPP	Key Performance Parameters
KSA	Key System Attributes
LCS	Littoral Combat Ship
LHA	Landing helicopter, amphibious
LMW	Littoral Mine Warfare
LPTA	Lowest Price Technically Acceptable
LSS	Littoral Sensor System
MAD	Mutually Assured Destruction
MATOC	Multiple Award Task Order Contract
MCM	Mine Counter Measures
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Material Development Decision
MILCON	Military Construction
MIW	Mine Warfare
MM	Mission Modules
MNV	Mine Neutralization Vehicle
MoD	Ministry of Defence (UK)
MOE	Measure of Effectiveness
MOP	Measure of Performance

MP	Mission Package
MPRA	Maritime Patrol and Reconnaissance Aircraft
MRAP	Mine-Resistant Ambush Protected (vehicle)
MT	Metric Tons
NATO	North Atlantic Treaty Organization
NAVSEA	Commander, Naval Sea Systems Command
NCCA	Navy Center for Cost and Analysis
NDAA	National Defense Authorization Act
NDI	Non-Development Items
NETWARCOM	Network Warfare Command (Navy)
NOACE	Navy Open Architecture Computing Environment
NPS	Naval Post-Graduate School
NSC	National Security Cutter (USCG)
NWDC	Navy Warfare Development Command
NWS	Naval Warfare Systems
OEM	Original Equipment Manufacturer
ONR	Office of Naval Research
OOD	Officer of the Deck
OPEC	Organization of Petroleum Exporting Countries
OPLAN	Operation Plan
OPNAV	Office of the Chief of Naval Operations
OSD	Office of the Secretary of Defense
OT&E	Operational Test and Evaluation
OTHWS	Over the horizon weapons system
PBL	Performance Based Logistics

PC	Patrol Coastal
PD-IRD	Preliminary Design Interim Requirements Design Documents
PEO	Program Executive Office
PLA(N)	People's Liberation Army (Navy)
PMB	Performance Measurement Baseline
PMS	Program Manager, Ships
PMS	Preventive Maintenance System
PPBE	Planning, Programming, Budgeting, and Execution system
PPBS	Planning, Programming, and Budgeting System
PWS	Performance Work Statement
R&D	Research and Development
R3B	Resources and Requirements Review Board
RAM	Rational Actor Model
RD&A	Research, Development, and Acquisition
RDT&E	Research, Development, Testing, and Evaluation
RFP	Request for Proposal(s)/Price(s)
RMA	Revolution in Military Affairs
RMMV	Remote Multi-Mission Vehicle
RMS	Remote Minehunting System
RN	Royal Navy
RPM	revolutions per minute
SD	Spiral Development
SDS	System Design Specifications
SLOC	Sea Line of Communication
SOF	Special Operations Forces

SOP	Standard Operating Procedure
SOW	Statement of Work
SRA	Segment Reference Architecture
SSDG	ship's service diesel generator
SSM	surface to surface missile
SSP	Strategic Systems Programs
SURFPAC	Commander, Naval Surface Force Pacific Fleet
SUW	Surface Warfare
SWDG	Surface Warfare Development Group
SWO	Surface Warfare Officer
SYSCOM	Systems Command
TD	Technology Development
TLA	Three Letter Acronym
TLRD	Top-level Requirements Document
TOC	Total Ownership Cost
TSCP	Theater Security Cooperation Plan
TSOA	Total Ship Open Architecture
TTP	Tactics, techniques, and procedures
TYCOM	Type Commander (Navy)
UAV	Unmanned Aerial Vehicle
UK	United Kingdom
UN	United Nations
USDA	US Department of Agriculture
USFF	United States Fleet Forces
USN	United State Navy

UUV	Unmanned Underwater Vehicle
WAS	War at Sea
WTO	World Trade Organization

## TABLE OF CONTENTS

Chapter	Page
LIST OF TABLES .....	xvi
LIST OF FIGURES .....	xvi
CHAPTER 1 .....	1
INTRODUCTION .....	1
GRAND STRATEGY .....	7
THE RETURN OF GEO-POLITICS? .....	14
CONSTRUCTIVIST GRAND STRATEGY .....	18
NAVAL STRATEGY .....	21
THE FUTURE FLEET PLATFORM ARCHITECTURE STUDIES .....	25
CONCLUSION .....	31
CHAPTER 2 .....	32
THE U.S. DEFENSE “MARKET” .....	32
THE UNITED KINGDOM (UK) VERSION .....	39
THE FEDERAL ACQUISITION PROCESS .....	41
THE REQUEST FOR PROPOSAL (RFP) AND AWARD .....	49
SECNAVINST 5000.2E, “DEPARTMENT OF THE NAVY IMPLEMENTATION AND OPERATION OF THE DEFENSE ACQUISITION SYSTEM AND THE JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM” .....	52
FLEXIBILITY IN ACQUISITION .....	58
SECNAVINST 5000.2E (CONT.) .....	59
SECNAVINST 5000.2E: THE TWO PASS, SIX GATE SYSTEM .....	62
SECNAVINST 5000.2E – CHAPTER TWO .....	70
THE ACTUAL ‘PROCUREMENT’ OF SYSTEMS AND SYSTEMS OF SYSTEMS .....	72
A SOLICITATION OR REQUEST FOR PROPOSALS OR QUOTES (RFP OR RFQ) .....	73
SUMMARY .....	76
CHAPTER 3 .....	78
THE STRATEGIC CONTEXT .....	80
THE BIRTH OF A CONCEPT .....	84
THE NAVAL POST-GRADUATE SCHOOL STUDY .....	88
CROSSBOW .....	89



SEA LANCE.....	91
THE WAR GAMING .....	98
THE CONCEPT “OPERATIONALIZED” OR “THE SOLICITATION” .....	102
THE STATEMENT OF WORK (SOW) .....	103
THE CONCEPT OF OPERATIONS.....	109
THE NAVY OPEN ARCHITECTURE GUIDANCE.....	113
THE RESPONSE REQUIREMENTS (AKA “THE PROPOSAL”) AND THE ASSESSMENT CRITERIA .....	124
THE PRECEDENT.....	127
CHAPTER 4 .....	130
THE LCS PROGRAM – AFTER MILESTONE A.....	130
ENGINEERING CHALLENGES .....	132
FIRST DEPLOYMENT.....	133
THE LINGERING ENGINEERING CHALLENGES .....	137
PREVIOUS ENGINEERING CHALLENGES .....	140
THE MISSION PACKAGES .....	145
SUMMARY .....	157
CHAPTER 5 .....	158
THE FRAMEWORK.....	158
THE ANALYSIS STRUCTURE.....	160
RAM .....	161
THE ORGANIZATIONAL BEHAVIOR MODEL .....	163
MODEL III – GOVERNMENTAL POLITICS.....	170
PREDICTED VERSUS OBSERVED BEHAVIOR – MODEL 1 .....	173
MODEL II - EXPECTED VERSUS OBSERVED BEHAVIOR .....	181
MODEL III - EXPECTED VERSUS OBSERVED BEHAVIOR.....	188
THE EVIDENCE OR LACK THEREOF .....	192
SUMMARY .....	194
CHAPTER 6 .....	195
EVOLUTIONARY ACQUISITION, SPIRAL DEVELOPMENT, AND THE TIME LAG.....	196
EVOLUTIONARY ACQUISITION AND SPIRAL DEVELOPMENT.....	197
DESIGN VERSUS REALITY: THE ACQUISITION SYSTEM IN PRACTICE.....	202
THE STRATEGIC LANDSCAPE OR “OPERATIONAL ENVIRONMENT” .....	204

THE ROYAL NAVY AND PLANNING FOR THE MARITIME STRATEGIC ENVIRONMENT	205
THE IMPERIAL JAPANESE NAVY AND SOVIET RED FLEET .....	209
WHAT CAN BE DONE? .....	214
ORGANIZATIONAL BEHAVIOR MODELS REVISITED .....	220
SUMMARY .....	222
BIBLIOGRAPHY .....	224
APPENDIX A .....	272
THE INTERVIEW PROCESS .....	272
APPENDIX B .....	274
THE INTERVIEW QUESTIONNAIRE .....	274
VITA .....	277

## LIST OF TABLES

TABLE 1- SEA LANCE MOE/MOP .....	94
TABLE 2- LCS DESIGN PARAMETERS .....	106
TABLE 3- RESPONSE PROPOSAL REQUIRED CONTENTS .....	125
TABLE 4- CONSTRUCTION COST/TON .....	184

## LIST OF FIGURES

FIGURE 1- SIMPLIFIED NOTIONAL ACQUISITION PROCESS .....	41
FIGURE 2- DAU DEPICTION OF THE RELATIONSHIP BETWEEN DAS, PPBE, & JCIDS .....	43
FIGURE 3- THE INTERACTION BETWEEN CAPABILITIES REQUIREMENTS AND ACQUISITION PROCESS.....	45
FIGURE 4- DIAGRAM OF THE 2 PASS/6 GATE SYSTEM .....	64
FIGURE 5 LCS FIELDING TIMELINE.....	80
FIGURE 6- LCS CONOPS BRIEF - SLIDE #7 .....	98
FIGURE 7- EXHIBIT A FROM THE LCS SOLICITATION (SLIDE 1) .....	109
FIGURE 8- EXHIBIT A FROM THE LCS SOLICITATION (SLIDE 2) .....	109
FIGURE 9- ATTACHMENT J-12 COST VS PERFORMANCE .....	122
FIGURE 10- LCS 1 (TOP) AND LCS 2 .....	132
FIGURE 11- MINE COUNTERMEASURES PACKAGE .....	151
FIGURE 12-MCM 7 PREPARING MINESWEEPING RIG, EXERCISE FOAL EAGLE 12 .....	152
FIGURE 13- RMS RECOVERY ABOARD LCS 2 .....	154
FIGURE 14- ANTI-SUBMARINE WARFARE (ASW) PACKAGE.....	155
FIGURE 15- GRAPHIC REPRESENTATION OF THE KNIFEFISH UNDERWATER UNMANNED VEHICLE (UUV) .....	190

FIGURE 16- RMMV TESTING UNDERWAY ..... 190  
FIGURE 17- USS SPRUANCE (DD 963) UNDERWAY 1975. USN PHOTO..... 201  
FIGURE 18- USS SHOUP (DDG 86), UNDERWAY 2017. USN PHOTO..... 202

## CHAPTER 1

### INTRODUCTION AND LITERATURE REVIEW

#### INTRODUCTION

This work started out as an investigation of the research question, “Do the government decision models presented by Graham Allison in *Essence of Decision*, sufficiently explain government behavior?” The hypothesis is the individuals have more impact and influence in government decisions and outcomes than the three models give them credit for thus making the three models insufficient for explaining and predicting outcomes. The U.S. federal acquisition process and more specifically the Department of Defense (DoD) acquisition process serves as an excellent physical proxy for comparing the theoretical constructs developed by Allison. While acknowledging that if one strictly adheres to the tenets of international relations one must examine the overarching international system or structure, there is value in analyzing at the sub-systemic or national level. There is also value in looking for a more nuanced explanation of state and national government behaviors, choices, and decision making if we attempt to un-pack the so-called “black boxes”<sup>1</sup> that are used to represent a “state” or a “government.” These entities, while functioning and examinable as unitary wholes are really only theoretical constructs representing the parties, interest groups, and above all the individual people who actually form a state or a government. In trying to determine and define the scope of individual influence and impact on government decision making, in this case the acquisition of a weapons system, the

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<sup>1</sup> Steve Yetiv. *Explaining Foreign Policy: U.S. Decision Making in the Gulf Wars*, 2<sup>nd</sup> ed. (Baltimore, MD: Johns Hopkins University Press, 2011), 12.

goal is not to prove or disprove the applicability of Allison's models but to identify other variables that might be significant in the design of these models and reveal the scope of their power and influence within the model structures.

The first chapter of this dissertation serves to introduce readers to both the structure of the work and the literature addressing the concept of "Grand Strategy." The overarching philosophical intent from the beginning of this research was to look at how the tools of grand strategy are chosen by a state, with a narrowing focus on case studies or a case study to examine this procurement in terms of policy but also in terms of the basic process. The intent was to go from the macro level which even though it remains below the traditional international relations systemic level remains important, after all the international system is made up of individual states. Moving down the ladder of abstraction, we will begin to examine both the strategic drivers that become important variables in the equation of selecting tools to fit intended strategies and the governmental process that control and drive the acquisition of weapons systems.

The basic outline of this dissertation starts with the introduction to the basic organization by chapter and an examination of the literature addressing grand strategy in Chapter One. To steal a phrase from my Army training brethren, "Tell 'em what you're going to tell 'em. Tell 'em. And tell 'em what you told them." The goal of the first chapter is to tell the reader what the author intends to tell them. It is also an attempt to explain the focus of this dissertation, going from the macro-level of IR to the micro-level, the purchase of the "tools" of grand strategy and one tool, the LCS. Why LCS? One of the major reasons for the focus on this acquisition program and the sole case study for this dissertation was the acrimony and sheer bad-blood that this ship class has engendered in the American naval community. A wide variety of writers, in and out of

uniform, former and current sailors, waxed and waned generally in derogation of the entire idea. The comments, papers, stories, and articles were very much more often than not harshly critical of the LCS both as a concept and once launched as actual physical platforms as well. There was a constant shadow of stories regarding engineering casualties, failures, crew training issues, equipment failing, and most damning of all, the increasing lag in the development of the warfare mission modules. In short, LCS has been one of the most contentious Navy acquisition programs ever and presented an opportunity to present a more academic and thus potentially, a more objective assessment of the system than was available in other sources.

The second chapter focuses on and provides an analysis of the market factors driving and limiting the acquisition of the common good known as national defense. This section explores the issue of monopsony, the legally required process that both serves to form and to distort the market for the good known as national defense, and by way of comparison, provides some insight from the national defense market in the United Kingdom (UK). It also focuses on the actual government procurement system and the two major instructions within the Department of Defense (DoD) and the Department of the Navy (DON) that govern acquisition; Department of Defense Instruction 5000.02, “The Operation of the Defense Acquisition System (DAS),” 07 Jan 2015 and SECNAVINST 5000.2E, “Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System,” Office of the Secretary of the Navy, Washington, D.C., 1 September 2011 respectively.

Chapter Three addresses the other ‘market forces’ driving national defense as represented by the changing strategic landscape and encapsulated in the Navy’s strategic guidance

publications starting with "...From the Sea..."<sup>2</sup> and tracing the development and evolution of these documents to the current day. This chronological analysis also examines several key studies, papers, and books that informed and influenced the decision to acquire the LCS. These included Vice Admiral Art Cebrowski's network centric, distributed platforms or "Streetfighter,"<sup>3</sup> Wayne Hughes books on fleet tactics,<sup>4</sup> and several engineering studies, most notably the "Sea Lance" study from the Naval Postgraduate School (NPS) in Monterey, California.<sup>5</sup> It also looks at the government solicitation which included concept of operations (CONOPS) that forms such a cornerstone for the entire LCS program.

Chapter Three is also in many ways an analysis of the actual Request for Proposals (RFP) that the government issued informed and influenced by the author's experience and background as a commercial contractor bidding in response to packages like the LCS solicitation. There is some significant value in this review because this was a very different methodology for ship procurement from previous solicitations for of warships like the SPRUANCE or OLIVER HAZARD PERRY classes. There is also an analysis of the Navy's "Open Architecture" standard<sup>6</sup> which is important because of both its impact on the nature of the design for LCS but

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<sup>2</sup> "...From the Sea Preparing the Naval Service for the 21<sup>st</sup> Century: A New Direction for the Naval Service," (Washington, DC: Chief of Naval Operations, 1992) U.S. Navy white paper, available online at <http://www.navy.mil/navydata/policy/fromsea/fromsea.txt>. Accessed 10/09/2016 at 1013 EDT.

<sup>3</sup> Wayne Hughes and Arthur Cebrowski, "Rebalancing the Fleet," *U.S. Naval Institute Proceedings*, Vol. 125, No. 11 (1999): 31-34.

<sup>4</sup> Wayne P. Hughes, *Fleet Tactics: Theory and Practice* (Annapolis, MD U.S. Naval Institute Press, 1986). -----. *Fleet Tactics and Coastal Combat* 2nd ed. (Annapolis, MD: U.S. Naval Institute, 2000).

<sup>5</sup> LT Howard Markle, USN, Team Leader, LT Rick Trevisan, USN, LT Tim Barney, USN, LT Karl Eimers, USN, LCDR Garrett Farman, USN, LTjg Ahmet Altekin, Turkish Navy, LT Ricardo Kompatzki, Chilean Navy, LT Chris Nash, USN, Technical Report NPS-ME-01-001, "Sea Lance Littoral Warfare Small Combatant System," Naval Postgraduate School: Monterey, CA, 2001.

<sup>6</sup> "Design Guidance for the Navy Open Architecture Computing Capability." Naval Surface Warfare Center Dahlgren: Dahlgren, VA, 01 October 2002.

also the importance of software in weapons systems which it serves to highlight as this requirement was included in the solicitation package from the Navy.<sup>7</sup>

The fourth chapter is a narrative analysis of the LCS class's road from the award to the two leading bidders to the achievement or non-achievement of its Initial Operating Capacity (IOC). This chapter serves to highlight the persistent and consistent "bad press" that the LCS received and that at least in the author's opinion indicates more than merely residual resistance within and without the Navy to this concept class of warships. This chapter also serves to place the fielding of the sea-frame (a concept borrowed from the aerospace acquisition field – the standard term there being air-frame) in relation to the development and slow fielding of the mission modules. This capability gap provides some justification for the bigotry against the entire program but is also reveals the very real engineering challenges of developing mobile and removable equipment packages that can be swapped out to meet changing warfare mission needs.

Chapter Five turns back to the field of international relations in a more traditional venue and re-engages with the question of the applicability of Allison's models to government decision-making. The three models, Rational Actor Model (model 1), Organizational Behavior model (model 2), and Governmental Policies model (model 3) are introduced, numbered for simplicities sake, and applied to the LCS acquisition. The analysis was seeking to determine the accuracy of fit for the model as applied to the actual process of program acquisition for the LCS. The analysis revealed that, in general, the government's and the Navy's predicted behavior from each of the three models was in line with the observed behavior during the LCS acquisition. The

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<sup>7</sup> LCS Solicitation, N00024-03-R-2309, Section J-10-1, dated 10 February 2003.



chapter also served to neither prove nor disprove the basic dissertation hypothesis that individuals had more impact than organizations on government or bureaucratic decision making. There was no, what this writer has labeled the “Smoking Gun,” revealed.

The sixth and last chapter serves as a summary and discusses what exactly this study reveals. There are two major findings for consideration, one in the federal acquisition field and the second in the strategic planning realm. The acquisition issue that was revealed is the risk that Evolutionary Acquisition and spiral development can create if there is a long lag time between developing a carrying frame i.e. the LCS hull and associated organic systems and the weapons and sensors this frame is designed to carry i.e. the mission modules. Having a sea- or air-frame with some built in capabilities may not suffice to meet the full range of intended and required capabilities for which the system was procured. This equates to risk in the military doctrinal world. The other issue is the inherent challenge of designing systems for both the current and the predicted operational environment.<sup>8</sup> Several naval case studies focused on the systems acquired and employed by various navies in the twentieth century, how effective these systems were, and how appropriate to the operational and strategic situation that obtained they proved. These case studies reveal how difficult it is to accurately predict the operational environment and how quickly it changes under the stress of combat and competition. In turn, this serves to highlight the importance of flexibility, adaptability, and dependability for weapons systems to remain effective in the operational environment.

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<sup>8</sup> “The JFC's operational environment (OE) is the composite of the conditions, circumstances, and influences that affect employment of capabilities and bear on the decisions of the commander. It encompasses physical areas of the air, land, maritime, and space domains; the information environment (which includes cyberspace); the electromagnetic spectrum (EMS); and other factors.” Joint Publication 3-0, “Joint Operations” (Washington, DC: Chairman of the Joint Chiefs of Staff, 17 January 2017), Chapter 4, Paragraph 2(a). Available online at: <https://jdeis.js.mil/jdeis/index.jsp?pindex=27&pubId=646#>. Accessed 12 September 2017, 0800 EST.

## GRAND STRATEGY

In order to avoid the trite introductory question “What IS Grand Strategy” and launch into the lengthy discourse required for definition, let us instead look at grand strategy by applying a framework applied in later chapters of this dissertation; that of ends, ways, and means. In this case means stands for the money or resources, ways stands for how the money is spent or resources expended, and ends represents the desired outcome or end-state. With these terms of reference, we can now turn to grand strategy as the application of ways and means to achieve desired ends. Various authors have offered definitions of grand strategy and while there are some very good ones available the following is offered as our working definition for this review of the competitors. Grand strategy is the planning and execution process through which a state having determined a desired outcome, generally one prejudiced in favor of the aforementioned state’s interests, aligns means to ways (money to systems in the LCS case) in order to effectively and hopefully, efficiently gain that desired end. This is sufficiently generic enough to apply to desired political, military, economic, or diplomatic end-states. It may not however be sufficiently detailed to ascribe the moniker “grand” to a given strategy. This is true to an extent because both means and ends are loosely defined by intent. This is partly due to the nature of this dissertation, we are trying to examine a case involving one of the tools of grand strategy, a ship to be overly simplistic, and not say for example, the idea of “containment” as practiced by the United States from 1948 until 1991. This provides some justification for a certain level of simplification.

The other issue in terms definition is that under the sobriquet of grand strategy we often find an extreme focus on the military means that are applied in certain ways to achieve the desired strategic end-state. This unfortunately, rather than over simplifying, overly restricts the

fields where grand strategy can and ought to be applied. Grand strategy for a state should imply the entire gamut of state capabilities from military to economic that can be used to attain a desired goal. The goal can range from triumph in a war as already mentioned, to the upset of a mercantilist economic system and the substitution of a capitalist free market in its place. However, at the core of the concept of grand strategy I would argue, lies the idea of maintaining the existence of a state. Grand strategy is in essence what a state does in order to guarantee its own continued existence, from balancing to band-wagging. But what we are looking at specifically in this dissertation, if not this chapter, is the resources and their application in the military sphere in contrast to the political decisions and theoretical constructs that form the basis for a given grand strategy or strategic vision.

One item of interest that surfaced in looking at the literature on grand strategy or strategy, at least written by U.S. based authors most frame the issues in terms of ways, means, and ends.<sup>9</sup> This is likely due to many of these writers being involved in the DoD process of Planning, Programming, Budgeting, and Execution (PPBE), especially the programming and budgeting steps of this process. The U.S. DoD has a distinct and pronounced tendency where strategy is involved to base the desired strategic end-state<sup>10</sup> on the force structure and funding for it that is available. This tends to bias or privilege analysis towards trying to match the desired end-state to the means in terms of budget dollars available. This is not surprising, but it does differentiate between the policy planner field and that of the academic scholar, there is a rather distinct

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<sup>9</sup> Paul M. Kennedy. *Grand Strategies in War and Peace* (New Haven: Yale University Press, 1991), 4, 27, 134, 147.

<sup>10</sup> For a definition of end-state, see Joint Pub 5-0, Joint Planning, Chapter 1.2 (a) "Principles of Planning." 16 June 2017.

"a. Focuses on the End State. Joint planning is end state oriented: plans and actions positively contribute to achieving national objectives. Planning begins by identifying the desired national and military end states. The commander and staff derive their understanding of those end states by evaluating the strategic guidance, their analysis of the operational environment (OE), and coordination with senior leadership."

border-land between the two especially because of the fiscal and actual physical considerations. The point to this excursion is to highlight some of the biases that scholars may bring into the discussion and to note that some of the literature is not directly addressing grand strategy from the IR perspective but from the foreign policy and military planner perspectives.

Robert Art, in *A Grand Strategy for America* presents a set of eight strategic alternatives or policies from which the U.S. could choose.<sup>11</sup> These options range from outright dominion to isolationism to off-shore balancing. Each of these has its own pros and cons but all are predicated on protecting U.S. national interests by keeping latent threats latent and reducing or outright removing threats to U.S. interests.<sup>12</sup> Art examines each strategy in terms of effectiveness and efficiency in terms of cost. His analysis led him to conclude that the best grand strategy, based on the strategic landscape in the early 21<sup>st</sup> century was selective engagement.<sup>13</sup> He was also careful to note that this strategy was appropriate at the time but not at all times.<sup>14</sup> This could be considered a watered-down version of the strategies linked to the liberal-institutionalist school of IR theorist like Keohane, Ikenberry and Nye; more on these scholars and their thoughts on grand strategy or how their thoughts apply to grand strategy in the following sections.

In contrast, taking Christopher Layne as the most persistent of its advocates, some scholars argue in favor of off-shore balancing.<sup>15</sup> He has been joined by noted scholars in the

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<sup>11</sup> Robert J. Art. *A Grand Strategy for America* (Ithaca, NY: Cornell University Press, 2003), 82.

<sup>12</sup> *Ibid*, 81.

<sup>13</sup> *Ibid*, 223.

<sup>14</sup> *Ibid*. For his similar take on American grand strategy in the 1990s see "A Defensible Defense: America's Grand Strategy After the Cold War" *International Security*, Spring 1991 (Vol. 15, No.4), 5-53.

<sup>15</sup> Christopher Layne. "From Preponderance to Offshore Balancing: America's Future Grand Strategy." *International Security* 22, no. 1 (1997): 86-124. "Rethinking American Grand Strategy, Hegemony or Balance of Power in the 21st Century." *World Policy Journal*. Summer 1998, 8-28.

field John Mearsheimer and Stephen Walt.<sup>16</sup> The main argument of these advocates is that offshore balancing by reducing the U.S. presence overseas would significantly decrease the size of defense budgets. A ‘Policy Analysis’ paper from the Cato Institute provides some broad cost estimates and specifics in advocating for U.S. withdrawal from overseas bases.<sup>17</sup> The most recent major work in this school is from Barry Posen and is entitled *Restraint a New Foundation for U.S. Grand Strategy*.<sup>18</sup> As the title suggest, Posen argues that the U.S. ought to restrain itself from enforcing the so-called “liberal hegemony” and instead work towards selected engagement with key allies and coalitions, if only to repress nuclear proliferation.<sup>19</sup> He takes a slightly different path from Art however in that selective engagement is important but Posen’s real key to success for the U.S. is control of the global commons.<sup>20</sup> His is a more maritime, and maybe cyber-, oriented strategy.<sup>21</sup>

In direct contrast to the offshore balancers, at least one author argues directly against it as a strategy if not in favor of other specific approaches. Hal Brands, a strategist at the U.S. Army War College, pointed out the limits to offshore balancing.<sup>22</sup> His conclusion is that the concept of offshore balancing is oversold on its potential benefits and its risks are understated. The telling

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<sup>16</sup>John J. Mearsheimer, and Stephen M. Walt. "The Case for Offshore Balancing." *Foreign Affairs* 95, no. 4 (2016).

<sup>17</sup> John Glaser, "Withdrawing from Overseas Bases," (Washington, DC: The Cato Institute, 2017). Available online at: <https://www.cato.org/publications/policy-analysis/withdrawing-overseas-bases-why-forward-deployed-military-posture>.

<sup>18</sup> Barry Posen. *Restraint a New Foundation for U.S. Grand Strategy* (Ithaca, NY: Cornell Studies in Security Affairs, 2014).

<sup>19</sup> See Chapter 1, “The Perils of Liberal Hegemony,” 24-68, and 72, 78-83 for engagement. It is interesting to note that many of the arguments against offshore balancing focus on remaining engaged in order to continue combating nuclear proliferation, see for example Stephen G. Brooks, G. John. Ikenberry, and William C. Wohlforth. "Don't Come Home, America: The Case against Retrenchment." *International Security* 37, no. 3 (2012): 7-51. And a response Campbell Craig et al., "Debating American Engagement: The Future of U.S. Grand Strategy," *International Security* 38, no. 2 (2013): 181-199.

<sup>20</sup> Ibid, 136-144, 148-158, 162-163.

<sup>21</sup> Of note, at least one group of European scholars characterized the U.S. strategy under the Obama administration as a type of offshore balancing, see Ana-Maria Ghimis et al., "America's New Grand Strategy - an Inherited Step Back?" *Strategic Impact*, no. 44 (2012): 98.

<sup>22</sup> Hal Brands, *The Limits of Offshore Balancing [Electronic Resource]* (Carlisle Barracks, PA: Strategic Studies Institute and U.S. Army War College Press, 2015), <https://ssi.armywarcollege.edu/pubs/display.cfm?pubID=1291>.

point he makes about withdrawing from overseas locations and intervening only when critical U.S. interests are at stake is that this will require significant air and maritime forces.<sup>23</sup> And even the “reduced” ground component would still require cutting edge (hence expensive) technologies to be effective against threats.<sup>24</sup> So, it would seem difficult to identify where the savings would be realized. To amplify this point, the last time the U.S. applied offshore balancing, before the Second World War, the lack of overseas bases or presence equated to extremely high physical entry costs, in the form of amphibious assault, air, and maritime campaigns to gain access into the geo-political theaters of that conflict. He goes on to note that while withdrawing U.S. forces from overseas is often portrayed as “removing” these forces from the reach of terrorism, that does not mean that terrorists will cease trying to attack U.S. military targets, it may actually increase the likelihood of another terrorist attack on American soil.<sup>25</sup> Now withdrawal to balance offshore would get us “out of peoples’ faces” in places like Okinawa where the U.S. may not be popular but in other locales the U.S. military population can be welcomed and certainly the money they bring into foreign “garrison” towns is welcomed – if only in lamenting its absence as some Bavarian locations have done since the Army garrison there drew down.<sup>26</sup>

All of these perspectives can be classified as realist or neo-realist in their orientation. Harkening back to Hans Morgenthau, Stephen Walt, and John Mearsheimer, their conceptual focus is on an anarchical global system where there is no overarching authority governing the

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<sup>23</sup> Ibid, 28.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid, 33.

<sup>26</sup> This is admittedly second-hand or hearsay from Army acquaintances but by way of comparison, in 2014 or 2015, the garrison and post at Fort Bragg near Fayetteville, NC accounted for about \$11 billion in economic activity in the immediate environs of the city. This was the figure cited by both the local DoD Contracting Office and the Army Contracting Battalion Detachment at Ft. Bragg.

relations between states.<sup>27</sup> It is an international system ‘red of tooth and claw’ where only the fittest and most powerful prosper and survive. Ultimately, international relations boils down to relative strength and the competition is about maintaining a state’s relative power against the most powerful or most dangerous (classical realist vs. neo-realist) potential foe. Balance of power becomes the key to maintaining relative power relations in the realist theoretical construct and offshore balancing just by its name highlights this focus. The notion of husbanding power and resources by remaining disengaged and only intervening when critical national interests are at stake is a rational course of action with more than a little appeal to isolationists, America “firsters,” libertarians, and fiscal conservatives but as Brands pointed out, it can have some steep costs and unanticipated consequences.

In contrast to the realists/neo-realists, another school of thought, much more along the lines of the liberal or liberal-internationalists advocates for a more selective engaged grand strategy with strong overtones of collective security. While he did not exactly address grand strategy, Robert Keohane has persuasively and persistently provided analyses and arguments that favor the role of the liberal world-order to include important and influential roles for international institutions like the United Nations and the former Global Agreement on Trade and Tariffs (GATT) now known as the World Trade Organization (WTO).<sup>28</sup> Joseph Nye is another

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<sup>27</sup> See Hans Morgenthau. *Politics among Nations the Struggle for Power and Peace*. 7th Ed. / Revised by Kenneth W. Thompson and W. David Clinton. ed. (Boston: McGraw-Hill Higher Education, 2006). Kenneth Neal Waltz. *Man, the State, and War a Theoretical Analysis*. Topical Studies in International Relations. (New York: Columbia University Press, 1959). ----- *Theory of International Politics*. 1st ed. (Boston, MA: McGraw-Hill, 1979). John J. Mearsheimer. *The Tragedy of Great Power Politics*. 1st ed. (New York: Norton, 2001). Charles Kupchan. *The End of the American Era: U.S. Foreign Policy and the Geopolitics of the Twenty-first Century* 1st ed. (New York: Knopf: Distributed by Random House, 2002). Stephen M. Walt. *The Origins of Alliances*. Cornell Studies in Security Affairs (Ithaca, NY: Cornell University Press, 1987). See especially Robert Gilpin. *War and Change in World Politics* (New York: Cambridge University Press, 1981) for a discussion of the balance of power and what causes change in the balance, he obviously comes down on the side of war as the main agent for change.

<sup>28</sup> Keohane, Robert O., and Lisa L. Martin. "The Promise of Institutional Theory." *International Security* 20, no. 1 (1995): 39-51. ----- "Institutional Theory and the Realist Challenge after the Cold War." In *Neorealism and Neoliberalism: The Contemporary Debate*, edited by David A. Baldwin (New York: Columbia University Press,

scholar in this school who in fact wrote a book *Power and Interdependence* with Keohane.<sup>29</sup> While not directly addressing grand strategy this book does serve to highlight the increasing inter-connectedness of the global economy and global politics both of which call into question one of the foundations of state grand strategies, specifically sovereignty. The author's analysis reveals a potential weakening of individual state powers which are becoming constrained by interdependence among states and between states and international political and economic institutions.<sup>30</sup> If we try to frame their analysis and arguments in terms of U.S. grand strategy, they would argue in favor of the liberal world order as established in the post-Second World War by the U.S. and bolstered by the resurgent western European industrial democracies and Japan in the years after 1950. This would be very much in opposition to offshore balancing because the U.S. would have to remain engaged politically and though maybe a stretch theoretically, engaged physically i.e. militarily with overseas allies and coalition members. One could characterize this as the benevolent hegemon fostering free markets and democracy of one flavor or another across the globe. John Ikenberry is another leading scholar in this theoretical school.<sup>31</sup> In *Liberal Leviathan*, he too makes an argument in favor of the benevolent hegemon but with a slightly different spin. The hegemon both enforces the rules but as the global order is joined by more and more states, the order itself constrains in some ways the hegemon creating trade space for rule-making that may not directly benefit the leading state. While not intended to slight Messrs.

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1993), 269-300. -----. *After Hegemony Cooperation and Discord in the World Political Economy* (Princeton, NJ: Princeton University Press, 1984).

<sup>29</sup> Robert O. Keohane and Joseph S. Nye. *Power and Interdependence*. 4th ed. Longman Classics in Political Science (Boston: Longman, 2012).

<sup>30</sup> See Susan Strange. *The Retreat of the State the Diffusion of Power in the World Economy*. Cambridge Studies in International Relations; 49 (New York: Cambridge University Press, 1996).

<sup>31</sup> G. John Ikenberry. *Liberal Leviathan the Origins, Crisis, and Transformation of the American World Order*. Princeton Studies in International History and Politics (Princeton, NJ: Princeton University Press, 2011). -----, *America Unrivaled the Future of the Balance of Power*. Cornell Studies in Security Affairs (Ithaca, NY: Cornell University Press, 2002).



Keohane and Ney, Ikenberry seems to have remained engaged in the on-going academic and policy debate about the correct world order.<sup>32</sup>

There is also the constructivist school of international relations who have weighed in on grand strategy albeit again not directly. As Alexander Wendt might point out, the very concept of grand strategy, defining the resources or capabilities to deploy in support of it, and the threats against which it is designed is very much a constructed dialogue.<sup>33</sup> There is a lot of discussion and dialogue that goes into the formulation and even the basic definition of grand strategy. And especially in the American case there is a definite process if we can let the National Security Strategy and National Military Strategy stand as proxies for the concept of grand strategy. While this school of analysis tends to be focused on the state level, often national security and again by proxy extension grand strategy, is not solely formulated within a given state. There are after all the threat(s) against which the strategy is designed. There are also the allies, friends, and neutrals that have some impact if not direct input into strategy formulation. While there does not seem to be significant constructivist writing on the topic of grand strategy there is definitely a place at the table for members of this school to analyze and discuss the topic to reveal concepts and theory of both value and interest to the field of IR.<sup>34</sup>

## THE RETURN OF GEO-POLITICS?

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<sup>32</sup> G. John Ikenberry. "The Future of Multilateralism: Governing the World in a Post-Hegemonic Era." *Japanese Journal of Political Science* 16, no. 3 (2015): 399–413. He also weighed in the days following 11 September 2001; "American Grand Strategy in the Age of Terror." *Survival* 43, no. 4 (2001): 19-34. For an earlier analysis of the rationale behind American hegemony see "Institutions, Strategic Restraint, and the Persistence of American Postwar Order." *International Security* 23, no. 3 (1998): 43-78.

<sup>33</sup> Alexander Wendt. "Anarchy Is What States Make of It: The Social Construction of Power Politics." *International Organization* 46, no. 2 (1992): 391-425.

<sup>34</sup> There is an interesting article applying constructivist theory to strategic culture; Edward Lock. "Refining Strategic Culture: Return of the Second Generation." *Review of International Studies* 36, no. 3 (2010): 685-708.

The study of how geography impacts the foreign policies of states seems to have fallen out of favor since the end of the Cold War. Other factors like demographics and economics remained apparently valid factors for political science equations but standard geography had fallen off of the table so to speak. Perhaps the bitter legacy of classical geopolitical theorists like Mackinder, Haushofer, and Spykman as embraced by totalitarian regimes, notably the Nazis, made geography a distasteful factor of consideration by scholars. The ideas of space, of geography, and of physical position had fallen out of favor as significant factors in IR with the growth of “globalization” and the shrinking of the world through the Internet and the rapidity of modern communications. Giving rise to terms like “glocalization” and phrase like “distant proximities,” globalization seemed to confirm the ‘end of history’ and a new homogenized, conglomerated, flattened world.<sup>35</sup> However, it would seem that the reports of the demise of the old-world concept of geography and its impact on international politics were exaggerated or at least a bit premature.

While he was not the first to begin resurrecting the idea of geopolitics Henry Kissinger’s stature as a practitioner of geopolitics and diplomacy guaranteed that he would at least get a hearing.<sup>36</sup> Another noted commentator on international relations and foreign relations, Walter Russell Mead, noted that the disappearance of old-fashioned geo-politics occurred only in the minds of Western scholars and policy wonks. As he put it, Westerners enjoyed a “false sense of

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<sup>35</sup> For some works on globalization and the ‘flattening of the world’ see; Rosenau, James N. *Distant Proximities Dynamics beyond Globalization* (Princeton, NJ: Princeton University Press, 2003). Jan Aart Scholte. *Globalization: A Critical Introduction* (New York: Palgrave Macmillan, 2005). Thomas L. Friedman. *The World Is Flat a Brief History of the Twenty-first Century*. 1st Picador Ed., Further Updated and Expanded, [Pbk. Ed.]. ed (New York: Picador/Farrar, Straus and Giroux: Distributed by Holtzbrinck Publishers, 2007). See also, *The Lexus and the Olive Tree*. Rev. ed. (New York: Farrar, Straus, Giroux, 2000). The ‘end of history’ is a reference to Francis Fukuyama’s work; *The End of History and the Last Man* (New York: Free Press/Maxwell Macmillan International, 1992).

<sup>36</sup> Henry Kissinger. *World Order* (New York: Penguin Press, 2014).

security” after the collapse of the Soviet Union.<sup>37</sup> It seems that the critical school and its adherents are also dis-interring geopolitics and maybe putting a Marxist or neo-Marxist spin on them.<sup>38</sup> While Klinke and his compatriots are not commenting directly on grand strategy, their focus is mostly about the dialogue and relations between Russia and the European Union, this literature is indicative of the re-emergence of geopolitics in a more traditional sense in scholarly circles. A much more traditional piece on Russian grand strategy and geopolitics is from Milan Vego of the Naval War College.<sup>39</sup> He provides a detailed discussion of the specific steps, policies, and political backing for the Russian regimes geopolitical focus and strategy. His conclusion is that this iteration of Russian geopolitics is not the existential issue as it was under the Soviet Regime but will cause tension between Russia and the West.<sup>40</sup> A somewhat more recent entry into the debate is from Stefan Auer who examines the role of geopolitics in the Kremlin’s policy towards Ukraine.<sup>41</sup> While his theme is less focused on details and more on actions than Vego, he is definitive in declaring that geopolitics as influenced by the Nazi geopolitical theorist Carl Schmitt form an important part of the Russian government’s intent and explain its actions towards Ukraine and internally for that matter.<sup>42</sup>

In a larger and longer discourse, and with a maybe surprising liberal flavor to some of his specific policy recommendations, Thomas Barnett examined U.S. grand strategy from the military’s perspective. In his book, *The Pentagon’s New Map*, Barrett argues for a bifurcated

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<sup>37</sup> Walter Russell Mead. "The Return of Geopolitics." *Foreign Affairs* 93, no. 3: 69-79. Military & Government Collection, EBSCOhost (accessed February 6, 2017).

<sup>38</sup> See Ian Klinke, "What Is to Be Done? Marx and Mackinder in Minsk." *Cooperation and Conflict* 48, no. 1 (2013): 122-42 and "Postmodern Geopolitics? The European Union Eyes Russia." *Europe-Asia Studies* 64, no. 5 (2012): 929-47.

<sup>39</sup> Milan Vego. "Russia and the Return of Geopolitics." *Joint Force Quarterly: JFQ*, no. 45 (2007): 8-15.

<sup>40</sup> *Ibid*, 15.

<sup>41</sup> Stefan Auer. "Carl Schmitt in the Kremlin: The Ukraine Crisis and the Return of Geopolitics." *International Affairs* 91, no. 5 (2015): 953-68.

<sup>42</sup> *Ibid*, 967-968.

national security policy and/or grand strategy that treats member states of the “Core” differently from those of the “Gap.”<sup>43</sup> This is not unreasonable considering how the U.S. treats individual states in the normal course of diplomatic and political relations; some states are more equal than others, at least in the eyes of the U.S. His take on grand strategy focuses on the lack of economic development and thus opportunities in the “Gap” mostly formerly third world countries clustered in Africa, Latin America, and the Middle East. He argues that the lack of connectedness and the lack of opportunities breed extremism and resentment against the “Core.” The “Core” is represented above all else by the United States but includes Europe, Japan, China, and the industrialized democracies of the world.

Another entry into the debate about geopolitics comes from a surprising source, a European and in fact British scholar. James Rogers authored an Egmont Paper for the Royal Institute for International Relations entitled “A New Geography of European Power?”<sup>44</sup> His discussion of the geopolitical and grand strategy interests of Europe and by extension the European Union focuses on a ‘Grand Area’ approach aimed at a permanent European presence.<sup>45</sup> The rationale is to avoid crisis management and instead practice a civil and military ‘forward presence’ thus reducing the need for sporadic intervention.<sup>46</sup> It sounds remarkably like the underlying premise that has justified U.S. and especially U.S. Navy strategic force distributions since the end of the Second World War. The two major differences from Barnett’s approach is that Rogers does not divide the world into a core and a periphery but focuses his ‘Grand Area’

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<sup>43</sup> Thomas P.M. Barnett. *The Pentagon’s New Map: War and Peace in the Twenty-First Century* (New York: G.P. Putnam’s Sons, 2004), 52.

<sup>44</sup> James Rogers, “A New Geography of European Power?” in Sven Biscop and Richard G. Whitman. *The Routledge Handbook of European Security* [e-book] (Hoboken, NJ: Taylor and Francis, 2012), 211-224. Also available online from the University of Pittsburgh Archive of European Integration (AEI) at: <http://aei.pitt.edu/29740/>.

<sup>45</sup> *Ibid.*, 213.

<sup>46</sup> *Ibid.*

around the Europe, North Africa, parts of West and East Africa, and the Middle East to the borders with India, the central Asian petroleum sources (like Kazakhstan), and part of the Indonesian archipelago.<sup>47</sup> The contrast with Barnett's map of the "non-integrated gap" is distinct if not striking. It may reflect a lower level of hubris, the EU is not concerned with the entire globe, but it also may reflect a bit more concentrated thinking on those areas, resources, and trade routes that really are crucial to the continued health and well-being of the EU's member states. It may also reflect an honest assessment of the reach and capabilities of the military forces available to European states with which they can impact the 'Grand Area.' It remains however very interesting that a graduate of Aberystwyth University and a practicing scholar in the EU offered such a traditional study of geopolitics and the interest of the European powers. It would be inferential and probably wrong to call his references to the "civilian power" and the "passive" use of military power as window-dressing to appease other European scholars but there is a distinctly traditional, maybe even old-school imperialist flavor to his analysis.

## CONSTRUCTIVIST GRAND STRATEGY

With more than a passing respectful nod to the constructivist school of international relations, we can easily see that grand strategy can be defined as a mutually constructed discussion or idea. It changes based not only of the international system of relative power but also on how the states, governments, and individual people involved in grand strategy at the sub-systemic or national level change. "The grand strategy of the Soviet Union was..." or "the grand strategy of the United States under [insert presidential administration here] is..." are example of how at least recently some scholars and writers have framed the issue of grand strategy. Scholars can trace changes in the grand strategies of individual states and even governments

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<sup>47</sup> Ibid, 219.

based on the identity of those Communist Party of the Soviet Union (CPSU) Politburo members who showed up atop Lenin's Tomb indicating who was in or out of power or as various national security experts in U.S. administrations have come and gone since the 1950s.

Paul Kennedy cites B.H. Liddell-Hart as a significant strategist in the pantheon of strategic thinkers and points out how Liddell-Hart's vision or concept of strategy was constructed.<sup>48</sup> His concept was based partially on his First World War experiences in France and partially on his post-war researches into the "British way of war." While Liddell-Hart settled on what in the military sense is basically a tactical, maybe operational level concept, the indirect approach,<sup>49</sup> his was a constructed vision likely informed and influenced by post-war writers like Jellicoe, Haig, and Churchill and his fellow military theorists like Douhet and J.F.C. Fuller. This is admittedly a hypothetical postulation, but it is very doubtful that Liddell-Hart conceived of the indirect approach and the British way of war totally out of whole cloth like some Athena new-sprung from his Zeus-like head.

On a slightly different note, there is a lively discussion among constructivist and/or post-modern geographers that has some bearing if only tangentially to the idea of grand strategy. The discussion is generally focused on the nature of identities and how both state and individual identities are constructed. In a guest editorial in *Political Geography*, Nick Megoran points out that geographers need to re-engage with political scientist and IR scholars regarding the revival of geopolitics or what he terms "neo-classical geopolitics."<sup>50</sup> This fits in with the previous discussion regarding geopolitics and at least one aspect of grand strategy as a broader concept. This is also true of a piece by Thomas Diez where he discusses the idea of the "other" based on

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<sup>48</sup> Paul M. Kennedy. *Grand Strategies in War and Peace* (New Haven, CT: Yale University Press, 1991), 2-4.

<sup>49</sup> Basil Henry Liddell Hart. *Strategy*. 2nd Rev. ed. (New York: New American Library, 1974), 2.

<sup>50</sup> Nick Megoran. "Neoclassical Geopolitics." *Political Geography* 29, no. 4 (2010): 187-89.

Frantz Fanon's pioneering work<sup>51</sup> and the role "otherness" plays in the development of EU integration.<sup>52</sup> The linkage here is that the revival of geopolitics is making the development of a European identity more challenging which in turn makes the development of a coherent EU grand strategy that much more difficult. The last constructivist works to address look at the roles of individuals, in keeping with original research intent of this dissertation but focusing on how their identities and roles are constructed and not on their individual impact on grand strategy. The first article by Edward Lock investigates 'strategic culture' and looks at how strategic culture impacts behavior, by states and individuals within the process. It also examines how strategic behavior shapes the identity of the actor who engages in this behavior.<sup>53</sup> The application of this sort of analysis could represent another opportunity to look inside the "black box" of grand strategy and understand who and how it is created for a given state. The last article by Merje Kuus looks at the role of intellectuals in the "production of geopolitical discourses."<sup>54</sup> He looks at how intellectuals as individuals contribute to foreign policy discourse and how these in turn, reflect a certain culturally concept and indemnity. As with Lock's analysis this potentially allows scholars to examine the role of the individual in the development and implementation of grand strategy for a given states.

The challenge with the constructivist, post-modern, or critical schools is that much of the dialogues as evidenced above are very much sub-systemic and even sub-state level in their studies. Again, there is value in examining the role of the individual or state and how the

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<sup>51</sup> Frantz Fanon and Richard Philcox. *The Wretched of the Earth*. 1st ed. (New York: Grove Press: Distributed by Publishers Group West, 2004).

<sup>52</sup> Thomas Diez. "Europe's Others and the Return of Geopolitics." *Cambridge Review of International Affairs* 17, no. 2 (2004): 319-35.

<sup>53</sup> Edward Lock. "Refining Strategic Culture: Return of the Second Generation." *Review of International Studies* 36, no. 3 (2010): 685-708.

<sup>54</sup> Merje Kuus. "Intellectuals and Geopolitics: The 'cultural Politicians' of Central Europe." *Geoforum* 38, no. 2 (2007): 241-51.

identity of the individual or state are developed through dialogues, cultural perceptions, social or organizational mores but it remains related to grand strategy at several removes from the overarching concept and the broader nature of grand strategy. In some ways, one is forced to tease out nuances and details in order to effectively apply a constructivist analysis to grand strategy. There is however a very interesting case study to do by applying constructivist approaches; the development of nuclear strategy as it relates to the U.S. and USSR in the 1960s and 1970s. Looking at how each state's identity was constructed by interactions between them, between them and their allies, and within each state could offer some great insights into strategic development and strategic planning. Examining how dialogue and identities affected the arms control negotiations or just how did the idea of Mutually Assured Destruction (MAD) develop and how did it come to be a shared idea? These are some interesting questions that constructivist scholars could successfully engage with the tools and analytic framework of their school.

## NAVAL STRATEGY

Though it might be best termed a sub-set of grand strategy, the final section of this literature review will look at the naval or maritime strategy. This is in keeping with the ultimate focus on a naval platform and how it fits into strategic planning and execution at several levels that may or may not have informed and influenced grand strategy. While historical writers like Mahan, Corbett, and Gorshkov<sup>55</sup> remain influential, more recent scholars like Norman Friedman,

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<sup>55</sup> Alfred Thayer Mahan wrote the traditionally viewed seminal work on naval strategy and power, *The Influence of Sea Power upon History, 1660-1783* (Boston: Little, Brown and Company, 1890). Sir Julian Corbett was a noted British naval strategist and writer who wrote several works on historical British strategy and tactics; an example of the tactical works is his *Fighting Instructions, 1530-1816*. Burt Franklin Research & Source Works Series, No. 182. (New York: B. Franklin, 1967) and what might be his signature work on strategy; *England in the Seven Years' War a Study in Combined Strategy* (New York: Longmans, Green, 1907). Sergei Gorshkov was the father of the Soviet Fleet and his *Sea Power of the State* while dated and perhaps overly influenced by communist party ideology was



Geoffrey Till, and John Hattendorf have made significant contributions to the field.<sup>56</sup> Much of the specific U.S. Navy strategic documents will be addressed in Chapter Three where we examine the strategic landscape that drove the Navy towards the concept of LCS. There are however two more recent debates that are of interest and provide insights into the on-going debate about naval power and its role in grand strategy.

The first of these debates was born in the ashes of the Cold War and addresses the question of the venue in which the U.S. Navy is most likely to fight. The demise of the Soviet Navy and the apparent rise in failed states seemed to indicate that the Navy would be mostly employed in the coastal waters and maritime chokepoints of the world as opposed to fighting a fleet on fleet engagement in the blue waters of the open oceans. Steven Kosiak, Andrew Krepinevich, and Michael Vickers, writing for the Center for Strategic and Budgetary Assessment (CSBA) argued that the Navy should re-orient away from forward presence operations in the Mediterranean and instead focus more on the Persian Gulf, South and East Asia.<sup>57</sup> As Frank Hoffman writing in Naval Institute's *Proceedings* points out however, the authors' focus on transformation as a key to continuing over-match and reducing force structure

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nevertheless an excellent exposition on the value of a navy to the Soviet state with potentially broader applicability to non-communist states.

<sup>56</sup> See, John B. Hattendorf. *U.S. Naval Strategy in the 1970s* [electronic Resource] Selected Documents. Newport Paper; No. 30 (Newport, R.I.: Naval War College, 2007). <https://permanent.access.gpo.gov/LPS92234/LPS92234/www.nwc.navy.mil/press/newportpapers/documents/NP30JH.pdf>. John B. Hattendorf, Peter M. Swartz, and Naval War College. *U.S. Naval Strategy in the 1980s* [electronic Resource] Selected Documents. Newport Paper; No. 32. (Newport, RI: Naval War College, 2008). <https://permanent.access.gpo.gov/lps106777/NP33.pdf>. Geoffrey Till. "THE NEW U.S. MARITIME STRATEGY: Another View from Outside." *Naval War College Review* 68, no. 4 (2015): 34-45. ----, *Seapower a Guide for the Twenty-first Century*. 2nd ed. Cass Series--naval Policy and History; 32 (New York: London: B Routledge, 2009). Norman Friedman. *The US Maritime Strategy* (New York: Jane's Publishing, 1988). ----, *Network-centric Warfare How Navies Learned to Fight Smarter through Three World Wars* (Annapolis, Md.: Naval Institute Press, 2009).

<sup>57</sup> Steven Kosiak, Andrew Krepinevich, and Michael Vickers. "A Strategy for a Long Peace." Washington, DC: Center for Strategic and Budgetary Assessments, 2001.

in view of increasing Anti-Access/Area Denial (A2/AD) are potential points of critical failure.<sup>58</sup> Another set of entrants into the debate focused on the changing nature of warfare and the increase threat that this change, called swarming, represented to conventional forces especially in the littorals.<sup>59</sup> Both John Arquilla and Sean Edwards focused on the impact of an apparently disorganized group or ‘swarm’ attacking from various directions against a traditional, linear-oriented foe.<sup>60</sup> There has not been much refuting of this definition of the threat or how dangerous it is. In fact, this writer worked on and reviewed several classified U.S. Navy tactical studies to address this threat as recently as 2013. The interest and research into swarming and countering it continues.<sup>61</sup> The challenge in focusing on swarming though is that it tends to focus on one or two geographic areas and one or two potential foes. The main geographic areas are the Persia Gulf and somewhat more specifically the Strait of Hormuz, and the other geographic region from the Navy’s perspective is the South China Sea. The two states of interest are Iran and the People’s Republic of China both of whom maintain large numbers of relatively well armed small ships and boats.<sup>62</sup> These surface craft are capable of conducting swarming attacks on U.S. surface combatants like the LCS and thus the swarming threat in the littoral still obtains.

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<sup>58</sup> Hoffman, Frank. "Defense Policy Choices for the Bush Administration, 2001-2005 / Holding the Line: U.S. Defense Alternatives for the Early 21st Century / A Strategy for a Long Peace." *United States Naval Institute Proceedings* 127, no. 7 (2001): 100-02. For more on A2AD see Stephen Biddle and Ivan Oelrich. "Future Warfare in the Western Pacific: Chinese Antiaccess/Area Denial, U.S. AirSea Battle, and Command of the Commons in East Asia." *International Security* 41, no. 1 (2016): 7-48.

<sup>59</sup> Per Meriam-Webster, littoral is defined as "of, relating to, or situated or growing on or near a shore especially of the sea." The Navy tends to refer to littoral waters as "brown" water vice "blue" water which is the open ocean generally outside the 100-fathom curve or off of the continental shelf.

<sup>60</sup> John Arquilla, David F. Ronfeldt, United States Department of Defense, and National Defense Research Institute. *Swarming & the Future of Conflict* (Santa Monica, CA: RAND, 2000). Sean Edwards and Paul Davis. "Swarming and the Future of Warfare" (PhD diss., Rand Graduate School, 2004), ProQuest Dissertations and Theses.

<sup>61</sup> Lara Seligman. "How Swarming Drones Could Change Air Warfare." *Defense News* (Springfield, VA), 23 May 2016. F. Filbert. "Swarming the Enemy with Joint Unmanned Aerial Vehicle Attacks." *Fires*, 2016, 39-40. Sierra Jones. "Awesome Autonomy: The Future Force and Roboboats." press release, Office of Naval Research Corporate Strategic Communications, 15 July 2016. <https://www.onr.navy.mil/Media-Center/Press-Releases/2016/RoboBoat-2016.aspx>.

<sup>62</sup> See Caitlin Talmadge. "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," *International Security*, Vol. 33, No. 1 (Summer, 2008), 82-117.

This leads us into the second part of this debate, where will the Navy fight? As mentioned above, the focus on the littoral regions of the world started after 1991 and really came into focus in the early 2000s. However, neither the Navy nor other interested parties have totally abandoned the high seas as a focal point for future combat. The first entry into this side of the debate could be Bernard Cole's *The Great Wall at Sea* from 2001.<sup>63</sup> This book serves to portray the People's Liberation Army Navy (PLAN) as a soon to be 'near peer competitor' and provided some fuel for stoking the furnaces of a return to the "War at Sea" (WAS).<sup>64</sup> It was included in the Chief of Naval Operations' reading list published by the *Navy Times* in 2012,<sup>65</sup> not that we ought to read too much into that. However, the term near-peer competitor has been surface in the defense establishment in the U.S. and certainly among naval officers and writers regularly over the last ten years.<sup>66</sup> While some of the authors are dismissive of the role of China or even Russia as a near-peer competitor in the maritime sphere and often dismiss this ideational effort as no more than a quest to justify funding the fact that the term is even used by its detractors provides some legitimacy and longevity to the idea. This writer has from personal experience working at both the office of the Chief of Naval Operations (OPNAV) and U.S. Fleet Forces Command (USFF) heard a lot of nostalgia for the Soviet Union and statements regarding the threat from a mildly resurgent Russian Navy.<sup>67</sup> The same holds true with regards to

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<sup>63</sup> Bernard D. Cole. *The Great Wall at Sea China's Navy Enters the Twenty-first Century* (Annapolis, MD: Naval Institute Press, 2001).

<sup>64</sup> War at Sea or "WAS" was a Navy training scenario, generally executed at the tactical level that involved air, surface, and sub-surface sensor and weapons engagements with a comparable 'hostile' force equipped with similar maritime warfare systems. The last one that this writer actively participated in was 1994.

<sup>65</sup> "CNO'S READING LIST." *Navy Times*, 29 October 2012.

<sup>66</sup> Stéphane Lefebvre, "Deterrence: From Cold War to Long War." *Air Power History* 57, no. 2 (2010): 52-53. Stew Magnuson. "Navy Program at Center of Drone Survivability Debate." *National Defense* 99, no. 730 (2014): 26-27. Martin Murphy. "The Unwanted Challenge." *United States Naval Institute. Proceedings* 134, no. 12 (2008): 46-51. Michael Dobbs. "SUBMARINERS MUST PREPARE FOR WAR." *United States Naval Institute. Proceedings* 143, no. 6 (2017): 17-20. John Meiter. "A Low-Visibility Force Multiplier: Assessing China's Cruise Missile Ambitions." *Air & Space Power Journal* 29, no. 6 (2015): 99-100.

<sup>67</sup> While Operations in the CNO's title, he and the OPNAV staff do not really direct the operations of the Navy, instead OPNAV focuses on the service responsibilities under Title 10 USC of manning, training, and equipping the

individual opinions of uniformed, civil service, and retired military personnel regarding the PLAN. This shows that the debate is going on at the individual level in the service and that there is a certain prejudice against operating on the edges and a desire to get back to fleet on fleet engagements.<sup>68</sup>

This provides a perfect segue into the next debate about maritime strategy, which is what are we going to fight with, which for the purposes of this dissertation will focus on the number and the types of ships that the Navy should buy. Where the Navy expects to fight is critical to this debate because different geographic and different physical environments require different capabilities from surface ships. An open ocean fight against the PLAN will require different platforms, weapons, and sensors than a littoral 'knife fight' in the strait of Hormuz against the Iranian Navy or the Iranian Revolutionary Guard Corps Navy. In trying to answer the question of what we are going to fight with the Navy commissioned several comparative studies in 2016 to examine the question.<sup>69</sup>

## THE FUTURE FLEET PLATFORM ARCHITECTURE STUDIES

The Navy first conducted an internal Force Structure Analysis as sort of an entering argument for the congressionally directed Future Fleet Architecture studies. The Navy determined that it would require 355 ships with one additional aircraft carrier, 20 additional large surface combatants i.e. not LCS, the same number of LCS ships (52), more attack submarines

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Navy. USFF serves as the executive agent i.e. does the grunt work of actually manning and training the ships, subs, squadrons and other units within the Navy before they are deployed and assigned or 'chopped' to the Geographic or Functional Component Commanders.

<sup>68</sup> For another example of the persistence of the fleet-on-fleet engagement as an *idée fixe* see U.S. Navy. "Report to Congress - Alternative Future Fleet Platform Architecture Study," Washington, DC: CNO, 27 October 2016, p. 6.

<sup>69</sup> Lee Hudson. "Navy Fleet Size Could Change Following New Force-Structure Assessment." *Inside the Pentagon's Inside the Navy*, February 29, 2016.

and amphibious ships.<sup>70</sup> In short, the same stuff only more of it. This is not meant to be critical, the Navy planners' charter was not to reinvent the fleet but to determine the type and number of platforms required to meet the Navy's operational needs based on Geographic Combatant Commander (GCC) plans approved by the Joint Chiefs of Staff (JCS). The Navy then proceeded to craft the first of the entries into the Future Fleet Architecture studies with mission guidance:

“This dedicated, Navy Project Team was given guidance and wide latitude to develop an analysis that was a distinct excursion not constrained by current Navy submissions. As such, the Project Team study does not represent any official Navy position, but just another independent approach to the problem.”<sup>71</sup>

This is important to note, foreshadowing the discussion regarding Allison's models and the issue of bureaucratic politics, because the writing team was composed mostly of senior civil servants and only two uniformed officers. Regardless of the composition of the concept development team, they are all in one form or another beholden to their parent organization plus the subordinate organizations for which they work. This was going to create some inherent bias and preferences in whatever assessment they produced.

The Navy entry into the future fleet design focused on a networked based capability or what they termed the ‘Distributed Fleet.’ This is in keeping with the Navy's tactical thought over the last two decades and owes much to Captain (ret.) Wayne Hughes who wrote a key work of fleet tactics in the mid-1980s and to Vice Admiral Art Cebrowski who first introduced the term ‘network-centric warfare’ to the Navy.<sup>72</sup> The Navy group focused on five main mission

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<sup>70</sup> OPNAV, Executive Summary, 2016 Navy Force Structure Assessment (FSA). 14 December 2016.

<sup>71</sup> U.S. Navy. “Alternative Future Fleet Architecture.” 3.

<sup>72</sup> Wayne P. Hughes, *Fleet Tactics: Theory and Practice* (Annapolis, MD: U.S. Naval Institute Press, 1986). Paul Hughes, Arthur Cebrowski, “Rebalancing the Fleet,” *U.S. Naval Institute Proceedings*, Vol. 125, No. 11, pp. 31-34. A. Cebrowski, “Network-centric Warfare. An Emerging Military Response to the Information Age.” *Military Technology* 27, no. 5 (2003): 16-18, 20-22.

areas including building security globally, establishing sea control, and projecting power.<sup>73</sup> The first mission description term is significant because ‘building security globally’ is so broad that it can be meant to describe everything from security cooperation events with friendly countries to forward deployment presence operations to launch land attack missiles. It is almost meaningless because it is so broad, but it also allows the Navy to include the littorals and open ocean as potential areas of conflict. Sea control on the other hand at least is very much a disputed term among naval theorists, it is ill-defined and can be used for everything from undisputed control of the open ocean to convoying merchant ships in the Persian Gulf. However, it is significant because, in its traditional usage, sea control was applied to the struggle between surface fleets, notably the Royal Navy and *Hochseeflotte* in the First World War. It was also a standard operational and tactical term used by the Navy in the 1970s and 1980s in the face of the growing threat from Soviet naval power. Thus, it could be indicative of the Navy’s continuing bias in favor of blue water battles versus mucking about in the shallows of the littoral regions of the world. Projecting power is significant because it represents a continuation of the Navy’s basic deployment strategy in place since about 1950.<sup>74</sup> In order to project power ships need to be operating forward, or projecting from the continental U.S. (CONUS). This mission description serves to confirm the way that the Navy has been operating and intends to continue operating.

The Navy’s report also mentioned that for the first time in 25 years there is a competition for maritime superiority with the rise of Russian and Chinese naval power.<sup>75</sup> This is another allusion to the blue water challenge and again may be reflective of this persistent prejudice in the

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<sup>73</sup> U.S. Navy. “Alternate Fleet Architecture.” 3. The other two mission descriptions are to protect the homeland and win decisively which are both standard and straight forward.

<sup>74</sup> See Peter M. Swartz, “Sea Changes: Transforming U.S. Navy Deployment Strategy: 1775-2002.” Washington, DC: Center for Naval Analysis, 2002. ----. “American Naval Policy, Strategy, Plans and Operations in the Second Decade of the Twenty-first Century.” Washington, DC: Center for Naval Analysis, 2017.

<sup>75</sup> See Note 67 above.

Navy. This sets the stage for what might constitute a surprising recommendation from the Navy regarding the required platforms for a new fleet architecture. The Navy recommended a fleet comprise of 457 ships which is no surprise but among those would be “136 large unmanned vehicles.”<sup>76</sup> That is somewhat surprising in view of the Navy’s continued commitment to manned platforms especially air and surface as its core weapons platforms. However, this is actually very much in keeping with the intent of the LCS concept both in terms of maximizing the number of hulls or platforms available and in trying to reduce one of the most significant costs in surface ships, the cost of the crew.<sup>77</sup> As one writer put it, the Navy went with “Robot PT Boats & LCS.”<sup>78</sup> That brings up the last point to make, this Navy report did not recommend deleting the LCS procurement. This is one of the significant differences between this group’s recommendation and the competing reports.

The second fleet architecture study was authored by the CSBA and while the authors are not academic in the traditional sense, they are experienced professional analysts, and several are Navy veterans who have held command at sea.<sup>79</sup> This provides some justification for their bona fides as subject matter experts and some of the potential outlooks that are reflected in this report. Unlike the Navy report, the CSBA authors focus on changing the fleet composition and assigned missions as opposed to focusing on a networked system of platforms as a major discriminator for their architecture. They present a force that is divided mirroring Barnett’s division between constabulary forces for counter-insurgency and stability operations and the more traditional

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<sup>76</sup> U.S. Navy. “Alternate Fleet Architecture.” 4.

<sup>77</sup> See Chapter 3 for a more in-depth discussion of the minimum manning concept.

<sup>78</sup> Sydney J. Freedberg, Jr. “Alternative Navy Study Bets Big On Robot PT Boats & LCS.” *Breaking Defense*, 13 February 2017. Available online at: <http://breakingdefense.com/2017/02/alternative-navy-study-bets-big-on-robot-pt-boats-lcs/>. Accessed 17 September 2017, 0900 EDT.

<sup>79</sup> Bryan Clark, Peter Haynes, Bryan McGrath, Craig Hooper, Jesse Sloman, and Timothy A. Walton. “RESTORING AMERICAN SEAPOWER: A NEW FLEET ARCHITECTURE FOR THE UNITED STATES NAVY.” Washington DC: Center for Strategic and Budgetary Assessment (CSBA), 2017.

conventional units for force on force combat.<sup>80</sup> The authors would divide the fleet into “Deterrence Forces” focused on specific regions and a “Maneuver Force” of Carrier Strike Groups (CSG) assigned to the Indian/Pacific Ocean region.<sup>81</sup> They also focus more or at least mention more often the rising near-peer competitors and their potential impact on naval operations in the future.<sup>82</sup>

The force mix that the CSBA authors provide is not much different from the Navy version except in terms of total numbers. They estimate a total of 382 ships (vice 457) and about 94 unmanned platforms (vice 136 large unmanned platforms). They also address Maritime Patrol and Reconnaissance Aircraft (MPRA) and unmanned aerial platforms whereas the Navy report did not. The CSBA group would cease production of the LCS class and push forward and maybe accelerate the Navy’s intention to procure more capable frigates (FF) in place of the last ten to twelve LCS platforms.<sup>83</sup> Another rather significant difference is that this report recommends acquiring ‘patrol vessels’ optimized for Surface Warfare (SUW) and strike warfare.<sup>84</sup> These are the most significant differences between the Navy’s recommended approach and that of the CSBA authors.

The last report came from the MITRE Corporation and provides no authorship information.<sup>85</sup> This is in keeping with MITRE’s tradition and general philosophy as sort of a neutral or objective participant in providing consulting and analytical service to federal

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<sup>80</sup> See Barnett, *Pentagon’s New Map*, discussion in regard to the “Leviathan” and the “System Administrator.”

<sup>81</sup> Clark, et al, “RESTORING AMERICAN SEAPOWER.” iii.

<sup>82</sup> Ibid, i, iii, iv, 1-5, 7, 9-17. And also note the title of Chapter 2 “The Emerging Great Power Competition.”

<sup>83</sup> Ibid, 77, 79.

<sup>84</sup> SUW or Anti-Surface Warfare (ASuW) is defined as attacks on surface warships generally using anti-ship cruise missiles (ASCM), range permitting. Strike warfare describes attacks launched against land targets using Tomahawk cruise-missiles.

<sup>85</sup> MITRE Corporation, “Navy Future Fleet Platform Architecture Study.” Mclean, VA: MITRE, 01 July 2016.



customers, but it makes it more challenging to identify potential bias or preconceptions that may have influenced this report. There is however the fact that MITRE was already contracted with OPNAV N81 (Chief of Naval Operations Director of Assessment Division) and this report was produced as a task or project order on a 2010 award, so we can postulate that there is an existing relationship with this customer and thus some influence on the writers from that quarter. Like the Navy and CSBA reports, MITRE does not recommend significant changes in the types of platforms and looks for increased effectiveness through new weapons and sensor systems and increased use of unmanned platforms.<sup>86</sup> There is mention of Russia and China but also of Iran and North Korea, and in general MITRE's contribution is focused on both force on force maritime warfare and operations in the littoral. There may be some bias in favor of fleet engagements based on the warfare areas that MITRE focuses on, specifically A2AD and Integrated Air and Missile Defense (IAMD) but it is no more and no less than the other two reports.<sup>87</sup> Here again, it would appear that 'Big Navy' equities and interest may have informed and influenced the writing team.

The force mix of 414 ships is not as large as the Navy's but larger than the CSBA (382) version. There is however, no apparent break-out of unmanned platforms in the force structure referenced in the MITRE report and the report categorically states that MITRE does not recommend the force mix of 414 ships because it is not affordable.<sup>88</sup> Significantly, MITRE also recommends shutting down production of the LCS and re-programming that funding to purchase one additional ARLEIGH BURKE class guided missile destroyer per year.<sup>89</sup> The other

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<sup>86</sup> MITRE, "Navy Future Architecture." 4.

<sup>87</sup> Ibid, 8, 9, 13, 16-20. There are also sections on terrorism and proliferation of ASCMs as threats that the Navy cannot ignore, 10, 23-24.

<sup>88</sup> Ibid, 2-3.

<sup>89</sup> Ibid, 4.

significant difference between MITRE's report and the other two is that MITRE recommends several additional types of manned surface and sub-surface platforms including an 'arsenal ship' and diesel vice nuclear powered submarines. They also recommend modifications to existing ship class designs for aircraft carriers and large deck amphibious ships to decrease costs while adding additional capabilities to these platforms.<sup>90</sup> This focus on manned surface platforms and adjusting current designs and intended acquisitions are the most notable differences between the MITRE report and those from the Navy and CSBA.

## CONCLUSION

The literature on grand strategy covers a broad swath of IR scholarship and ranges from the extreme heights of theory to the individual level of identities and dialogues. Some of the works discussed above, notably the future fleet architecture studies do not fit neatly into scholarly definitions. They are however, still pertinent based both on the intent of looking at how and why some of the physical tools of grand strategy are purchased and on the intent to highlight the intellectual effort, if not traditionally academic that goes into examining policy and into analyzing questions of national security. This is by no means a comprehensive review of the literature and scholars who address strategy, but it should suffice to frame the examination of U.S. national security, naval policy, and naval acquisition that is the focus of this dissertation.

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<sup>90</sup> Ibid.

## CHAPTER 2

### INSIDE THE BLACK BOX: THE FEDERAL ACQUISITION SYSTEM

This chapter is to provide an analytical framework or structure for understanding how the U.S. government procures public goods in the national defense market. It looks at the nature of the defense market in the U.S., several of the key higher-level acquisition documents, and provides a truncated and simplified description of a Request for Proposal (RFP) process for a MDAP. While some researchers have recommended that models of military expenditure need to incorporate a specific role for the behavior of agents in the political market,<sup>91</sup> this chapter seeks to describe the defense market writ large while subsequent chapters will examine the role of bureaucratic agents at the sub-systemic and even sub-national level, specifically examining the role of bureaucratic and individual agents in the U.S. Department of Defense (DoD) and the Department of the Navy (DON).

#### THE U.S. DEFENSE “MARKET”

If we try to frame the U.S. defense market in terms of classical economics, we ought to start by defining the goods that are traded in this market.<sup>92</sup> Specifically, the good that is exchanged is national defense and it is classified as a public good. This is a good that is both non-excludable and non-rivalrous, in that individuals cannot be effectively excluded from using the good and where use by one individual does not reduce availability or utility to others.<sup>93</sup> Economists use the term “non-excludable” when defining a public good. This means that national defense is not a zero-sum game for the consumers, theoretically. However, unlike a

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<sup>91</sup> Keith Hartley, *The Economics of Defence Policy* (New York: Brassey’s, 1991): 60.

<sup>92</sup> Here the term ‘good’ is used to denote a purchase, whether of parts, materials, or services.

<sup>93</sup> Hartley, *Economics of Defence Policy*, 30.

traditional supply versus demand market where production efficiencies and/or competitive advantage lead to some suppliers gaining market share based on price differentiation, meaning their costs are lower in turn leading to lower prices for the consumer and increased purchases by the consumer, this is not true in the U.S. national defense market. This market is a distorted one with most of the distortion caused by endogenous vice exogenous factors. By this, we mean that the importance or value of a factor is determined by the importance of other factors within the system. The factors that create distortions in military procurement are most often internal to the acquisition process (if we widen the definition beyond just the DoD officially delineated process) or at least internal to the U.S. vice created by external factors, like other states or the international economic or political structure. One of the specific factors that create significant distortion is the fact that this is a market consisting of small numbers of producers and in effect one consumer. For commercial products like beer, cars, or large-screen televisions, private markets of specific consumers e.g. private individuals or a hotel chain, will represent a set of prices for those products that can be estimated with some degree of accuracy.<sup>94</sup> For example, market research can identify the number of consumers with sufficient income in a geographic area or region who might possibly afford and also be interested in say a \$85,000 European sport sedan. This enables suppliers to estimate the size and composition of a market into which they may want to sell. The national defense market is harder to predict and often less flexible in its demand. A further complication or wrinkle in the actuality of the defense market is that commercial markets also offer a yardstick for measuring a firm's performance in that market. This is not necessarily so in the market for defense goods.<sup>95</sup>

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<sup>94</sup> Hartley, *Economics of Defence Policy*, *ibid.*

<sup>95</sup> *Ibid.*

The idea that the U.S. defense market is distorted or warped may cause some raised eyebrows considering that the amounts of money involved are by no means small but when we stop to consider the number of systems, suppliers, and customers we find that they are all very, very small. There is really only one main consumer of national defense, the U.S. federal government in the form of the executive agency known as the Department of Defense (DoD). There are for major weapons systems<sup>96</sup> a limited number of large commercial companies capable of providing these large, complex, and often expensive systems to the DoD. And as in the UK or France, the government has created barriers to entry in order to protect existing, domestic firms especially from foreign competitors.<sup>97</sup> While it is beyond the intended scope of this work to examine the protection of what the U.S. government calls the defense industrial base,<sup>98</sup> we ought to bear in mind the significant impact of what could be termed protectionist policies on the U.S. defense market, despite the inroads that firms like British Aerospace and Engineering (BAE) or Oto-Melara have made over the last three to four decades. The market is consciously and actively biased and warped in favor of American firms by intentional government policies.

While most readers are likely familiar with the term monopoly, where there is only one producer of a good who can therefore set the price for that good, monopsony is less well known. Monopsony is almost the exact opposite of monopoly where there is only one buyer in a market but more than one producer of a good or service. This results in the monopsonistic buyer

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<sup>96</sup> For the purpose of this paper, the term ‘major weapons system’ is interchangeable with the legal and official term Major Defense Acquisition Program (MDAP) as defined by 10 USC 2340. Available online at: [http://uscode.house.gov/view.xhtml?req=\(title:10%20section:2430%20edition:prelim\)](http://uscode.house.gov/view.xhtml?req=(title:10%20section:2430%20edition:prelim)). Accessed 2 Aug 2016, 0903 EDT.

<sup>97</sup> Hartley, *Economics of Defence Policy*, 25.

<sup>98</sup> The Defense Industrial Base [Sector] as defined by the U.S. Department of Homeland Security “is the worldwide industrial complex that enables research and development, as well as design, production, delivery, and maintenance of military weapons systems, subsystems, and components or parts, to meet U.S. military requirements.” Available online at <https://www.dhs.gov/defense-industrial-base-sector>. Accessed 12 Jan 2017, 1544 EST.

theoretically being able to set prices. In many ways this is very much the definition of the role that the U.S. government plays in the acquisition of the public good of national defense. Often in federal purchasing, most notably for large and complex weapons systems, the federal government and more specifically the Department of Defense is the sole buyer. This may be because no other entity has a need or demand for this national security good or because other entities are legally prohibited from purchasing the good. The Department of Homeland Security is an exception as are potential overseas purchasers (via the Foreign Military Sales [FMS] program) but one would not expect the Department of the Interior to purchase jet fighter aircraft or Health & Human Services to buy an aircraft carrier or ballistic missile submarine. Likewise, the average citizen does not need and is in fact not allowed to purchase artillery pieces or strategic bomber aircraft.

Another unique factor that significantly shapes the market for defense goods is the existence of mutual dependencies between buyers and suppliers. With one overwhelmingly positioned buyer and relatively few suppliers, the market cannot effectively determine prices and create 'efficiencies' through competition. However, the DoD is often reluctant or restrained from taking the best prices that it can get because in doing so, the sellers could be driven out of business. This presents a dilemma for the federal government because if enough companies decide to exit the weapons systems market supply-side the government will have to produce these goods themselves. This has often proved inefficient in the past and would likely prove to be unpopular among those citizens who lose their positions to government workers and stockholders who lose their investments in commercial companies. There is also a policy issue at stake in driving commercial entities out of the defense business; since at least the Truman administration, the U.S. government has sought to satisfy its goods and services needs by

leveraging the traditional free market process, seeking out the ‘best’ price for the desired quality of good. Forcing all defense production into state-run enterprises would equate to an abandonment of this long-standing federal policy which has remained consistent regardless of the political party in power at any given time.<sup>99</sup> It could also require the government to devote even more resources to creating the public good of national defense, further straining the fiscal and physical resources available to both the government and to the national economy. At least in the short run, developing a governmental defense industrial base of the size required would divert significant public and potentially private investment into support this development thus removing that capital from investment opportunities in both the public and likely in the private sectors of the economy. To an extent, the government is hostage to the continued existence of those commercial companies who are willing and able to provide major weapons systems. Without suppliers willing to work with the government, and often willing to accept lower Return on Investment (ROI),<sup>100</sup> the government would be forced to either produce the goods itself or purchase from foreign suppliers, a course of action certain to be rejected by various domestic interests in the U.S.

The limited customer base in the U.S. defense market results in the government enjoying a monopsonist position in the market. Most of the literature in the acquisition community addresses the monopsonist pricing power of the government.<sup>101</sup> But in some cases, there are

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<sup>99</sup> While it is intentionally outside the scope of this work to look at the conventional politics of weapons procurement, it is worth the time to note that defense contractors i.e. commercial companies have made a conscious and concerted effort to spread their production facilities, suppliers, and partners throughout and across almost every state in the Union. This makes defense procurements of some level of interest to almost all of the delegations in the U.S. Senate and House of Representatives - because this spread of defense industry provides employment to their constituents.

<sup>100</sup> Willis R. Greer, Jr. and Shu S. Liao, “Analysis of Risk and Return in the Defense Market,” *Management Science*, Vol. 32, No. 10 (Oct 86), 1263.

<sup>101</sup> David T. Day, “The Limits of Monopsony Pricing Power on the Markets for Defense Goods,” paper delivered at the DAU Research Symposium, “The Limits of Competition in Defense Acquisition,” Sep 2012, 4

counter-balancing factors that prevent the government from fully leveraging its monopsonist power. Without distracting from the main intent of looking at LCS acquisition, there is some value in taking a short look at some of the literature addressing monopsony issues in government procurement. One of the better pieces is an article from Walter Adams and William James Adams, entitled “The Military-Industrial Complex: A Market Structure Analysis.” The reason this article is valuable because the authors’ postulate a market composed on the monopsonist and a group of oligopolistic vendors.<sup>102</sup> The UK’s defence market has been characterized as one of “selective competition resembl[ing] oligopoly with entry restrictions.”<sup>103</sup> This is in fact a very accurate description of what the U.S. defense market and DoD’s acquisition process, especially for major weapons systems is like. The DoD is in effect a monopsonist buyer, despite as mentioned earlier some potential FMS customers, and the suppliers resemble oligopolistic market entities. An oligopoly is akin to a monopoly except rather than one firm dominating the market thus setting prices, a more limited number; often two or three firms dominate the market.<sup>104</sup> In James Hasik’s “Better Buying Power or Better Off Not?” he cites a report authored under the chairmanship of then-Under Secretary of Defense for Acquisition, Technology and Logistics Ashton Carter addressing the government’s monopsony buying power. He notes that Carter in effect asked why the U.S. government, as the largest buyer by far of weapons worldwide, and the monopsony buyer in the largest market, did not have more power in pricing its purchases.<sup>105</sup> Hasik goes on to discuss the issue of government purchases of the technical data rights for systems as his main topic but he also notes that in many ways the

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<sup>102</sup> Walter Adam & William James Adams, “The Military-Industrial Complex: A Market Structure Analysis,” *The American Economic Review*, 62 (1), 281.

<sup>103</sup> Hartley, *Economics of Defence Policy*, 82

<sup>104</sup> Thomas A. Pugel, *International Economics*, 13th ed. (Boston: Boston : McGraw-Hill Irwin, 2007), 94, 110-112.

<sup>105</sup> James Hasik, “Better Buying Power or Better Off Not?” *Purchasing Technical Data for Weapon Systems*, *Defense Acquisition Research Journal*, Vol. 21 No. 3 (July 2014), 695.



relationship between the government and some of its suppliers resembles more of a bi-lateral monopoly versus a purely monopsonist to market (or supplier) relationship.<sup>106</sup> Here again, we can see a relationship that appears close to a monopsony purchaser and oligopolistic set of sellers.

Daniel Day in his paper “The Limits of Monopsony Pricing Power in the Markets for Defense Goods,” while accepting the apparent monopsony power of the government also presents several reasons why the government does not enjoy pure monopsony power. He assumes the government position as monopsonistic but also provides several strong examples of how and why this power is eroded by external and internal factors. For some purchases, the government is in fact not the only purchaser,<sup>107</sup> fuel is a particularly appropriate example commodity of which DoD buys a lot and must compete on the open market for pricing. This open market is a global one and despite the influence of the Organization of Petroleum Exporting Countries (OPEC) is still one mostly driven by classical supply and demand. Day further points out that while the DoD can force prices down on other products that it is indeed the sole or major purchaser of, the department must also allow some price and profit incentive in order to keep its suppliers in business and providing the needed products and services.<sup>108</sup> He also addresses the role of politics in DoD purchasing and its impact on diminishing DoD monopsony power.<sup>109</sup> And finally, Day also acknowledges the oligopolistic power of major defense suppliers, specifically addressing the United Launch Alliance between Lockheed Martin and Boeing, which mitigated the government’s ability to dictate supplier pricing.<sup>110</sup> As other scholars have, he

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<sup>106</sup> Ibid, 698.

<sup>107</sup> Day, “Monopsony Limits,” 10-13.

<sup>108</sup> Ibid, 14.

<sup>109</sup> Ibid, 17-18.

<sup>110</sup> Ibid, 18-19.

accepts that the U.S. government is a monopsonistic entity in terms of purchasing the public good of national defense but he also points out several factors that contribute to diminishing this power.

## THE UNITED KINGDOM (UK) VERSION

While the UK's defense market has gone through many of the same consolidation and limited growth challenges as defense firms in the U.S. has since the early 1990s it remains both a distinct national and international market that mirrors the defense market in the U.S. fairly closely. While it may not remain as true as it was two decades ago, it is likely that a number of UK high technology companies can be characterized as domestic monopolies, specifically aircraft, helicopters, missiles, nuclear powered submarines, tanks, and torpedoes.<sup>111</sup> There was and is to an extent, an absence of rivalry or competition, especially within the UK while certainly not within the EU or globally. By way of proof, there are reported examples of UK Ministry of Defence (MOD) procurements where competitive bidding has resulted in cost savings to the British Crown ranging from 10 to 70 percent.<sup>112</sup> This level of cost saving could be interpreted as indicative of monopoly pricing, inefficiencies in the UK defence market, or a market that parallels the monopsony prevalent in the U.S. defense market. Traditional economic theory would expect or potentially predict that the MOD and the armed forces would substitute relatively cheap for more expensive weapons systems in order to make their pound go further.<sup>113</sup> However, often the MOD like the U.S. DoD will select the more expensive option, sometimes based on the more effective capabilities the chosen system offers but sometimes based on other reasons. These factors must by their very nature include potential enemies and current allies as

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<sup>111</sup> Hartley, *Economics of Defence Policy*, 18

<sup>112</sup> Ibid.

<sup>113</sup> Ibid, 20.

well as arms races, actual conflicts in progress, new technologies and the Exchequer's or Treasury's capability to pay for the weapons systems.<sup>114</sup> So in the case of the UK, we have indications of the purchaser of national defense (or defence) goods as another monopsonist but we also find some mitigating or variable factors that may impact or influence purchasing decisions. What is true for the UK is likely to a lesser or greater extent to hold true for the U.S. not because of the so-called special relationship but because of relative similarities (government form, alliances, etc.) between these two states. So, monopsony may rule so to speak but it may also not be an absolute ruler.

In short, the U.S. government does bear a striking resemblance to a monopsonistic buyer as described in economics theory. However, often this role as the sole purchaser is off-set or blunted by the sellers' strengths as oligopolistic firms, with limited numbers being able to supply the require goods and sometimes services. However, there are several other factors including regional issues, economic policies, and legislative interest that have significant impact on the government's purchasing and pricing decisions. Not to mention the impact of imposed rules like the Federal Acquisition Regulations (FAR), and the Defense FAR Supplement (DFARS). These rules, as we will see in the discussion of the DoD DAS, act as sort of pseudo-market drivers. The intent is to level the playing field and to artificially force suppliers to adjust their pricing and quality as if there were competing buyers, at least for major weapons systems. So in effect, the government works in many ways to force itself out of a monopsonistic position in the hopes of getting better pricing through competition vice using its inherent market strength to dictate specific 'better' pricing.<sup>115</sup> One might think that the government and DoD would use its power

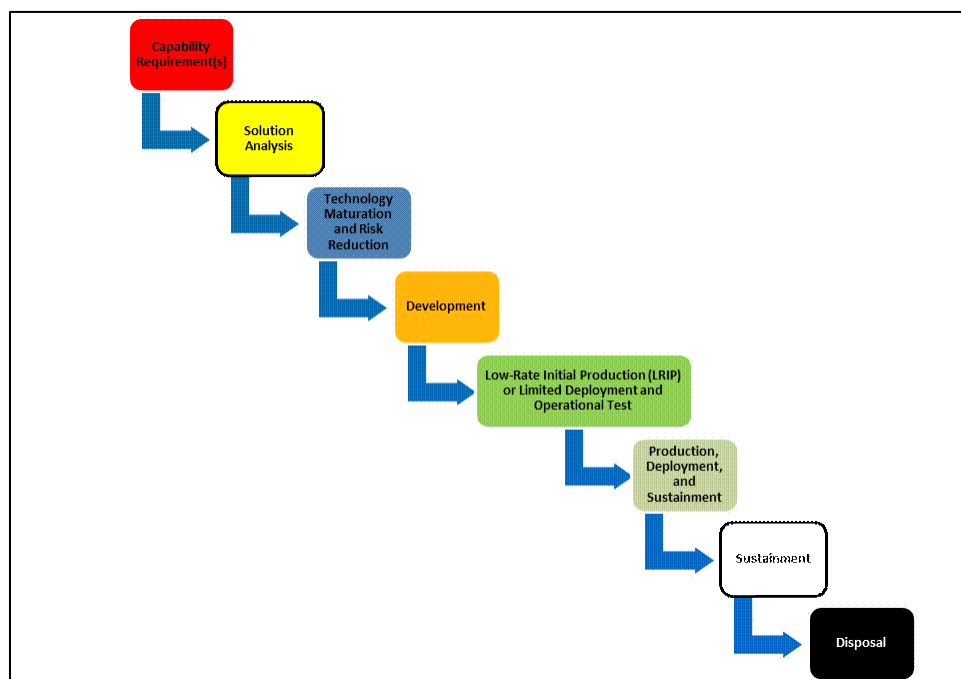
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<sup>114</sup> Ibid, 43.

<sup>115</sup> See Tom Campbell, "Bilateral Monopoly in Mergers," *Antitrust Law Journal*, Vol. 74, No. 3 (2007): 521-536 for an interesting counter-argument. His thesis is that sole buyers (monopsonists) coupled with sole suppliers

to the utmost in order to drive prices down and save money but as several authors have noted, if prices are too low, suppliers will lose money and thus exit the defense market – leaving the government without commercial suppliers to meet its national defense needs. This is viewed by almost everyone in the government-side of acquisition as a less than optimal choice. This obviously holds true on the commercial-side of acquisition as well.

## THE FEDERAL ACQUISITION PROCESS<sup>116</sup>



*Figure 1- Simplified Notional Acquisition Process*

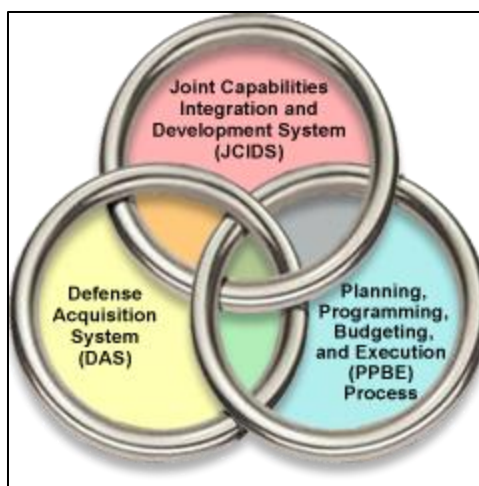
(monopoly) would result in a better pricing situation for both parties vice competitive suppliers in relation to sole purchasers and competitive buyers versus one supplier. By extension, this would appear to support the aggregation of DoD major systems suppliers; fewer suppliers equals better pricing for the monopsonist and the suppliers.

<sup>116</sup> Figure 1 is based on DAU provided graphic. Available on-line:

[https://dap.dau.mil/aphome/Documents/Defense%20Acquisition%20Waterfall%20Chart%20with%20color%20enhancements%2017%20Dec%20final%20\(3\).pdf](https://dap.dau.mil/aphome/Documents/Defense%20Acquisition%20Waterfall%20Chart%20with%20color%20enhancements%2017%20Dec%20final%20(3).pdf). Accessed 01 Aug 2016, 1033 EDT.

The federal procurement system as practiced by the U.S. government and especially the DoD is a complex one designed to reduce or remove favoritism or bias in selecting goods and services that the government purchases. See the preceding figure (Figure 1) for a highly simplified version of the Defense Acquisition process. From the contractor's point of view, it is governed by two major sets of rules, the FAR and the DFARS. However, these two documents are only the tip of the iceberg in terms of the rules, regulations, and statutory documents that govern how the DoD procures weapons systems and in fact everything else that it buys. This section will examine in some depth the governing DoD and Department of the Navy (DON) instructions on major acquisition of systems (equipment) and services.

One of the other key governing documents is the National Defense Annual Authorization (NDAA). This is basically the DoD's annual budget as promulgated by Congress. It often directs changes to the FAR and/or DFARS, directs contract awards of a certain size to firms of a certain type, and basically provides a lot of prescriptive guidance on how procurement ought to proceed under that Fiscal Year's (FY) budget authority. This is Congress' opportunity to exert its power of the purse over the executive branch of government. The challenge of the NDAA is that because it is an annual document it changes and can do so significantly from year to year.



*Figure 2- DAU Depiction of the Relationship between DAS, PPBE, & JCIDS*

The Defense Acquisition University presents the acquisition system as a series of three interlocking rings, representing the Joint Capability Integration Development System (JCIDS), the DAS, and the Planning, Programming, Budgeting, and Execution (PPBE) and their interaction (see Figure 2 above).<sup>117</sup> As the DAU website puts it; “DoD has three principal decision-making support systems. Together, the systems provide an integrated approach to strategic planning, capabilities needs assessment, systems acquisition, and program and budget development.” This is actually a very important concept to grasp, there are three key factors that DoD considers in purchasing major weapons systems, the requirement or threat (strategic planning), if the capability is really needed to fulfill the requirement or respond to the threat (capabilities), and can we afford it (PPBE) or do we settle for half loaf as better than none? This is a very close parallel to the concept of ways, means, and ends. There is a desired end and there are certain ways and means to get there – but what is the best of these or the best combination of these ways and means? Identifying the ends and the ways they may be achieved determines the

<sup>117</sup> Available online at: <https://dap.dau.mil/aphome/Pages/Default.aspx>. Accessed on 08 June 2016, 20:46 EST.

means required (although in short-term strategies or crisis planning, the means currently available may determine the ways and ends).<sup>118</sup> The other key item of interest in looking at the overarching system of DoD procurement is that inputs from outside the system – near-peer competitors, strategic non-state threats, and environmental issues – are critical input variables that go into the equation of defense procurement. This is akin to the old adage that “the enemy gets a vote.”

For the purposes of this study and brevity, we will focus on the DAS and while not ignoring the impact or importance of the other two systems, avoid going into depth about them in relation to the LCS procurement. The DAS is the more important of the three interlocking systems in acquisition as a topic of discussion for the purpose of this study.

The notional system begins with the definition of a requirement, often by a specific service, say the Navy for example, that is needed in order to accomplish the assigned missions, tasks, and functions that the service is required to perform. Once this requirement is defined by a service or joint entity, it is presented to the Joint Requirement Oversight Council (JROC) for vetting, review and approval or disapproval. The Joint Capabilities Integration and Development System (JCIDS) is the process used by the JROC to fulfill its statutory responsibilities to the Chairman of the Joint Chiefs of Staff (CJCS), including but not limited to identifying, assessing, validating, and prioritizing joint military capability requirements.<sup>119</sup> JCIDS ultimately informs much of the system development and procurement process from requirements acceptance through the DAS and the Planning, Programming, Budgeting, and Execution (PPBE) where

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<sup>118</sup> Colonel Dale C. Eikmeier, “Ends, Ways, Means: A Logical Method for Center-of-Gravity Analysis,” *Military Review* 87, no. 5 (September-October 2007): 62.

<sup>119</sup> Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01I, “Joint Capabilities Integration and Development System (JCIDS),” 1.

money is actually allotted to the services and other DoD entities (Combatant Commanders, Combat Service Agencies, Joint Staff, etc.).<sup>120</sup>

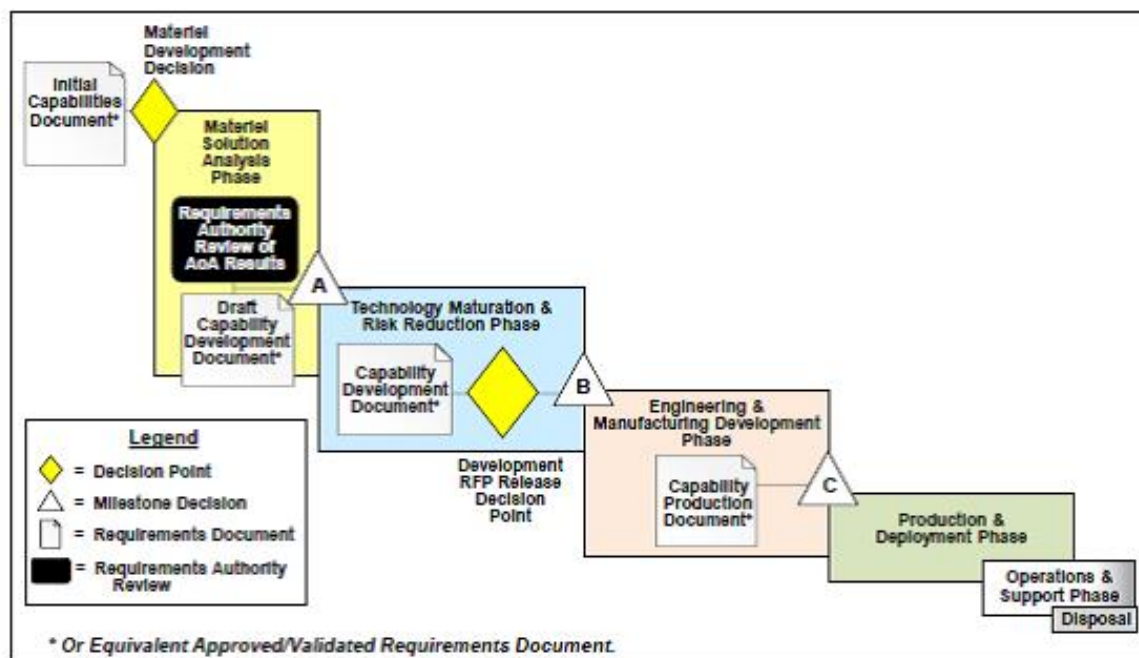


Figure 3- The Interaction between Capabilities Requirements and Acquisition Process<sup>121</sup>

Using Figure 3 above, let us examine the notional flow from capabilities requirements definition – “We need something” to acquisition – “We are buying something that we need.” The initial capabilities document serves to both define the need and provide the justification for it being a needed capability for one of the (in our case) military departments. Some recent examples that serve to illustrate this are; a new air-superiority fighter, the F-22 for the US Air

<sup>120</sup> Ibid, 2. An interesting footnote is that Special Operations Command (SOCCOM) actually has validation authority and acquisition authority for its own requirements.

<sup>121</sup> Department of Defense Instruction (DoDI) 5000.02, “The Operation of the Defense Acquisition System (DAS),” 07 Jan 2015, 5.



Force, a mine- and Improvised Explosive Device (IED) vehicle, the Mine Resistant Ambush Protected (MRAP) for the U.S. Army and Marine Corps, and a new surface combatant, the Littoral Combat Ship (LCS) for the U.S. Navy. If this capability document is reviewed and accepted by the JROC, then a Material Development Decision (MDD) must be made. At this point there has been a decision made that a new product or system is indeed justified and needed and the lead service or Milestone Decision Authority (MDA) must analyze the alternative solution(s) available. This pushes the acquisition program in the system into the Material Solution Analysis Phase. The outcome of this is a review of the Analysis of Alternative (AoA) by the requirements authority, which varies with the size (cost) and nature (for example some DoD Information Technology programs are the purview of a Defense Acquisition Executives, generally a senior Deputy or Under-Secretary of Defense vice a military officer). The outcome of this step is the drafting of a Capabilities Development Document and the first milestone in the acquisition process commonly referred to as Milestone A.

Milestone A, or the Risk Reduction Decision, is an actual decision to procure something to fulfill a capabilities requirement. It is a decision by the DoD or service to invest in developing a specific product or design concept. The intent is to commit the resources, generally funding, to mature a technology and/or reduce the risks inherent in a new technology before further resources are committed that would lead to the production and fielding of a system.<sup>122</sup> The bottom line here is that the procuring agency or department needs to make a decision that something like the electro-magnetic rail-gun the Navy has been developing for the last five to ten years is effective enough and sufficient 'bugs' have been worked out of the technology that paying a company to set up a production line, provide a prototype able to function at sea, and

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<sup>122</sup> DoDI 5000.02, 7.

then being producing sufficient numbers to fit on Navy ships is a reasonable commitment of the Navy's limited resources. Or in our specific case study, that the concept of the LCS would provide the mission effectiveness and system reliability that the Navy needs for the next 20-30 years.

If a system passes Milestone A, it proceeds into the Technology Maturation and Risk Reduction phase. Here the service seeks to improve the selected technology or develop it so that potential failures are minimized. There is another phase of Capability Development documentation because the requirements may have changed during the intervening period of maturation. As the instruction states: "Capability requirements are not expected to be static during the product life cycle."<sup>123</sup> We shall see just how important this specific statement in the road to IOC for LCS. The world situation, new technologies, emerging threats, and budgets all play a part in the definition of required capabilities and the acquisition professionals need some way to adjust system and design acquisition to address these changes. The DoD employs what it calls Configuration Steering Boards (CSB), to periodically review acquisition programs and adjust or even out-right recommend cancellation based on the capability requirements at that time. For example, the Army's self-propelled artillery system "Crusader" was cancelled with the end of the Cold War and the reduced call for large caliber, mobile tube artillery.<sup>124</sup>

At some point in the technology maturation and Risk reduction process, DoD begins to shift into the Engineering and Manufacturing Development (EMD) phase of the acquisition. This is when DoD actually commits to building and putting into service a system, aircraft, or

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<sup>123</sup> Ibid, 5.

<sup>124</sup> Jeff Clabaugh, "Embattled Crusader weapons program canceled," *Washington Business Journal*, 09 August 2002.

See also Colonel James L. Davis, "The Cancellation of Crusader: A Study in the Dynamics of Decision-Making," Strategy Research Paper (Carlisle Barracks, PA: U.S. Army War College, 07 April 2003).

ship and it entails three major decision points. The first of these is the Requirements Decision Point or Capability Development Document (CDD). There is where major cost versus performance trade-offs have been completed and enough risk mitigation done to commit to the set of requirements that will apply to the initial design, development, and production of a system. This means that the Navy has determined that 42 ships with a certain speed, weapons systems, and endurance are preferable in terms of cost versus 20 ships with half the speed, more systems, and longer endurance, again if we apply our specific case study, the LCS. Bear in mind, that the cost is not just the procurement cost per unit but the entire cost of the system (people to run it, training the same, spare parts, system upgrades, even disposal costs) over the entire life-span of that system. In the Navy's case, as evidenced by the very recent retirement of USS ENTERPRISE (CVN 65) a life-span can last almost a half-century – and in her specific case much longer in view of the eight nuclear reactors that were installed and still require disposal at the time of this writing (June 2014).

The second major decision point in the EMD phase is where industry really starts to get interested because it leads to the government soliciting a proposed solution from commercial companies. This is the Develop Request for Proposal(s) (RFP) Release Decision Point.<sup>125</sup> At this point, DoD decides whether or not a vendor, more often than not a commercial company, can provide a capable system to meet the requirement(s) as defined by the government. For LCS, the requirement addressed ship size (tonnage and dimensions), crew, weapons systems, engineering systems, sea-keeping (how well the ship was supposed to handle rough seas and winds), maintenance, durability, speed, and endurance (either in range or days at sea). With the required performance parameters provided by the government, the bidders are expected to

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<sup>125</sup> DoDI 5000.02, 7.

provide a design that fulfills all of the required metrics of performance and present the anticipated cost for them to design and build this system.

## THE REQUEST FOR PROPOSAL (RFP) AND AWARD

The final decision point in the EMD stage is DoD's Milestone B, or the decision to actually award a contract to a bidder who best satisfies the stated requirement(s). The government has several options in awarding a contract, especially for a major weapons system like a ship or aircraft. The simplest procurement selection process is called LPTA or "Lowest Price, Technically Acceptable." In effect, if the offered solution is "good enough" and cheaper than the other offerors, that bidder is awarded a contract. This is however, not the preferred solution in the case of major systems because of the complexity and overall cost of the system. The other option labeled 'quality trade-off' is the preferred one for complex procurements like the F-22 or the LCS. In this process, the government assesses the quality or value of the offered solution in comparison to the cost of the unit or whole series procurement. Again because of the size and scope of major weapons systems acquisitions this is the preferred and generally most appropriate source selection criteria to use. One generally wants to avoid buying anything, especially multi-million or multi-billion-dollar weapons systems from the proverbial "lowest bidder."<sup>126</sup>

Another alternative has gained popularity in government procurement though mostly for service contracts vice systems acquisition. This is a multiple award contract, where there are numerous winners of a contract who then in turn compete for individual task orders issued

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<sup>126</sup> This term often includes connotations of the cheapest and thus shoddiest solution though this is admittedly not always the case. Nonetheless the perception persists as does the phrase as a disparagement used by government and contractor personnel alike.

against that contract. These are often seen in military construction (MILCON) and called Multiple Award Task Order Contracts or MATOC and in services where Indefinite Delivery/Indefinite Quantity (IDIQ) are issued. These have become much more common because first, if everyone wins, no one loses and thus no bidder has grounds for protesting the award of a contract. However, in competing for the individual task orders there are quite a few losers and often only one of two winners; this is in fact one of the main complaints heard from holders of the Navy's Seaport-E multiple award contract vehicle.<sup>127</sup> There has been a decided rise in the number of protests over the last decade and the addressing a protest costs the government a lot of time, money, and delays actually procuring the services or equipment that is required. The other advantage from the government's perspective is that bidders continue to compete, often driving down price bids, against one another for the individual task orders issued under a MATOC. In the case of LCS, the government decided to make two awards, one to a consortium headed by Lockheed Martin and the other by General Dynamics – Bath Iron Works.<sup>128</sup> This retains a certain level of the continued competition leveraged in multiple award contracts but requires more management from the procuring service. However, two Rand Corporation studies, one on shipbuilding and the other on the Joint Strike Fighter actually provide evidence to the contrary. In *Why Has the Cost of Navy Ships Risen?* the authors note that they “found no statistically significant evidence that using multiple producers lead to lower unit costs.”<sup>129</sup>

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<sup>127</sup> This is based on the author's own experience working at a company with a Seaport-E contract and discussions with over a dozen companies on the Seaport-E contract vehicle in the Hampton Roads region.

<sup>128</sup> Alkire, et al, *Littoral Combat Ships: Relating Performance to Mission Package Inventories, Homeports and Installation Sites* (Santa Monica, CA: Rand, 2007), 3

<sup>129</sup> Arena, et al, *Why Has the Cost of Navy Ships Risen: A Macroscopic Examination of the Trends in U.S. Naval Ship Costs of the Past Several Decades* (Santa Monica, CA: Rand, 2006), 47. See also Mark A. Lorell, Michael Kennedy, Robert S. Leonard, Ken Munson, Shmuel Abramzon, David L. An, and Robert A. Guffey, *Do Joint Fighter Programs Save Money?* (Santa Monica, CA: RAND, 2013).

The decision to award a contract is not the end of the procurement process but is the final major milestone in DoD acquisition. The final but often the most complex and costly steps are in the initial fielding, operational, and the disposal phases of the process. Often new systems, including LCS go through “teething” problems as previously unsuspected or unexpected mechanical, electronic, maintenance, or software challenges (to name just a few) emerge with the first operational deployment or employment of a system. One of the unexpected problems that has emerged with the LCS as a class is a more severe degree of metal fatigue and cracking than was predicted.<sup>130</sup> Rectifying these issues takes time and money and can delay the Final Operational Capability (FOC) of a system, which though not exactly a procurement milestone is nonetheless a critical one for the owning service and the Geographic or Functional Combatant Commanders (COCOM) who will actually utilize these systems in military operations. The other piece that is often overlooked is that weapons systems, especially ships but also aircraft and vehicles are not only maintained but updated over their life-cycle. This sometimes engenders another round of procurement as the government looks to commercial vendors to develop new capabilities, install new equipment, or provide material repairs and overhauls to the systems and sub-systems. One good example of this is the B-52 “Stratofortress.” This aircraft was originally designed in the late 1940s to early 1950s, first flew in the mid-1950s and remains in service today (2016). Over this almost 60-year life-cycle, most if not all of the systems including the engines and electronics have been replaced at least twice and the airframes themselves have been mechanically repaired on a regular basis. Very much like DOD 5000.02 states, the requirements will not remain static over the life-span of a system and neither will the mechanical or electrical or software structure of the system. This reflects why and how the Operations and Support phase

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<sup>130</sup> Interview with senior Navy engineering maintenance officer, Norfolk VA, 09 June 2016.

can actually become much more expensive than the purely acquisition phase(s) for a major weapons system. Disposal costs are becoming more and more important as ecological values gain popular currency and the cost of protecting the environment rises. We have already discussed the case of CVN 65, but Naval Air Station North Island in Coronado CA is another good illustrative case. There was and is a major Navy aviation maintenance depot at North Island which has been there since the 1920s. This is akin to a mid-sized factory or major industrial plant which overhauls and repairs aircraft, engines, electronics, and other aviation systems. The problem is that for the first fifty or so years of the depot's existence the issue of toxic heavy metals, petroleum products, and other chemical and metallurgical waste was not an issue. It was often buried or dumped near the airfield and no provision to prevent toxic materials from contaminating the soil or ground water was required. However, in the 1970s the environment and protecting it started to become a major interest item for the American people and thus for the military. The level of contamination or pollution at North Island to this day, despite 30 plus years of remediation is high enough to match some of the EPA's "Superfund" Sites. This means that the military, and not just the Navy but all of the services have become much more environmentally conscious because of the costs inherent in spills, pollution, and contamination. Many major weapons systems like ships cost money to dispose of properly and while neither the Navy nor this writer believe the environment to be unimportant; the Navy ought to expend its resources supporting the national security and national military strategies not in creating and then cleaning up new environmental disaster sites.

**SECNAVINST 5000.2E, "DEPARTMENT OF THE NAVY  
IMPLEMENTATION AND OPERATION OF THE DEFENSE ACQUISITION  
SYSTEM AND THE JOINT CAPABILITIES INTEGRATION AND  
DEVELOPMENT SYSTEM"**

The Navy's governing instruction fits or nests underneath the over-arching structure provided by the Secretary of Defense's instruction. It starts out with the usual broad statements of intent and applicability and then aims directly at many of the key pieces that fit under the DoD instruction. The Assistant Secretary of the Navy, Research, Development, and Acquisition (ASN, RD&A) serves as the Component Acquisition Executive (CAE) for the Navy.<sup>131</sup> Thus he or she is the key person in the formal procurement process for equipment and services for the U.S. Navy, assigning duties and responsibilities for specific acquisition programs to other individuals, offices, or organizations in the Department of the Navy (DON). For us, in looking at the LCS program, the prescribed role of the Chief of Naval Operations (CNO) is of particular interest. The CNO is tasked to assign program sponsors who are responsible for identifying naval warfare and functional areas program capability needs and requirements.<sup>132</sup> This means that the CNO or his staff (known as OPNAV – Office of the Chief of Naval Operations) is responsible to identify and quantify or qualify the capability requirements for naval warfare which include several different areas applicable to the LCS class, including Surface Warfare, Air Warfare, and Undersea Warfare, to name some of the more significant. It also means that functional areas, like communications, Command and Control (C2)<sup>133</sup>, and sensors like sonar or radar are 'owned' by OPNAV designated program sponsors. This has some important implications in the procurement process and the manner in which decisions are made – especially as we explore the issues of organizational behavior and bureaucratic politics. Also of note, the SECNAV instruction ensures that the verbiage in the instruction is in keeping with the latest

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<sup>131</sup> SECNAVINST 5000.2E, 4.

<sup>132</sup> Ibid, 5.

<sup>133</sup> Of note, traditionally when the Navy discusses C2, the topic is centered on the technology of command and control i.e. how orders and data are transmitted and by what machines. In Joint Doctrine, Command and Control is how units are organized and what the hierarchy is among them vice what radios of computers are used to pass orders and information or "command relationships." See Joint Pub 1, V-14 to V-17 for more specifics.



joint directives by stating that the “legacy term ‘requirements’ as used in this instruction may be interpreted to mean ‘capability requirement’ as defined in” the JCIDS Instruction (CJCSI 3170.01D).<sup>134</sup> Returning to the role of resources sponsors, the instruction notes that CNO resources sponsors are responsible for specific appropriations categories, the acquisition categories of ACAT, which are defined by both the equipment, systems, and services being acquired as well as the cost of these. They may also have dual responsibility as program resources sponsors.<sup>135</sup> Here again, we can see the potential for impacts driven by organization behavior and/or bureaucratic politics in the Navy’s acquisition process.

The instruction also delineates the process by which the Navy reviews and makes resource allocation decisions in a forum that allows the various stakeholders a say in where and when the Navy’s resources are allotted. This is in the form of the Resources and Requirements Review Board (R3B). The R3B serves as the organizational process or decision point where the senior members of the Navy’s flag mess, 3- and 4-star admirals look at major Navy and Joint acquisition programs, specifically ACAT levels I through IV. A simple if imprecise characterization means that level 1 programs cost more than \$2.19 billion (FY2000 dollars), level II cost more than \$660 million, III are less than or equal to \$660 million, and IV don’t meet some of the other criteria for level III while still costing \$660 million or less.<sup>136</sup> This simplified description serves to highlight the significant costs of the acquisition programs that the R3B reviews and also serves to highlight just how much of the Navy’s resources may or may not be committed to fund an ACAT program. The decisions that the R3B makes can have significant impact on the resources that the Navy has available for regular operations (or Operations &

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<sup>134</sup> SECNAVINST 5000.2E, 5.

<sup>135</sup> Ibid, 5.

<sup>136</sup> Ibid, taken from Table E1T1, 1-22. This is a very much simplified version of the ACAT level qualifications.

Maintenance often called O&M dollars) and for other acquisitions in both a specific fiscal year (FY) but also for the ‘out years.’<sup>137</sup> In short, R3B decisions can have a significant impact over half-a-decade later on the naval service. As the instruction puts it, the R3B serves as:

“a focal point for decision-making regarding Navy and JCIDS ACAT I through IV and abbreviated acquisition requirements; the validation of non-acquisition related, emergent, and Joint requirements; the coordination of service input to Planning, Programming, Budgeting, and Execution (PPBE) processes; and the resolution of cross-enterprise or cross-sponsor issues.”<sup>138</sup>

The section regarding the PPBE processes again highlights the potential influence of organizational behavior because this is where the competition between the services for resources is often ‘fought’ out in a very political, Darwinian, and Machiavellian sense.<sup>139</sup>

The instruction goes on to describe the roles and responsibilities for various OPNAV and Navy entities in the procurement process and interestingly highlights an overarching theme of cost reduction or cost control whenever and wherever possible. For instance the Deputy CNO for Manpower, Personnel, Training and Education or CNO (N1) is tasked to support the Program Executive Offices (PEO), System Commanders (SYSCOM), and direct reporting program managers (DRPM) with maximizing the use of technology in order to reduce manpower and personnel requirements and associated life-cycle costs for acquisition programs.<sup>140</sup> This is of particular note for the LCS program because one of the key concepts for the individual platforms is the idea of minimum manning. Sailors are considered both one of the Navy’s most important

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<sup>137</sup> From the DoD and DON perspective, the ‘out years’ are generally referred to as the four years following the current year (FY) and the budget year. See Defense Acquisition University ACQuipedia, available online at <https://dap.dau.mil/acquipedia/Pages/ArticleDetails.aspx?aid=a2cc2ade-6336-433e-a088-42f497cdf7ef>. Accessed 05 Jul 2019, 2210 EST.

<sup>138</sup> SECNAVINST 2000.2E, 5.

<sup>139</sup> See Perry M. Smith. *Assignment--Pentagon the Insider's Guide to the Potomac Puzzle Palace*. 1st ed. AUSA Institute of Land Warfare Book (Washington, DC: Pergamon-Brassey's International Defense Publishers, 1989).

<sup>140</sup> *Ibid*, 6.

resources but also one of its largest expenses and any possibility of reducing manpower requirements can translate into significant savings in other areas of the Navy's corporate structure. Likewise, the Deputy Chief of Naval Operations (Information Dominance) CNO (N2/N6) is enjoined to "optimize Navy network investments."<sup>141</sup> This means that he or she is responsible to make the most efficient use of the Navy's money in buying the computer hardware and software possible. Considering the number of computers required to effectively run most of today's weapons systems, ships, and aircraft, network investments represent a large sum of money and being able to purchase the most effective systems in an efficient manner can represent large resource savings potentially freeing up money that the Navy can invest elsewhere. Likewise, though it is more implied than categorically stated, the Vice CNO for Fleet Readiness and Logistics (N4) is tasked with developing and recommending policy for the ASN (RD&A) to approve regarding acquisition life-cycle logistics. This office is also directed to conduct assessments of system life-cycle cost affordability.<sup>142</sup> Again it is drawing inferences, but the unstated assumption is that N4 should develop policies that will, if possible, minimize systems maintenance costs for the entire life-cycle of the system. Likewise, if the system logistics life-cycle is not affordable, N4 will notify the acquisition lead and potentially make suggestions on how to decrease the overall life-cycle costs, cut-short, or even recommend cancellation.

One final observation from the introductory section of SECNAVINST 5000.2E; the various acquisition entities tasked with leading procurement efforts are provided with very definite directions. The various Program Executive Offices, System Command Commanders

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<sup>141</sup> Ibid.

<sup>142</sup> Ibid, 7.

and DPRMs are granted the authority, responsibility, and accountability for the life-cycle management of all acquisition programs under their respective cognizance.<sup>143</sup> Again, this infers that managing and if possible reducing those costs in a policy goal supported by the office of the Secretary of the Navy and levied upon subordinate organizations in the acquisition process.

For the LCS program, the role of Commander, Space and Naval Warfare Systems Command (COMSPAWARSYSCOM) assigned by this governing instruction has some special significance. This is because much of the LCS concept is based on the idea of networked platforms working in concert.<sup>144</sup> SPAWAR (to use Navy short-hand) is tasked with managing the system and technical architecture and mission-area chief engineer for command and control (C2) and net-centric segment reference architectures (SRAs). Again, this is important because the LCS mission or function concept relies very heavily on timely and accurate C2 and the integration of individual LCS platforms (hulls) into net-centric networks where each functions as part of the greater sum to apply kinetic or non-kinetic effects (or “fires”) against a specified target.<sup>145</sup> The introduction goes on to delineate roles and responsibilities for a host of other offices and organizations from Navy Net Warfare Command (NETWARCOM), the Naval

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<sup>143</sup> Ibid, 9.

<sup>144</sup> See Arthur K. Arthur Cebrowski and John J. Garstka, “Network-Centric Warfare: Its Origins and Future,” *U.S. Naval Institute Proceedings*, Vol. 124, No. 1 (January 1998): 28-35. Arthur Cebrowski, “Military Responses to the Information Age,” *The RUSI Journal*, Vol.145 No. 5 (01 October 2000): 25-29. -----, “The power of transformation,” *Federal Computer Week*, Vol.19, No. 41 (05 December 2005): 42-43. “Network-Centric Warfare,” DoD Office of Force Transformation pamphlet, 2003. “Implementation of Network-Centric Warfare,” DoD Office of Force Transformation report, 05 January 2005. James R. Blaker, *Transforming Military Force: The Legacy of Arthur Cebrowski and Network Centric Warfare* (Westport, CT: Praeger Security, 2007). Norman Friedman, *Network-Centric Warfare: How Navies Learned to Fight Smarter through Three World Wars* (Annapolis, MD: Naval Institute Press, 2009).

<sup>145</sup> For more on effects based operations see Edward A. Smith, Jr., *Effects Based Operations: Applying Network Centric Warfare in Peace, Crisis, and War*, DoD Command and Control Research Program (CCRP) publication (Washington, DC: CCRP, 2002). Edward C. Mann III, Gary Endersby, Thomas R. Searle, “Thinking Effects: Effects-Based Methodology for Joint Operations,” Cadre Paper (Maxwell Air Force Base, AL: Air University Press, 2002). Brian McAllister Linn, “The U.S. Armed Forces’ View of War,” *Daedalus*; Vol. 140, No. 3 (Summer 2011): 33-44.

Center for Cost Analysis (NCCA), and the Ergonomics Center of Expertise owned by the Naval Facilities Engineering Command (who as “NAVFAC” is more often associated with shore based architecture and engineering, than systems acquisition).

## FLEXIBILITY IN ACQUISITION

While the DoD acquisition system is a clearly defined and complex process it is not set in stone. Part of this is necessitated by the differences inherent in procuring a ship or a system of systems, and for example, a radar system to be mounted on said ship. Differences, especially in the time required to develop and field a major weapons system force the ability to adapt and adjust the system to program needs and to filling defined ‘gaps and seams’ in current military capabilities. The governing instruction specifically states:

While these generic decision points and milestones are standard, MDAs have full latitude to tailor programs in the most effective and efficient structure possible, to include eliminating phases and combining or eliminating milestones and decision points, unless constrained by statute.<sup>146</sup>

The intention here is not to enable Milestone Decision Authorities to cheat, it is to allow them sufficient flexibility to get the required capability into the hands of those who need it in as timely a manner as they can consistent with budgetary and legal i.e. statutory constraints. This idea is repeated in several other places in the instruction; “Tailoring is always appropriate when it will produce a more efficient and effective acquisition approach for the specific product.”<sup>147</sup> And in fact, there is a specific acquisition model for the “Accelerated Acquisition Model”<sup>148</sup> as well as an entire enclosure addressing the acquisition process for the Rapid Fielding of Capabilities.<sup>149</sup>

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<sup>146</sup> DoDI 5000.02, 8.

<sup>147</sup> Ibid, 16.

<sup>148</sup> Ibid, 13.

<sup>149</sup> Ibid, Enclosure 13, 143-152.

What these passages and example all serve to highlight though is that the acquisition process is described as being capable of flexibility and adaptability. There are certain advantages to this and the Navy has adapted them to its ship acquisition process.

#### SECNAVINST 5000.2E (CONT.)

The Navy's acquisition process is governed by the DoD instruction and the Secretary of the Navy's instruction, 5000.2E. This instruction describes how the Navy is to implement and execute the DAS and JCIDS program within its own acquisition programs. It also describes in somewhat less detail how Navy acquisition may diverge from the strictest interpretation of the Secretary of Defense's guidance. As mentioned several times in preceding passages, the acquisition of ships, representing a "System of systems" can be and often is significantly more complex and more expensive than a new aircraft or tank. While these systems are not simple by any means, the sheer size of most ships and the number of component sub-systems that are installed on ships can be orders or magnitude larger than other DoD weapons systems. This increases the development time, the design and construction time, and the overall cost of the program. In view of the time requirements to bring a new ship class into service, the Secretary of the Navy has "hedged" his or her bets by including verbiage that allows increased flexibility specifically for shipbuilding.

Unlike most DoD major acquisition programs, according to the Secretary of the Navy, because of the need to design the structure of the ship (hull and superstructure), the program may be initiated at milestone A – before the technology maturation and risk reduction efforts are undertaken.

“Shipbuilding programs may be initiated at milestone A in order to start ship design concurrent with sub-system and component TD.”<sup>150</sup>

The rationale behind this is that naval architecture and systems engineering need to proceed in concert (if not 'lock-step') so that while the systems are being designed, the container that they shall be placed in i.e. the hull is designed at the same time. All of the systems to be installed need to both fit and be mounted in such a way that they do not make the ship unstable or underpowered. A very appropriate historical example is the Swedish warship VASA. She was and is a masterwork of 17<sup>th</sup> century naval architecture but when her weapons systems (cannons) were fitted they created a negative metacentric height, in effect the distance between the ship's center of gravity and its center of buoyancy was insufficient to provide a righting arm (otherwise known as the metacentric height). This in turn created a very unstable platform that once it was in the water with the guns mounted proceeded to heel (tilt) excessively, allowed water to pour in further decreasing the metacentric height, and finally sank because of the flooding off the shore of Stockholm.<sup>151</sup> Another famous historical example is the Tudor warship MARY ROSE. While scholars, maritime archeologists, and naval architects still debate the specific reason(s) for her sinking on 19 July 1545, one of the more reasonable hypotheses is that she was overloaded with guns newly fitted before the battle with the French. This coupled with a sharp heel during a turn allowed water to flood through her lower gun ports sinking the ship. The key fact that these two

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<sup>150</sup> SECNAVINST 5000.2E, “Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System,” (Washington, DC: Office of the Secretary of the Navy, 1 September 2011), 1-28.

<sup>151</sup> For a short analysis of contributing and engineering factors see available online <http://faculty.up.edu/lulay/failure/vasacasestudy.pdf>. Accessed 22 June 2016, 0950 EST. See also, Frederick M. Hocker, *Vasa: A Swedish Warship* (Oakville, CT: David Brown Book Co. distributor, 2011).

examples highlight however, is that designers have to be very careful when installing systems or weight into and on a waterborne hull.

These historical anecdotes while potentially anachronistic highlight the very real concern regarding stability of a warship. The U.S. Navy has made a very calculated risk-reward decision in its acquisition program by enabling program managers to adjust the formal DoD process to allow for concurrent design and development of ships and systems in order to better balance the engineering requirements with the capability requirements or performance. Many major weapons systems must address the balance between intended systems to provide the desired capability and the physical platform which will carry the system or systems through the operational environment. Military aircraft need radars, bombs, missiles, radios, etc. in order to accomplish their mission. These physical loads must be balanced with the airframe that will carry them, the engines that will propel them and the airframe, and the fuel required to power the whole system. Trade-offs need to be made so that the aircraft has the required range, speed, and the flight endurance to carry out required missions; the same is true for LCS and other ship classes. Concurrently designing the ship and the technologies is a logical approach depending on the complexity or “newness” of the technology. There is also the fact that while ships are often designed to be multi-mission platforms, sometimes they are specifically designed around one major weapon or one major system. The TICONDEROGA class of cruisers was designed around the Aegis weapons system, using an already existing hull and power plant. This led to some early challenges with stability because the radar transmission panels and associated power and cooling systems were mounted high in the superstructure.

What the Navy has done by allowing parallel development and design is to adjust volume and weight considerations in the technologies and to in turn adjust the volume, weight, and shape



of the hull which is intended to carry those systems. Referring back to the earlier example of the electro-magnetic rail gun, a gun that is too large or requires too much power for a given hull would potentially fail to fulfill the required capability. As an extreme example, a gun that can fire a projectile 200 nautical miles and sink any ship afloat but that requires a 1000-foot hull and 20 electrical generators to power it, might match the required capability but be so expensive to produce that it is impractical and ultimately fails to truly fulfill the capability requirement. In developing the gun system while designing the hull and supporting systems, the Navy might be able to produce a level of effectiveness at a reasonable cost that does satisfy the capability requirement. The same holds true in the case of the LCS class; designing the systems or more accurately the mission packages while designing the ship itself enables the needed tailoring and adaptation to integrate these equipment packages into an effective system of systems.

The Navy's instruction returns to the standards set out in the DoD governing instruction with the statement that a Capabilities Development Document will be validated and approved before a shipbuilding program not started at milestone A is approved for program initiation.<sup>152</sup> This serves to reiterate that while the Navy may choose to initiate an official procurement program at milestone A this is not necessarily the general rule. In the case of shipbuilding, the lead ship and initial follow-on ships are normally approved at milestone B. The follow-on ships that are approved at milestone B shall be sufficient quantities to maintain shipyard construction continuity until the FRP DR.<sup>153</sup>

## SECNAVINST 5000.2E: THE TWO PASS, SIX GATE SYSTEM

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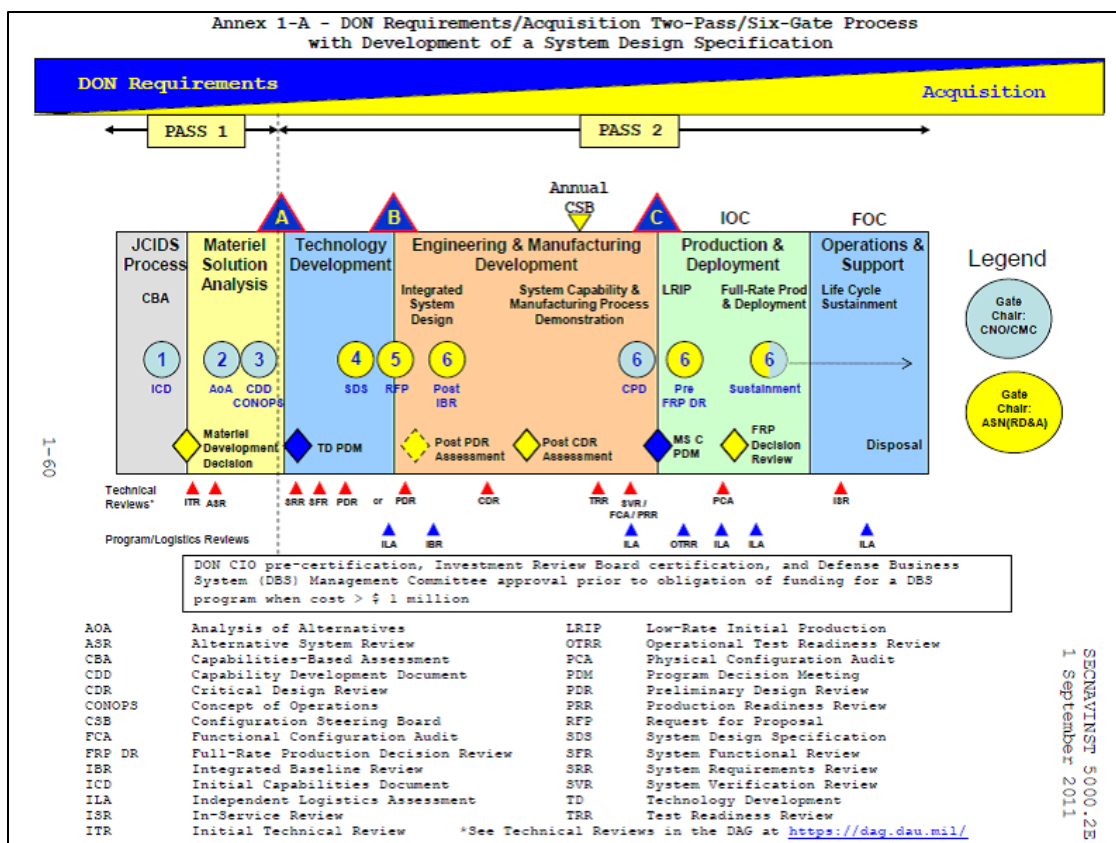
<sup>152</sup> SECNAVINST 5000.2E, 1-27.

<sup>153</sup> Ibid, 1-29 to 1-30.

The companion volumes to the DoDI 5000.02E from the Navy are the Secretary of the Navy instructions, 5000.2E “Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System” and its partner volume SECNAVINST M-5000.2 “Department of the Navy Acquisition and Capabilities Guidebook.” These two instructions expand and amplify the direction provided by the DoD instruction and tailors acquisition planning to better fit Navy (and Marine Corps) needs. Both of the documents follow the prescribed processes laid out in the DoD instruction while assigning specific duties and responsibilities to organizations and individuals internal to the Navy organization in accordance with the governing instruction. However, neither of these service specific documents are mere reiterations of what the Secretary of Defense has published; they both leverage off of and differ from the overarching guidance in some particularly important ways. Having already looked at the first section of SECNAVINST 5000.2E, let us turn to the second section where we can find the Navy’s acquisition process described by the “Two-Pass and Six-Gate DON Requirements and Acquisition Governance Process”<sup>154</sup> depicted in the below figure.

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<sup>154</sup> SECNAVINST 5000.2E, 1-51.



*Figure 4- Diagram of the 2 Pass/6 Gate System<sup>155</sup>*

The Navy's DAS and JCIDS implementation guide provides a description of what the service calls the "2 Pass, 6 Gate System." The stated intent of this process is to "improve governance and insight into the development, establishment, and execution of acquisition programs in the DON. The goal of the review process is to ensure alignment between Service-generated capability requirements and systems acquisition, while improving senior leadership decision-making through better understanding of risks and costs throughout a program's entire

<sup>155</sup> SECNAVINST 5000.2E, Annex 1-A, 1-60. For a less complex presentation see Navy Center for Cost Analysis. "Gate Review Process." Briefing provided at the DoD Cost Analysis Symposium, 2009. Available online at: <https://www.ncca.navy.mil/dodcas/briefings/DODCAS2009-GateReview.ppt>. Accessed 01 December 2016, 0847 EST.

development cycle.”<sup>156</sup> The DON process in effect overlays or is embedded in the standard DoD acquisition process. Pass 1 and gates 1 through 3 are focused in the JCIDS and Material Solution Analysis phases before the milestone A decision point. Gate 1 is the Initial Capabilities Document that must be routed and approved by both the Navy’s and the joint community’s acquisition hierarchy. Gate 2 encompasses the Analysis of Alternatives (AoA) where the intent is for the service or MDA to determine the ‘best’ solution to their capabilities requirement. Without belaboring the point or reiterating specifics from the DoD instruction, this step is important because the alternatives are not always technical or physical in nature. One of the unspoken policies at US Joint Forces Command in the early 2000s until the command was dis-established was the pursuit of non-materiel solutions.<sup>157</sup> Often in looking at required capabilities analysts would investigate the DOTMLPF-P<sup>158</sup> domain for solutions not requiring the acquisition of major weapons systems. Gate 3 is the review of the service approved Capability Development Document (CDD) and Concept of Operations (CONOPS) for the system described in the CDD and ought to be completed before milestone A.<sup>159</sup> It encompasses an additional variety of steps or system attributes that must be certified before the program can move forward. These include developing the cost position and scope – or in other words the affordability of the system – with a focus on the costing of the technology development (TD) phase.<sup>160</sup> In concert with the costing of the TD phase, gate 3 requires a review and acceptance of the strategy for TD,

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<sup>156</sup> SECNAVINST 5000.2E, “Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System,” Office of the Secretary of the Navy, Washington, DC, 01 September 2011, 1-51.

<sup>157</sup> For a description of ‘non-materiel solutions’ see AcqNotes website. Available online at: <http://www.acqnotes.com/acqnote/acquisitions/dotmlpf-analysis>. Accessed 09 August 2009, 0907 EDT. The policy observation is based on the author’s interactions with JFCOM personnel (2004-2009) and later employment at JFCOM in the J9 (experimentation) and J7 (training) directorates (2010-2013).

<sup>158</sup> DOTMLPF-P: doctrine, organization, training, material, leadership and education, personnel, facilities, and policy. If a capability requirement could be satisfied by changes or adaption in one of these areas, it might eliminate the need for new material or technology acquisition(s).

<sup>159</sup> SECNAVINST 5000.2E, 1-29.

<sup>160</sup> Ibid, 1-54.

for testing and evaluation, and for the System Engineering Plan. Following along this funding theme, there is also a requirement to certify the selected solution for funding for milestone A and to review the entire intended program for health in terms of both costs and funding.<sup>161</sup> There is also the requirement in the technical sphere to validate the System Design Specification (SDS) Development plan and to ensure that the outlined SDS links to the required Key Performance Parameters (KPP) and Key System Attributes (KSA). In short, the intent of these technical reviews is to ensure that the system or system of systems is designed to perform as intended and to fulfill the required capability for which it is being chosen.

Pass 2 starts at milestone A but just before the technology development (TD) phase itself initiates. This pass encompasses gates 4 through 6 with 6 lasting throughout the entire life-cycle of the acquired system or ‘system of systems.’ It is led by the Component Acquisition Executive (CAE) and as noted above encompasses three acquisition gates and continues through the end of the system life-cycle to disposal.<sup>162</sup> Gate 4 approves the formal SDS and formally approves a program to proceed to gate 5 and milestone B. The gate chair (Assistant Secretary of the Navy for Research, Development & Acquisition – ASN [RD&A]) is responsible for verifying that the SDS reflects the design parameters necessary the KSAs and KPPs delineated in the Capability Development Document (CDD). He is also responsible to review and certify that the system is designed for some degree of ‘mass’ production, operability, inter-operability, reliability and maintainability.<sup>163</sup> In short, to make sure that it can be built with some level of manageable cost, that it works and that it will work without prohibitively intense maintenance and/or repairs. For some systems these are not easy characteristics to certify and it requires significant effort on the

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<sup>161</sup> Ibid.

<sup>162</sup> Ibid, 1-55.

<sup>163</sup> Ibid.

part of the service and stakeholders to ensure that these attributes apply with a level of accuracy to the system to be procured. Here again, as at gate 3, the reviewing body and chair are required to look at the overall program health in terms of cost and budgeting but also in terms of schedule and risk before passing the program to proceed through the acquisition process. This is also a stage where the Configuration Steering Board (CSB) provides inputs regarding any changes to the systems, and where their technology, their required performance, materials, etc. are addressed and incorporated as required. The CSB has significance for the LCS program because of the two selected platforms or hull forms and the variety of intended mission modules. Maintaining the configuration of these systems or adjusting them to changes in required capabilities can be a complicated and expensive endeavor. This requires that the CSB monitor the technical configuration of the systems and sub-systems to ensure that the required updates meet the requirements and are cost-effective. In some cases, required capabilities may need to be delayed or even out-right rejected by the CSB, if implementing them will be too expensive or take too much time to complete.

Gate 5 is designed to ensure that the Navy has completed the needed actions and recommendations made by the MDA so that the MDA can release a formal Engineering and Manufacturing Development (EMD) Request for Proposal (RFP) to industry.<sup>164</sup> This gate also serves to justify full funding certification for milestone B and to ensure that the CSB changes have been addressed. It also provides another point in the government acquisition process to review the overall health of the program, the risk in the schedule, and the planned program budgeting for sufficiency throughout the entire life-cycle of the capability acquisition.<sup>165</sup>

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<sup>164</sup> Ibid, 1-55, 1-56.

<sup>165</sup> Ibid, 1-56.

Gate 6 repeats the assessment of the overall health of the program and continues to do so throughout the life-span of the program. It also requires an assessment of the program's readiness for productions, the sufficiency of the SDS, the Earned Value Management System (EVMS) Performance Measurement Baseline (PMB), and the Integrated Baseline Review (IBR).<sup>166</sup> Gate 6 reviews are conducted initially after the EMD contract award and the satisfactory completion of the IBR. They are also conducted before the Full Rate Production Decision Review (FRP DR) and after the system reaches IOC. The post-IOC review focuses on program sufficiency in terms of both fiscal and material resourcing. Gate 6 reviews will be conducted periodically during the entire life-span of the systems and serves as a forum for annual CSBs.<sup>167</sup>

The gate review boards are composed of various stakeholders from across the Navy (and Marines when appropriate) and sometimes the joint world as well. The principal members include Vice Chief of Naval Operations; Assistant Secretary of the Navy (Research, Development, and Acquisition (ASN(RD&A)); Assistant Secretary of the Navy (Financial Management and Comptroller (ASN(FM&C))); Director, Naval Nuclear Propulsion Program (N00N) as required; Principal Military [Assistant to] DASN(RD&A) (PMDASN(RD&A)); CNO (N1, N2/N6, N3/N5, N4, N8); Warfare Enterprise (WE) representative(s) (Surface, Undersea, Naval Aviation; Naval Network Warfare (NETWAR)/FORCENet; and Navy Expeditionary Combat Command) lead (TYCOM)<sup>168</sup>; and or Deputy, United States Fleet Forces Command

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<sup>166</sup> In accordance with Department of Defense (DoD) acquisition policy, Program Managers (PMs) must conduct Integrated Baseline Reviews (IBRs) on contracts with Earned Value Management (EVM) requirements. IBRs are intended to provide a mutual understanding of risks inherent in contractors' performance plans and underlying management control systems. Source: "The Program Manager's Guide to the Integrated Baseline Review Process" (Washington, DC: Office of the Secretary of Defense, April 2003), 1.

<sup>167</sup> SECNAVINST 5000.2E, 1-56.

<sup>168</sup> The TYCOMs are 'type commanders' in the Navy who are responsible for the maintenance, manning, and training of specific platform types; surface ships (Commander Naval Surface Forces), aircraft (Commander, Naval

(USFLTFORCOM), and cognizant SYSCOM commander. The chair determines the specific membership for each Gate Review. The chair also determines which advisory members or other representatives may be included while principal members may request attendance by other relevant stakeholder commands. These relevant commands may include Department of the Navy Chief Information Officer (DON CIO); Chief of the Navy Reserve (CNR); cognizant PEO; and Director, Strategic Systems Programs (SSP).<sup>169</sup>

The advisory members for gate reviews may include Chief of Naval Operations (CNO Director, Programming Division (OPNAV (N80)); Director, Assessment Division (OPNAV (N81)); Director, Fiscal Management Division (OPNAV (N82)); Associate Director, Assessment Division (OPNAV (N81D)); CNO (N091); resource sponsor); Deputy, USFLTFORCOM (Fleet Policy Capabilities Requirements, Concepts and Experimentation (N5/N8/N9)); DASN(Budget); DASN(Cost and Economics (C&E)); DASN(Acquisition and Procurement)(AP); Office of General Counsel (OGC); SYSCOM cost director; Director, Navy International Programs Office (NIPO); SECNAV Office of Program Appraisal (OPA); DASN Research, Development, Test, and Evaluation (RDT&E); Chief Systems Engineer (CHSENG); cognizant DASN; and the Commander, Operational Test and Evaluation Forces (COMOPTEVOR). It is notable that we can see the scope and breath of organizations involved based on the position title of the respective organizations or offices – there are quite a few stakeholders in Navy ACAT programs. They cover a broad spectrum of service equities including the funding sources, the technology offices, the acquisition community, and some of the actual operations stakeholders. This broad spectrum presents an opportunity to get buy-in from key stakeholders, but it also presents the

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Air Forces), and submarines (Commander Naval Submarine Forces) respectively. They are generally Vice Admirals located on either the east or west coast with Rear Admiral deputies stationed on the opposite coast.

<sup>169</sup> SECNAVINST 5000.2E, 1-57.



opportunity for an organization or individual to impact the course of an acquisition. In some cases, there may be a ‘cast of thousands’ or a small, select group of decision makers involved in all of the gate reviews under the SECNAVs’ cognizance and the CNO has a preponderance of influence in selecting or allowing participants.

## SECNAVINST 5000.2E – CHAPTER TWO

The following chapter in the instruction addresses specifically the assessments required for initiating a shipbuilding program, paragraph 2.10.3. The title of the paragraph says it all “Assessments Required Prior to Approving the Start of Construction on First Ship of Shipbuilding Program.” SECNAV is required by law (the 2008 NDAA) to submit a report to the congressional defense committees on the results of any production readiness review and concurrently certify to them that the findings the review support commencement of construction.<sup>170</sup> These production readiness review report assessment addresses multiple key issues in an acquisition program focusing on shipbuilding. The first metric the report must address is the maturity of the ship’s design as measured by the stability of the contract specifications e.g. how much growth there has been in the Statement of Work/Performance Work Statement (SOW/PWS). This measuring of stability must also include the degree of completion of detailed designs and production design drawings.<sup>171</sup> The next set of metrics that are addressed in the report are the development status of the developmental Command and Control (C2) systems, the weapons and sensor systems, and the Hull, Mechanical, and Electrical (HM&E) systems. Along with these metrics, the SECNAV must report on the readiness of the shipyards

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<sup>170</sup> Ibid, 2-43.

<sup>171</sup> Deborah L. Clark, Donna M. Howell, Charles E. Wilson, “Improving Naval Shipbuilding Project Efficiency Through Rework Reduction,” Master’s Thesis, Naval Postgraduate School, 26. Thomas Lamb, *Engineering for Ship Production: A Textbook* (Ann Arbor, MI: University of Michigan, 1986), 16. Available online at: <http://www.dtic.mil/get-tr-doc/pdf?AD=ADA452843>.

and personnel to physically begin construction of the ships which requires inputs from the commercial contractors like Marinette and Ingalls Shipbuilding who have bid on the work. The final three metrics are by no means the least but are all interconnected and connected to the preceding series of measures addressed in the report.

The SECNAV speaking for his department must report on the Navy's estimated complete program cost at completion of the acquisition and the adequacy of budgeting to support this estimate. He must also provide the estimated delivery date(s) for the ship and/or ships and justify or explain any variance from the contracted delivery date(s). And finally, SECNAV must tell the defense committees what processes are in place and what metrics will be used to measure and manage risk (e.g. cost overruns, production delays) for the entire scope of the program.<sup>172</sup> This is obviously a comprehensive and critical report for the acquisition program, and potentially explains the adopting of a rigorous internal acquisition process on top of or in addition to the strictures already delineated in the DoD instruction on major acquisitions.

The full rate production decision i.e. building ships number two and three and so forth is actually addressed in chapter 1 and thus it is logical to address that decision point here vice under the section on chapter 1 above. The FRP DR is held to inform the MDA on the outcome of the initial operational test and evaluation (IOT&E). It also serves to authorize the construction of the remaining follow ships in the class and to satisfy the requirements of the instruction itself.<sup>173</sup> This assumes of course that the IOT&E has been successful or at least satisfied the minimum requirements for authorizing continued construction.

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<sup>172</sup> SECNAVINST 5000.2E, 2-43.

<sup>173</sup> Ibid, 1-33.

## THE ACTUAL ‘PROCUREMENT’ OF SYSTEMS AND SYSTEMS OF SYSTEMS

At this point, we will step away from the governing instructions and how the government’s processes are designed to work to look at the actual process, in a broad sense of how the systems are actually physically procured by the government and in a narrow sense as to how the Navy is procuring these specific ships. This should help set the stage for the following chapters which will describe the actual acquisition of the LCS; since its inception as a capability concept to the six commissioned and 13 under-construction units.<sup>174</sup> It also provides some insight into the competition for contracts, the source selection process, and the administration of awarded contracts.

At a much lower level, once the money is divvied out and the individual services receive their budgets, they then decide what the internal distribution will be. In our case, the Navy has to decide how much money the shipbuilding and systems acquisition offices get to build and to equip the hulls that the Navy is buying. The Commander, Naval Sea Systems Command (NAVSEA) is the overarching organization within the Navy responsible for surface ship acquisition including the LCS class. The respective subordinate offices, like the Program Executive Office (PEO) Ships then decide what portion of their monies will go to the LCS program, what portion other surface combatants (like guided missile destroyers (DDGs)) and so forth. This money becomes the bucket from which the LCS program office can draw to purchase what they require. Thus, despite potential resources available from other programs or money

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<sup>174</sup> U.S. Navy Fact File, “Littoral Combat Ships - Fleet Introduction and Sustainment – LCS” Available on-line at: [http://www.navy.mil/navydata/fact\\_display.asp?cid=4200&tid=1650&ct=4](http://www.navy.mil/navydata/fact_display.asp?cid=4200&tid=1650&ct=4). Accessed 16 Aug 2016, 1022 EDT.

freed up by Overseas Combat Operations (OCO) supplemental funding, the program office must make choices and prioritize what it will buy.

The uniformed or Government Service (GS) decision makers, who actually ‘own’ the funding must then work through the procurement or contracting offices to write Requests for Proposals (RFP) or Requests for Quotes (RFQ) to which commercial bidders must respond in order to qualify for a contract award. This was what the DoD and SECNAV instructions labeled the RFP step or milestone B. This is the stage where the FAR and DFARS really come into play. For the purposes of this work, with the focus on the “power balance” between organizational behavior and individual behavior, the FAR and DFARS, while they are important are also beyond the intended scope. For the sake of brevity and allowing for the inaccuracy of the statement, these documents direct how the Request for Proposals will be written by the government, how the government should assess the responses, and how the government will administer the awarded contract or contracts. They in effect determine the playing field upon which the potential vendors will compete and how the government will deal with all of the competitors both successful and unsuccessful.

## A SOLICITATION OR REQUEST FOR PROPOSALS OR QUOTES (RFP OR RFQ)

In a simplified example of an RFP issued by the government, the Statement of Work (SOW) or Performance Work Statement (PWS) delineates exactly what the government wants from the vendors.<sup>175</sup> In the case of LCS, these specifications included range, maximum speed in a high sea-state, aircraft embarked, provisions in terms of days, weight capacity for mission modules,

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<sup>175</sup> Despite using the phrase “exactly” what the government wants, often there are some questions on specifics and definitions that require negotiation after contract award.

draft, and operational availability.<sup>176</sup> There were also a variety of other design parameters that the bidders were required to provide, many of them exactly mirroring the programmatic requirements illuminated in both the DoD and SECNAV acquisition instructions. The actual structure and contents of the solicitation will be the subject of a significant section of the following chapter and for the sake of brevity this is as deep as we will dive into the contents for this chapter.

The various bidders review the solicitation, especially the SOW/PWS, the contents and format required to be included in the response, and the grading criteria. Based on these specifics and their firm's intended solution, the proposal team will write a response to the government describing and pricing how they will satisfy the government's capability requirement. Usually, a proposal for a MDAP like LCS or the Joint Strike Fighter will include four to five volumes encompassing the technical approach in volume 1. The second volume will generally describe the contract and program management design. Volume 3 will include past performance, describing how a bidding firm or team of firms has successfully completed similar projects in the past. Pricing is generally included in volume 4 and the fifth volume will address the sub-contracting plan, delineating how the prime contractor will use its smaller team-mates like 8(a) firms, minority and women owned small businesses and companies certified as Historically Underutilized Business Zones (HUBZones)<sup>177</sup> for example. The RFP response being duly

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<sup>176</sup> Solicitation N00024-03-R-2309, Attachment J, "Preliminary Design Interim Requirements Document Serial Number: N763F-S03-026 For Littoral Combat Ship (LCS) Flight 0 Pre ACAT." Issued by Commander, Naval Sea Systems Command, 28 February 2003.

<sup>177</sup> Per the Small Business Administration: "The 8(a) Business Development Program is a business assistance program for small disadvantaged businesses. The 8(a) Program offers a broad scope of assistance to firms that are owned and controlled at least 51% by socially and economically disadvantaged individuals." For HUBZone firms: "The Historically Underutilized Business Zones (HUBZone) program helps small businesses in urban and rural communities gain preferential access to federal procurement opportunities." The qualification requirements for both programs are more extensive than we need to investigate for this work, but more information is available online at <https://www.sba.gov/contracting/government-contracting-programs/8a-business-development-program/about-8a->

written, the bidders are generally required to provide at least one hard-copy and electronic copies on CD to the government.<sup>178</sup>

The government receives the proposals and begins their review. Often, the government will set up both a proposal review team and a source selection committee to which the review team reports. The review team will be broken down into technical, managerial, and fiscal review groups who in turn review the pertinent sections or volumes of the proposals. Once the review team determines if a proposal is compliant with the response requirements, they will assess the sections of the proposal for the value of the solution that they provide. As mentioned earlier (see p. 49) the grading criteria are generally either LPTA or a quality trade-off (quality compared to cost). Almost invariably bidding firms state that they will meet the government's needs 'better, faster, cheaper' but unless they categorically and clearly state how they plan to achieve these goals, the review team will down-select or reject their proposal. One key item to bear in mind is that the government is looking for reasons to reject proposals – they are laboring under a deadline as was the proposal writing team and anything that enables them to save time, like rejecting a non-compliant proposal, will be embraced with alacrity. Once the review team selects the best proposal or proposals, they will provide the source selection committee with their assessments and recommendations. The committee actually decides on the winning proposal(s). The responsible contracting officer will review the source selection and if they concur, will notify the winner(s).

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business-development-program and <https://www.sba.gov/contracting/government-contracting-programs/hubzone-program>. Accessed 17 Aug 2016, 0902 EDT.

<sup>178</sup> This scenario is again, based on a major acquisition program and does not describe the level of effort and cost often involved in just submitting a bid. And it should be noted that for large acquisition programs, the response documents can run will over 500 pages of text, graphics, diagrams, and sometimes blueprints.

The award of a contract is only the beginning of a more intricate and complicated process by which the contract is administered and executed. The administration deals with required reporting, delivery schedules, payment, personnel, and security issues. The execution is the schedule of progress, level of effort, monetary expenditure (often called 'burn-rate'), and the testing of delivered materials, systems, or sub-systems. This is a much-simplified version of how a contract is awarded and executed but it provides a frame-work for understanding the next chapter on the specifics of the acquisition of the LCS.

## SUMMARY

This chapter described the nature of the U.S. defense market, described how the U.S. DoD goes about acquiring products and services, with a distinct focus on MDAPs like LCS, and in a very simple manner, presented the RFP process from both the bidder and from the government perspective. The intent is to provide a basic understanding of the structure within which the LCS procurement was and is operating and to introduce some of the key stakeholders if not by name then by role or sometimes more importantly their 'office.' This framework should provide the needed context for a more descriptive and in-depth narrative and analysis of the actual development, acquisition, and fielding of the LCS class of ships.

The other key take-away from this chapter is that the market for national security is not a traditional market in the Smith, Ricardian, or Chicago School sense of a 'free market.' It is instead a significantly warped market where supply and demand are both greatly impacted and warped by indigenous and endogenous factors. The single demand source has very much of a monopsonist's power in the market. Meanwhile the limited number of firms enjoy very much of an oligopolistic power of supply in reference to the customer. It is a challenging environment for

for-profit companies to compete and also for the government to get what it needs at a reasonable price.



## CHAPTER 3

### THE LCS CONCEPT AND SOLICITATION

This chapter is a narrative of the actual development of the LCS from a concept to IOC. The intent is to answer as many of the 5 ‘Ws’ as possible with some emphasis on the ‘Who’ question. In order to understand the program and the organizations involved however, we need to understand the ‘What, Where, When,’ and of course the ‘Why’ of this acquisition program. This chapter starts with an investigation of why the U.S. Navy decided that it needed a Littoral Combat Ship. The strategic environment that the U.S. had faced since 1945 suffered a sea change with the fall of the Berlin Wall and the dissolution of the Union of Soviet Socialist Republics. The open ocean war at sea was a thing of the past. This required new capabilities and thus new ships. The second portion of this chapter addresses the actual solicitation that was released to industry for designing and constructing the LCS. This Request for Proposal (RFP) is reviewed in depth to highlight the scope and breadth of the requirement. This portion of the chapter is also intended to highlight just how transformational this solicitation was in comparison to past Navy ship procurements. Previous classes of ships were incremental developments on preceding hulls and were solicited as technical specification bids. LCS was a brand-new hull design and was solicited as a performance specification bid. This encompasses almost ten years and about seven ships to date. The overarching intent of this chapter is to recount the background and the specifics of the solicitation.

We need to examine this road to IOC for the LCS class to better understand the class’ triumphs and failures. The intent of this chapter is to examine the ‘birth’ of LCS, tracing it from the federal solicitation for bids to the first deployment of USS FREEDOM (LCS 1) to the current

status of the class. The goal is not to emphasize the failures of the LCS program so much as to reveal the challenges inherent in fielding an entirely new ship class. The intent is to emphasize the revolutionary nature of this procurement program. The LCS class was solicited in a very different way from any other class of ships in the U.S. Navy and it incorporates a ground-breaking main propulsion system unlike any since the introduction of the US Navy's first screw driven steamship USS PRINCETON in 1843. This chapter will highlight just how unique the RFP for the LCS was in comparison to other ship solicitations and how different the installed propulsion system is from any other larger ship in the Navy. This was the first time in living memory that the Navy solicited a new ship class using performance vice design specifications; there may have been some precedents but no other major combatant since the Second World War has been procured in this manner. Akin to the Joint Strike Fighter (JSF) program, the Navy told bidders what the LCS must and should be able to do and told them to design and build it based on those required capabilities. One of the direct outcomes of this, specifically based on the required speed of the LCS class, was the design and construction of the first major U.S. warship propelled by hydro jets vice propellers. The other engineering first that resulted from this Navy requirement was the capability to reconfigure the individual platforms for different missions. This was another major departure from traditional warship design. Previously ships were designed for one fixed mission or to undertake several different missions with appropriate weapons systems permanently installed.<sup>179</sup> This chapter will provide an in-depth view of the solicitation and the resulting ships.

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<sup>179</sup> For example, frigates were generally outfitted with a focus anti-submarine (ASW) sensors and weapons while destroyers had a broader equipment suite including anti-surface (ASuW) and anti-air systems (AAW). Currently cruisers represent the most stereo-typical multi-mission platform including weapons and sensors for ASW, AAW, ASuW, strike warfare (SW), and electronic warfare (EW).



*Figure 5 LCS Fielding Timeline*

## THE STRATEGIC CONTEXT

The LCS was born of a sea change in the strategic environment in the early 1990s. The end of the Cold War and the final dissolution of the Soviet Union created a brave new world (or “New World Order”)<sup>180</sup> for which the US Navy needed a brave new operational concept. 1992 saw the first in a series of Navy white papers aimed at re-orienting the operational focus and training of the Navy from a “blue water” battle against the Red Banner Fleets of the Soviet Union to fighting in the littorals against regional threats. The maritime focus of the U.S Navy shifted from the open ocean of the high seas to the cluttered regions near the shore where regional states represented potential maritime threats. The white paper “...From the Sea” was

<sup>180</sup> "Bush: 'Out of These Troubled Times ... a New World Order'." *The Washington Post*, September 12, 1990.

the first official Navy document that addressed the littoral “or near land” areas of the world as important potential areas where the Navy expected to face threats and in which it would be forced to operate.<sup>181</sup> This was a huge conceptual adjustment from the open ocean combat that the Navy had expected in the North Atlantic to keep the sea lanes of communication (SLOC) open for reinforcing the land forces battling the Red Army as it tried to overrun Western Europe. Instead the US Navy envisioned a series of brush-fire wars similar to those fought across the Third World during the Cold War against a series of regional adversaries or those fought by the British and French during the height of the 19<sup>th</sup> centuries imperialist years in Africa, the Near, and the Far East. Further complicating the future challenges was the very nature of the littorals; rather than the unrestricted waters of the high seas, the littorals are “confined and congested water and air space”<sup>182</sup> with friendly, hostile and neutral entities and geographic features significantly complicating the identification, targeting, and weapons engagement processes.

“...From the Sea” was also the first place that mentioned the concept A2/AD though not in so many words. What the white paper did mention however, was the capability of adversaries to concentrate and layer their defenses.<sup>183</sup> These defenses did not include anti-ship ballistic missiles but did encompass tactical ballistic missiles, sea-skimming cruise missiles, submarines, mines, and potentially small attack craft.<sup>184</sup> It also proposed the first tentative steps towards a mission tailoring albeit indirectly. The concept did categorically state that a “carrier battle group” may not be the answer in every situation.<sup>185</sup> Instead, the new war in the littoral regions

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<sup>181</sup> “...From the Sea Preparing the Naval Service for the 21<sup>st</sup> Century: A New Direction for the Naval Service,” (Washington, DC: Chief of Naval Operations, 1992), U.S. Navy white paper, available online at <http://www.navy.mil/navydata/policy/fromsea/fromsea.txt>. Accessed 10/09/2016 at 1013 EDT.

<sup>182</sup> Ibid, 5.

<sup>183</sup> Ibid.

<sup>184</sup> Ibid.

<sup>185</sup> Ibid, 7.

would require continuously tailored naval forces with sufficient command and control and surveillance capabilities (among others) to dominate the battlespace.<sup>186</sup> This threat assessment and required operational capabilities would persist as key issues for the design and intended employment LCS. Additionally, the concept of affordability and of fiscal resources impacting naval operations was highlighted in “...From the Sea.” This white paper categorically stated that the naval forces had to be capable and affordable for the new struggle to control the littorals. It also addressed at least in passing, the redundancy remaining in the Navy in the aftermath of the end of the Cold War. These ideas too were going to resurface throughout the development of the LCS.

The next iteration of Navy strategy was entitled “Forward...From the Sea” and came out in 1994. This white paper reiterated the new challenge focused in the littoral regions of the world.<sup>187</sup> It also focused much more intently than its predecessor on the idea of presence and most especially on forward presence by U.S. Navy units.<sup>188</sup> But like “...From the Sea,” the new concept paper also mentioned the idea of “tailored” naval forces with specific capabilities. Alongside the consistent reiteration of forward presence in regional hotspots, this strategic concept paper emphasized the tailoring or sizing of naval forces as one of its basic themes. This idea came to be one of the foundation concepts for the development of the LCS, that being the ability to adjust system installations on platforms to or for specific mission capabilities like mine warfare and surface warfare.

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<sup>186</sup> Ibid.

<sup>187</sup> “Forward...From the Sea,” U.S. Navy white paper. Available online at: [www.dtic.mil/jv2010/navy/b014.pdf](http://www.dtic.mil/jv2010/navy/b014.pdf). Accessed 09 Oct 2016, 1200 EDT.

<sup>188</sup> Ibid, 3, 5.

The last iteration of naval strategy papers from the 1990s again emphasized the criticality and influence of forward deployed naval forces operating in contested littoral regions around the globe. It also continued the theme of dispersed and networked systems (or platforms) “linking dispersed units as an integrated force with command and control networks.”<sup>189</sup> This phrase was repeated later in terms of spreading surveillance and reconnaissance capabilities across a wide geographic area.<sup>190</sup> This version of the Navy’s operational concept provided more focus on the idea of the dispersed and networked platforms.<sup>191</sup> It also emphasized or introduced so to speak the idea of on-scene command and control and the inherent self-sustainment capabilities of naval platforms, specifically in our case ships. This self-sustainment piece included what became another key concept for LCS, the rapid re-deployment piece.<sup>192</sup> The idea of the mobility of naval forces and dispersion of the same remained a persistent theme throughout this iteration of the Navy’s operational concept.

It also brought out a point regarding the littorals that proved to be an important phrase in the following years for both the LCS program and for the Navy as a service. “Seventy-five percent of the Earth’s population and a similar proportion of national capitals and major commercial centers lie in the littorals.”<sup>193</sup> Several other key buzzwords or phrases like this also entered the strategic lexicon on the U.S. Navy in the wake of the Cold War. Over 70 percent of the world’s surface is covered by water, over 90 percent of international trade by weight and volume value is sea-borne<sup>194</sup> and any disruption of the global maritime commons would have a

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<sup>189</sup> “Forward...from the Sea – Navy Operational Concept,” U.S. Navy white paper, 1997, 3. Available online at: <http://www.navy.mil/navydata/policy/fromsea/ffseanoc.html>. Accessed 12 Oct 2016, 0330 EDT.

<sup>190</sup> Ibid, 5.

<sup>191</sup> Ibid.

<sup>192</sup> Ibid.

<sup>193</sup> Ibid.

<sup>194</sup> *Globalization and Maritime Power*, Sam Tangredi ed. (Washington, DC: National Defense University, Institute for Strategic Studies, 2004), xxvi.

serious deleterious impact on the global economy. By extension this would have significant negative impacts on the American economy. All of these phrases came to play a large role in what might be termed marketing materials published and promulgated by the Department of the Navy, the U.S. Marine Corps and the Navy itself. In many ways, the ‘New World Order’ presented a much higher risk to the continued fiscal health of the Navy than it did to any of the other services, not excepting the Marines. The blue-water armada that Admiral Sergey Gorshkov had so assiduously nurtured as Commander-in-Chief of the Soviet Navy was almost completely no more and certainly most distinctly diminished. The U.S. Navy had to find other dragons abroad to slay, if only to guarantee its continued physical and fiscal existence in the face of a looming ‘peace dividend’ in the years immediately following after the fall of the Berlin Wall.

At the end of the Cold War, in a surprisingly short time for such a large organization, the U.S. Navy re-evaluated the international system that it faced and worked very hard to adjust its strategic assessments, plans, and goals to better suit the new operational environment. The LCS was born of this strategic re-assessment especially when the outside environment was matched with the resource constrained national security environment or atmosphere internal to the U.S. and especially to the government, if not to the Department of Defense. The Navy realized that it was going to face new threats both foreign and domestic and that it needed to adapt its approach and resource allocation to more effectively address these threats. Hence new naval strategies were crafted, and new thoughts emerged on what sorts of systems the Navy ought to procure in the decade of the 1990s and into the Twenty-first century.

## THE BIRTH OF A CONCEPT

The genesis of the LCS began with the publication of Wayne Hughes' *Fleet Tactics* in 1986.<sup>195</sup> There had been various other attempts to field small, high-speed surface ships from the ASHVILLE class gunboats in the 1960s to the PEGASUS class hydrofoils in the 1970s. Hughes provided a new and somewhat compelling if fictionalized argument in support of small surface combatants. In his account of the 'Second Battle of the Nile' he emphasizes the impact and effectiveness of the "absurd little eight-hundred-ton missile boats" comprising the U.S. Mediterranean (Sixth) Fleet.<sup>196</sup> He also pointed out that conceptually mobility is the capacity to move long distances in a relatively self-sustaining manner and to do so in a timely and quick manner.<sup>197</sup> Both of these ideas came to form key pillars in the concept development, design, and construction of the LCS. Hughes also introduced the concept of dispersed platforms concentrating their firepower effectively in the offensive which also became another key pillar in the development of the LCS class.<sup>198</sup> In many other ways *Fleet Tactics* was a seminal work as it strove to re-introduce the idea of tactical thought and development into the U.S. Navy, at least in the surface warfare community. However, for our purposes Hughes' postulates of a 'new' killer-class of small, fast, and hard-hitting surface combatants employing long range missiles, connected (or networked) into a cohesive striking force, and moving with significant rapidity serve as the soil in which the LCS concept germinated and began to flower.

The second edition came out in 2000 and added both a new title and several new chapters focusing on the near shore or littoral regime. The new title *Fleet Tactics and Coastal Combat* highlighted the significant and continuing shift from the "blue water" or open-ocean to the

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<sup>195</sup> Wayne P. Hughes, *Fleet Tactics: Theory and Practice* (Annapolis, MD, U.S. Naval Institute Press, 1986).

<sup>196</sup> *Ibid*, 281.

<sup>197</sup> *Ibid*, 150.

<sup>198</sup> *Ibid*, 249.



littoral regions of the world as the main stage for U.S. Navy operations.<sup>199</sup> The preceding fifty years had seen the USN focused on fighting the Soviet fleet in the North Atlantic in an updated version of the fight against the German *Kriegsmarine* to keep the flow of men material across the Atlantic Ocean to the European theater going. The end of the Cold War had created a sea change in the operational and tactical focus for the USN and for most of the US allies around the globe. The second edition of *Fleet Tactics* also highlighted the challenge between fighting in the littorals with the large, multi-mission platforms against smaller, cheaper and often less individually capable weapon systems. The disparity in the costs of the two types of platforms only served to emphasize this challenge.

The next key work that forms the basis for LCS was an article co-authored by Hughes and the-then president of the Naval War College, Vice Admiral Arthur Cebrowski and published in 1999. This article “Rebalancing the Fleet” addressed the Navy of yesterday, today, tomorrow, and the ‘day after’ tomorrow and focused very much on the littoral regions as the key places where the Navy today and in the tomorrows, would be operating.<sup>200</sup> The first of the major ideas was the issue of numbers (of hulls) and the ‘robustness’ or survivability of these hulls. They made a consider argument in favor of raw numbers while still accepting the importance of the idea of economy of force.<sup>201</sup> Ultimately, the Navy and DoD only have so many resources or so much money, meaning that there must be a balance between just raw numbers and the individual capability (or complexity) of hulls or systems. The authors also highlighted the importance of networking “a series of systems” in order to mass fires (or effects)<sup>202</sup> in order to achieve military

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<sup>199</sup> Wayne P Hughes. *Fleet Tactics and Coastal Combat* 2<sup>nd</sup> ed. (Annapolis, MD: U.S. Naval Institute, 2000).

<sup>200</sup> Paul Hughes and Arthur Cebrowski, “Rebalancing the Fleet,” *U.S. Naval Institute Proceedings*, Vol. 125, No. 11 (1999): 31-34.

<sup>201</sup> *Ibid*, 31.

<sup>202</sup> See Joint Pub (JP) 3-03 Joint Interdiction, Chapter II Joint Capabilities, paragraph 1(b) for Maritime Forces and massing of fires. See also JP 3-02 Amphibious Operations, Chapter V, and Navy Tactics, Techniques, and

missions. Several other key attributes that also came to be intimately associated with LCS were discussed in this article including speed and modularity.

Hughes and Cebrowski summarized their fleet rebalancing in terms of many small ships, minimally manned, and operating in swarms. This was their version of the Naval War College's "Streetfighter Concept."<sup>203</sup> They likened it to the 1970's high-low mix with a change in that the smaller less-individually capable ships would lead the entry into hazardous waters in effect clearing the way for the larger, more expensive multi-mission platforms.<sup>204</sup> The authors also discussed the portion of the concept that dealt with modularity enabling the smaller hulls to be tailored with specific systems installed or swapped-out to better execute given mission sets like (anti-) surface (ASuW) or anti-submarine warfare (ASW). This scalability was married very closely to the required capability for networking the different platforms mentioned above. The three key attributes that the authors were aiming for were numbers of platforms, affordability (including manning and flexible modules), and networking the platforms to mass fires or effects.<sup>205</sup>

In fact, the issue of affordability was actually rather strongly addressed in Cebrowski and Hughes' article. As noted above, the authors' basic theme was a mixed force of multi-mission ships and a more numerous group (the Economy B force) of platforms.<sup>206</sup> This bore a passing resemblance to the 'High-Low' surface combatant mix first pursued during Admiral Elmo Zumwalt's tenure as CNO (1970-74). Focusing on the price for the predicted force the authors

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Procedures (NTTP) 3-02.2/Marine Corps Warfighting Publication (MCWP) 3-31.6, Supporting Arms Coordination in Amphibious Operations. See also Navy Warfare Pub (NWP) 5-0 Navy Planning for the role of fires in naval operational planning and execution.

<sup>203</sup> Cebrowski and Hughes, "Rebalancing the Fleet," 32.

<sup>204</sup> Ibid.

<sup>205</sup> Ibid, 34.

<sup>206</sup> Ibid, 32.

stated that the Navy must develop an Economy B force that complements and enables the capabilities of the larger, more expensive multi-mission ships “our Economy A power-projection force.” The intended goal was to create a low-end force of ships costing less than 10 percent of the more expensive ships. Based on a rough price estimate of one billion US dollars for a high-end guided missile destroyer, the authors envisioned a “Streetfighter” ship to cost (in 2001 dollars) about \$100 (or less) million per hull. This was actually not an unreasonable pricing strategy but would certainly have resulted in a rather austere platform when compared to the High-end ships envisioned in this strategy. It is also likely that the Economy B ships would have had to be single mission ones. The other part of the estimated force structure was that the B-team ships would comprise more than one quarter of the entire surface force. This coupled the argument in favor of less costly ships with the idea that raw numbers of hulls was good. The idea of affordability or economy was one that has persisted throughout the life-cycle of the LCS program.

## THE NAVAL POST-GRADUATE SCHOOL STUDY

In 2000, the President of the Naval War College, then Vice Admiral Cebrowski, asked the Naval Postgraduate School (NPS) in Monterey, CA to undertake a study or series of studies investigating the potential functionality of fast, dispersed and ‘cheap’ surface platforms to meet the Navy’s operational needs. These studies included the following two key documents, the ‘Crossbow’ and ‘Sea Lance’ engineering studies. Cross functional team of NPS studies undertook these analyses as part of the curriculum for Systems Engineering & Integration, Total

Ship Systems Engineering Program, the Aeronautics and Astronautics, and Business and Public Policy graduate programs.<sup>207</sup>

## CROSSBOW

The “Crossbow” engineering study was the first volume of the ultimately five-volume series of studies aimed at defining how to realize the ‘Streetfighter’ concept championed by Admiral Cebrowski. The first volume of the report focused on the ‘system of systems’ that would create the capabilities needed to field an effective “Streetfighter” force. This report went beyond merely analyzing the required surface platform capabilities, it analyzed the required capabilities of a “Streetfighter” and the systems needed to deliver these capabilities. This is one of the key ideas that many people have ignored when analyzing the LCS program. LCS was never envisioned as a stand-alone platform but as one part of a system of systems to include a Littoral Sensor System (LSS) that through networking would provide the functionality required by the Navy to meet intended missions in the 21<sup>st</sup> century. The hull was in effect a truck or frame upon which the required systems could be mounted, removed, and replaced with other systems depending on the assigned mission(s).

The Crossbow study started by defining the problem and scope in terms of the required capabilities:

“CROSSBOW: A high-speed, rapidly deployable, integrated and distributed naval force with a primary mission of forward presence, littoral sea control, forced access, and access maintenance, in low to moderate threat environments around the globe.”<sup>208</sup>

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<sup>207</sup> R. Muldoon, KheeLoon “Richard” Foo, Hoi Kok “Daniel” Siew, Cheow Siang Ng, Victor Yeo, Teng Chye” Lawrence” Lim, Chun Hock Sng, et al. (2001). “CROSSBOW REPORT (CROSSBOW VOLUME 1),” Monterey, California: Naval Postgraduate School, 1.

<sup>208</sup> Muldoon, et al, “CROSSBOW Report,” 1.

The team then listed some of the entering assumptions and key considerations for the CROSSBOW system. For the purposes of this work, the assumptions of interest include the idea of “combat-consumable” units, high-speed, and the system as a distributed force.<sup>209</sup> The issue of combat-consumability did not survive as a basic system attribute into the construction and fielding of LCS except possibly indirectly.<sup>210</sup> The indirect way that this may have survived is through the continued calls for cost control and ‘cheapness’ for want of a better term in the procurement of the LCS class of ships. The high-speed requirement has definitely remained throughout the course of the entire acquisition program from concept to realization. This is true too, of the distributed force operation both in terms of physical distribution but also in terms of networked platforms working as a complete, integrated system. The “Key Considerations” that the engineering team utilized also replicated (or established) some of the basic attributes that were also delineated in their assumptions sections; these attributes have also persisted as components of the LCS class over its life-span. The first of these was the intended extensive use of commercial-off-the-shelf (COTS) technology – in order to reduce the cost of the system.<sup>211</sup> The other important cost saving intent was the stated ‘need for automation.’<sup>212</sup> This was aimed at reducing the crew size which in turn can significantly reduce the cost of operating a system or system of systems, especially over the full life-cycle of said system. The last section of the key issues focused on environmental factors; in terms of the external environment within which the system or platforms(s) would be required to operate and not environmental protection type issues. None of these factors are necessarily remarkable but all have in one way, shape, or form

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<sup>209</sup> Ibid, 5-6.

<sup>210</sup> Certain stakeholders, both inside and outside of the Navy balked at the idea of “disposable” ships (and thus sailors) – this topic will be address more fully in the following chapter(s).

<sup>211</sup> Muldoon, et al, “CROSSBOW Report,” 6.

<sup>212</sup> Ibid.

continued on into the actual procurement of the class. Two specifically rate some discussion, one addressed the physical geography and the other the sea-worthiness required of the platform itself. The first environmental point in the report addressed the cluttered physical environment and the increased risk of effective surprise attacks in the littoral regions of the world.<sup>213</sup> This concern has provided fodder for the critics of LCS and has remained one of the required functional capabilities of the LCS from the release of the original design-build specifications to the present day. The second consideration was the capability to operate in various weather and sea-state conditions.<sup>214</sup> There were certain minimums of stability and sea keeping capabilities that any platform would require in order to effectively operate at sea, regardless of the specific geographic location.

## SEA LANCE

The study group at NPS undertook another significant engineering study in academic year 2000 that resulted in the “Sea Lance” concept report.<sup>215</sup> This is in many ways the first true effort to format the modeling and simulation entities from war games and experiment into a physical reality that could be built. The design team followed the standard acquisition programmatic in defining the requirement and crafting a mission needs statement from this requirement. They then created an operational requirements document with a variety of topics to be addressed including the expected threat, current gaps and seams, required capabilities and cost. The next step was an AoA with three alternatives and a comparison of the relative merits and shortfalls of each. The last step was a technical evaluation that examined the actual

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<sup>213</sup> Ibid, 7.

<sup>214</sup> Ibid. See also about p. 25 for a discussion regarding ship stability and sea-keeping.

<sup>215</sup> Technical Report NPS-ME-01-001, “Sea Lance Littoral Warfare Small Combatant System,” Monterey, CA: Naval Postgraduate School, 2001.

engineering and technical requirements to satisfy the overall system requirements. From this in-depth study, the engineering team found that the Sea Lance concept could satisfy the mission requirements as defined by the Navy.

The mission statement noted that the end of the Cold War had shifted the U.S. Navy's most likely operating areas from the "Blue Waters" of the high seas to the near shore, or littoral regions of the world in reacting to regional crises.<sup>216</sup> The team's stated key to success was to, in effect, to flood the littoral waters with sensors, platforms, and weapons but to do so with sufficiently robust and affordable forces.<sup>217</sup> This is in keeping with the already noted key attributes of 'higher' numbers of platforms and 'manageable' cost per unit. The team also noted that the current fleet is not suited to operating in the confined and cluttered regions of the littorals<sup>218</sup> – and while they do not categorically say so, the inference is that the current fleet is also extremely expensive to replace and losing it fighting in the littorals would likely be cost prohibitive. In comparison, the Sea Lance would potentially be viewed by hostile forces as no worse than a "nuisance" and not worth expending expensive ordnance to eliminate.<sup>219</sup>

The operational capability requirement that the engineering team focused on was the "Capabilities for the Navy After Next" (CNAN), part of a study sponsored by Navy Warfare Development Command (NWDC). The main focus was on platforms to distribute and augment a littoral sensor grid or network called the "Expeditionary Warfare Grid" (EWG), a successor to the LSS with slightly expanded capabilities but designed to cover a smaller geographic area. The goal was to develop a combatant platform that could deploy the system and become part of the

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<sup>216</sup> "Sea Lance," NPS Study, 10.

<sup>217</sup> Ibid.

<sup>218</sup> Ibid, 11.

<sup>219</sup> Ibid, 19.

network as dispersed individual platforms networked together and with other platforms, sensors, and weapons.<sup>220</sup> The key issue to note is that while the individual platforms were the focus of the study, the required capabilities of these platforms were not necessarily inherently organic to the ships themselves. The mission goal was to be able to deploy the EWG – to temporarily install a system that would provide Intelligence, Surveillance, and Reconnaissance (ISAR) of the operational environment, the littorals. The Sea Lance was merely one of four main components in the EWG i.e. the “small combatants that deploy/tend the sensors and weapons.”<sup>221</sup> They would provide some command and control of the sensor systems but much of the overall capability would reside in the networked nature of the systems.

The engineering study team in effect conducted the acquisition program steps of the Analysis of Alternatives (AoA).<sup>222</sup> This included or was followed by the technical evaluation of the specific engineering alternatives that were reviewed in the AoA process. The AoA looked at three potential system architectures. The first was a medium size combatant with a tow (Option I). The second was composed of all medium size combatants (Option II). The final architecture reviewed was a mixture of small and medium sized combatants (Option III).<sup>223</sup> The design team then developed a set of Measures of Effectiveness and Performance (MOEs and MOPs) depicted in Table 2 below. These included a number of standard warship attributes like range, speed, stability and some specific, new factors like the Grid Deployment Order and Modularity – of which Modularity has persisted as a key LCS attribute to this day.

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<sup>220</sup> See Cebrowski and “Network Centric Warfare.”

<sup>221</sup> “Sea Lance,” NPS study, 12.

<sup>222</sup> For a definition and importance of the AoA, see DoD Instruction 5000.02, “Operation of the Defense Acquisition System,” January 7, 2015, 16, 17, 82, 125-126. See also SECNAV Manual M-5000.2, “Department of the Navy Acquisition and Capabilities Guidebook,” May 2012, 1-6, 1-37, 5-4 to 5-7, and 5-9 to 5-20.

<sup>223</sup> Ibid, 27.



MOE/MOP	Flexibility	Versatility	Lethality	Survivability	Deployability
Range	X				X
Speed	X		X	X	X
Grid Deployment Order	X				
Payload Capacity	X	X			
Sea Keeping	X		X		X
Organic Sensor Capacity	X	X	X		
Cost					
a. Total Fuel Consumed					
b. Number of personnel at risk	X	X	X	X	X
c. Procurement					
d. Maintenance/Upkeep					
Multiple Mission Capability		X			
Modularity		X			
Craft Organic Weapons		X	X		
Weapons Load Out			X		
Stealth			X	X	
Susceptibility					
a. Speed	X		X	X	
b. Stealth					
c. Point Defense					
Vulnerability					
a. Armor					
b. Redundancy				X	
c. Egress Capability					
d. Arrangement of Equipment/Spaces					
Endurance					X
Habitability					X
Logistic Support					X

*Table 1- Sea Lance MOE/MOP* <sup>224</sup>

The team then analyzed the capacity of the potential system architectures to fulfill the required capabilities represented by the MOPs and MOEs. There were several, notably the procurement and upkeep costs that the team could not realistically assess and reasonably they did not do so. The next attribute of the Sea Lance that the team looked at was the salvo analysis. This analysis looked at required number of missiles or amount of ordnance required to attack a target, land, surface or air generally, or to defend the platforms themselves from attack. This was

<sup>224</sup> Sea Lance, NPS study, Table 1, 37.

an application of operations analysis similar to that applied by Hughes in his Tactics books.<sup>225</sup>

The research team followed this with a cost analysis focusing on the initial platform material and engineering costs.<sup>226</sup> They looked at flexibility, lethality, and survivability and came to the conclusion that the largest of the three hull sizes (by displacement) scored best in four of the five MOEs/MOPs.<sup>227</sup>

The following section of the report looked at the specific nuts and bolts of the system architecture. By this the authors meant the engineering systems, focusing on propulsion but also damage control systems<sup>228</sup>, sensors, computers, and the software to run all of these systems. In striving to explore new and innovative solutions, the team looked at an electric drive for the ship based on the intent to apply an “Integrated Power System, which include[ed] electric drive.”<sup>229</sup> In a more ground-breaking move, the engineering team considered and decided that the surface platforms ought to employ water-jet propulsion in place of conventional propellers and shafts for the main propulsion system(s). This engineering design recommendation was ultimately retained in the design-build phase of the LCS. In a more information technological focused innovation, the team recommended the adoption of a Total Ship Open Architecture (TOSA)<sup>230</sup> system to the Crossbow platforms. This is in effect a commercial or open data and information for engineering, control, communication, and energy systems throughout a platform.<sup>231</sup> The goal of TOSA was to reduce costs by enabling similar engineering standards across various sub-systems

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<sup>225</sup> Ibid, 38. See also Hughes, *Fleet Tactics*, 1986 and 2<sup>nd</sup> ed. 2000.

<sup>226</sup> Sea Lance, NPS Study, 51-54.

<sup>227</sup> Ibid, 60.

<sup>228</sup> The U.S. Navy’s definition of damage control systems and equipment includes installed and portable firefighting systems, de-watering (drainage) systems, mechanical/structural repair equipment like the ‘Jaws of Life’ mechanical metal cutting tool, and emergency power (electricity) cables.

<sup>229</sup> Sea Lance, NPS Study, 96.

<sup>230</sup> See J. Vasilakos, R. Devries, and K.T. Tompkins. "Total Ship Open Systems Architecture." *Naval Engineer's Journal* 112, no. 4 (July 2000): 59.

<sup>231</sup> Sea Lance, NPS Study, 102.

thus minimizing required hardware changes when systems updates or installations were made. This was part of the PMS 512 (PEO Surface Strike) “Affordability Through Commonality” program where using similar software and more importantly similar hardware e.g. electrical controls, switches, motor controllers for various different ships and submarines would save money for the Navy by allowing the service to buy in bulk. The other advantage, cost-wise, is that by using commercial-off-the-shelf (COTS) software programs, the cost of acquisition is significantly reduced as compared to proprietary software or software written to a specific military specification (the infamous ‘milspec’).<sup>232</sup>

The engineering team continued with their analysis by examining the estimated volume (cubic feet), weight (tons), required power (kilowatts) and cost of the weapons and sensors to be installed.<sup>233</sup> These estimates were based on COTS equipment available on the open market, mostly courtesy of European vendors. They also categorically stated that the Sea Lance combatant is primarily [intended to be] a network centric warfare ship.<sup>234</sup> In keeping with the intent to reduce costs, the team also looked at the minimum required crew to operate but not to maintain the installed systems on the platforms.<sup>235</sup> The crewing review included reviewing the required sewage system, habitability issues (bunks, cooking [mess] facilities), and the training required to prepare the crew to operate the platforms. The idea of the crew as focused on just on operating equipment versus operating and maintaining the equipment is another concept that has been retained throughout the acquisition and fielding of the LCS.

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<sup>232</sup> The drawback is that COTS software tends to be more susceptible or vulnerable to cyber-attacks than some proprietary and military developed software.

<sup>233</sup> Sea Lance, NPS Study, 124-132.

<sup>234</sup> Ibid, 132.

<sup>235</sup> Ibid, 134, 164-5, 169.

The key take-aways from the CROSSBOW study and especially from Volume II, the SEA LANCE were the value of multiple, simple dispersed platforms operating in the newly important littoral regions of the world. The end of the Cold War revealed to the Navy that the areas of strife would likely shift from the high seas, especially the North Atlantic or Pacific to areas much closer to shore and in regions where maritime threats had previously been unimportant or less important than the threat from the peer competitor force, the Soviet Navy. Smaller and thus cheaper surface platforms ships for all intents and purposes were assessed to be more effective for the predicted costs. Single mission ships, dispersed throughout the battlespace would in effect provide more bang for the buck to the U.S. Navy than a force of multi-mission ships operating in a more constrained geographic dispersion. Alongside the idea of “quantity having a quality all its own,” rode the idea of high-speed. Whether it is covered by ‘self-deployability’ or simply ‘high-speed’ in the required capabilities, speed remained one of the core required capabilities for LCS from concept development through fielding. The same has held true for the concept of networked or network-centric platforms and sensors. These three key determinants have consistently dominated the LCS program – low cost for high(er) numbers, high speed, and networked systems. By way of illustrating this, the Commander Fleet Forces Command (CFFC) “Overarching Requirements” in the LCS Concept of Operations brief (Figure 6 below) that was released with the solicitation for LCS preliminary design stated: Cost, mission packages, and networking capability while speed was to be a prioritized parameter for the new class i.e. they needed to be fast.<sup>236</sup> This Fleet Forces table serves to further illustrate the three

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<sup>236</sup> LCS Solicitation, N00024-03-R-2309, Section J-4, “PRELIMINARY DESIGN INTERIM REQUIREMENTS DOCUMENT,” dated 10 February 2003, 4.

key factors of cost, numbers, and connectivity or networked platforms. The crew size entry re-emphasizes the desire to field minimally manned platforms in order to reduce overall costs.

## ***CFFC Overarching Requirements***

- **Balanced requirements in the areas of:**
  - Cost
  - Mission package development
  - Integration with FORCENET
- **Prioritize key parameters in areas of:**
  - Speed
  - Endurance and range
  - Stability (low speed) and seakeeping
  - Draft
  - Aviation capability
  - Crew size
  - Mission flexibility
  - Unmanned vehicles
  - Signature management

***Should be balanced one with and against the others*** 7

*Figure 6- LCS CONOPS Brief - Slide #7*

## THE WAR GAMING

It is a bit difficult to separate the sequence of the Cebrowski & Hughes article and the series of experiments conducted under the auspices of the Naval War College collectively labeled “Streetfighter.” The article was published in November 1999, while then Vice Admiral Cebrowski was appointed as the President of the War College in 1998.<sup>237</sup> The first reported “Streetfighter” experiment was conducted as part of the War College’s annual Global or Title

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<sup>237</sup> Greg Jaffe, “Debate Surrounding Small Ship Poses Fundamental Questions for U.S. Navy,” *The Wall Street Journal*, 11 July 2001.

10/Global<sup>238</sup> war-game in the summer of 2000. The Global series of war games started in 1978 to explore Navy capabilities employed in a strategic context against the Soviet Union. For the Navy, Global turned into the Title 10 game and carried on after the Cold War exploring Navy capabilities and doctrine.<sup>239</sup> This war game series focuses on operational level warfighting concepts and was conducted by the War College from 1978 to 2001 as Global and resumed as Global/Title 10 in 2008. For the 2001 iteration, the small, self-deployable and networked ships provided a potent surface component in the war-game scenario; where the U.S. Navy was facing an Anti-Access/Area Denial (A2/AD) operational concept based on a potential capability of the People's Republic of China circa 2015.<sup>240</sup>

There were also war-games or experiments conducted as part of the Fleet Battle Experiment (FBE) series in the early 2000s as a sort of follow on series to the Naval War College's "Streetfighter." The Navy Warfare Development Command (NWDC) executed the FBE series in the late 1990s and early 2000s to investigate new material and procedural capabilities to fulfill the Navy's mission requirements in various warfare areas. The emphasis was slightly different in these experiments in that the networked platforms were not just surface platforms but included other sensor system, unmanned systems and Marine Corps assets as well.<sup>241</sup> The monograph "Strategy for a Long Peace" besides discussing the FBE series, also assessed the value of smaller (cheaper) surface platforms, networked with other platforms, and

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<sup>238</sup> U.S. Naval War College website. Available on-line at <https://www.usnwc.edu/Research---Gaming/War-Gaming/Documents/RAGE/Gaming/-Global-Title-X-Series.aspx>. Accessed 26 Sep 2016, 0956 EDT.

<sup>239</sup> Douglas Ducharme. "Approaches to Title 10 Gaming," U.S. Naval War College on-line article, p.1. Available online at [https://www.usnwc.edu/getattachment/Research---Gaming/War-Gaming/Documents/Publications/Articles/Title\\_10\\_gaming\\_article---Ducharme.pdf.aspx](https://www.usnwc.edu/getattachment/Research---Gaming/War-Gaming/Documents/Publications/Articles/Title_10_gaming_article---Ducharme.pdf.aspx). Accessed 27 Sep 2016, 0735 EDT.

<sup>240</sup> Jaffe, "Debate Surrounding Small Ship."

<sup>241</sup> Steven Kosiak, Andrew Krepinevich, Michael Vickers, "A Strategy for a Long Peace," Washington, DC: Center for Strategic and Budgetary Assessments, Jan. 2001), 36-38.

with high speed. The high speed for Krepinevich, et al was a tactical asset but the overall concept ultimately valued high speed for self-deployability vice the ability to out-maneuver a foe or out-run a hostile missile or torpedo. The FBE series encompassed at least two (FBE “Foxtrot” and “Golf”) events and potentially three (the two named earlier and “Hotel”) where the surface platforms and networked system of systems of “Streetfighter” were physically tested and analyzed.

There was also a series of experiments or war-games executed in the mid to late 1990s sponsored by OPNAV which examined the concept of smaller, distributed and networked surface platforms. These games were executed under the general title of the Joint Multi-Warfare Analytical Game (JMAG) and unlike the FBE series, were done completely through modeling and simulation.<sup>242</sup> The JMAG series investigated various unmanned systems, weapons, sensors, and platforms operating against a notional adversary (likely modeled closely on real-world states) with live decision makers, uniformed and non-uniformed subject matter experts (SME) in the decision loop.<sup>243</sup> Reportedly many of the specific attributes of what came to be known as LCS were highlighted in JMAG events. These included operations in the littorals, specifically focusing on the Strait of Hormuz; small, relatively high-speed surface ships; and mission capabilities focusing on mine warfare and anti-surface warfare capabilities. The results and feedback from the SME participants provided several key insights that are likely to have impacted the concept development for LCS. These included smaller size, mission specificity with some multi-mission capability depending on the threat environment, minimum manning, self-deployability, a level of high-speed, the ability to defeat multiple small boats attacking in

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<sup>242</sup> Robert Carney, “Birth of the Littoral Combat Ship,” *U.S. Naval Institute Proceedings*, Vol. 238, No. 9 (Sep 2012): 42.

<sup>243</sup> *Ibid.*

concert (known as “Swarming tactics”<sup>244</sup>), and some of the specifics of the hull forms and materials.<sup>245</sup> Despite the claim of the article’s author, the JMAG series of war-games were only one of several concepts, experiments, and ideas that contributed to the creation of the LCS program and to the actual construction of the ships and their associated systems.

These sets of war games and experiments while not necessarily directly linked all served to investigate the concept of the LCS. There have been continuing questions regarding whether or not the Navy did the due diligence encompassed in the JCIDS process. There may be some legitimacy in the contention that the level and number of experiments and war games served to feed the Initial Capabilities Document (ICD) and the Analysis of Alternatives (AoA) required in the first two phases of the acquisition process. The real disconnect from the standard process timeline is revealed in that the Capabilities Development Document (CDD) was not released until after Milestone A – meaning that per the flexibility stated in both the DoD and DON acquisition instructions, the Navy did start this shipbuilding program before the official Milestone A was ‘met.’

The really important concepts that were revealed through the Navy’s war gaming and experimentation were however, the keystone concept ideas that culminated in the design and

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<sup>244</sup> See John Arquilla, David Ronfeldt, *Swarming and the Future of Conflict* (Santa Monica, CA: Rand, 2000) and Sean Edwards, *Swarming on the Battlefield: Past, Present, and Future* (Santa Monica, CA: Rand, 2000). Stew Magnuson. "Military Beefs Up Research Into Swarming Drones." *National Defense* 100, no. 748 (2016): 22-25. Radomir Jankovic. "Computer Simulation of an Armoured Battalion Swarming." *Defence Science Journal* 61, no. 1 (2011): 36-43. Edwards, Sean, and Davis, Paul. *Swarming and the Future of Warfare* (PhD diss., Rand Graduate School, 2004). Graham Warwick. "ONR: Swarming UAVs Could Overwhelm Defenses Cost-Effectively." *Aerospace Daily & Defense Report* 252, no. 19 (2015): 2. John Arquilla, David Ronfeldt. "Swarming-- The Next Face of Battle." *Aviation Week & Space Technology* 159, no. 13 (2003): 66. Yagil Henkin. "On Swarming: Success and Failure in Multidirectional Warfare, from Normandy to the Second Lebanon War." *Defence Studies* 14, no. 3 (2014): 310-32. David Hughes. "NETWORKING, SWARMING AND WARFIGHTING Networking Can Provide an Edge in a Major War, a Conflict with an Ideological 'elite' or the Reconstruction of a Nation." *Aviation Week & Space Technology* 159, no. 13 (2003): 48-51. Alan Campen. "Swarming Attacks Challenge Western Way of War." *Signal* 55, no. 8 (2001): 33-34.

<sup>245</sup> Carney, “Birth of LCS,” 45.



fielding of the LCS class. The first was that the new ships needed to be cheaper, both as individual hulls but also in terms of manning as compared to the larger, multi-mission ships like the TICONDEROGA class cruisers and the ARLEIGH BURKE class guided missile destroyers. The operational environment (formerly battlespace) that the Navy expected to see in the 21<sup>st</sup> century encompassed geography that enabled hostile states to apply Anti-Access/Area Denial (A2/AD) systems that would make sending larger classes into their coastal waters would greatly increase the risk of losing these expensive ships even if the mission(s) are successful. The second key attribute was that the new class of ships needed to be flexible with systems that could be tailored to specific missions. This was based on the predicted operational environment but was also based on the scheduled decommissioning of several classes of legacy ships like the mine-warfare ships (AVENGER and OSPREY classes), the PERRY class guided missile frigates, and the aging of the CYCLONE class Patrol Coastal (PC) boats. There was an observed need, in the late 1990s and early 2000s, that each of the missions that these classes were capable of had to be done by another, replacement class of ships. The pending decommissioning and/or aging of 91 hulls would leave a large gap in the number of ships that the U.S. Navy needed in order to accomplish its peace- and war-time missions. And lastly, the new class needed to meet certain specific physical characteristics in order to be effective in the predicted environment. These specific characteristics included a very good turn of speed, shallow draft, and a range of operation enabling them to 'self-deploy' to regions where they might be employed. These three broad areas of characteristics became the driving force(s) behind the concept and the material design of the LCS.

**THE CONCEPT "OPERATIONALIZED" OR "THE SOLICITATION"**

As noted above the CDD was officially released in 2004. But the actual RFP was solicited in 2003. This in effect made industry a collaborator in taking the concept of a warship for the littorals and turning it into a physical reality. There was (and is) by necessity a rather higher level of collaboration and or 'free rein' for bidders to design ships as compared to smaller, less complex military systems. The actual solicitation that was released bore more of a relationship to set of performance specifications versus a standard set of bid specifications. The Navy basically told the bidders "Here are the capabilities that we want. Please provide a design or model that will achieve the required capabilities in the package size that we described." While many fans and critics will not admit it, the LCS solicitation package in effect was an attempt to make the "Streetfighter" concept a physical reality. The actual RFP was issued on 28 February 2003 under the title "Littoral Combat Ship (LCS) Preliminary Design," (Solicitation Number: N00024-03-R-2309). The required response date and time was "2:00 PM Eastern Standard Time on 14 April 2003." This did not allow a large response time-frame and there was a lot of required response material to compete for this contract.

## THE STATEMENT OF WORK (SOW)

The SOW specified the initial 'flight' or first production run as the desired Navy acquisition and specified that the delivered product had to meet the parameters listed in the Preliminary Design Interim Requirements Document (PD-IRD) (Attachment J-4).<sup>246</sup> It also categorically stated that the "CAIV target for the LCS ship and the installed core mission systems is \$220M FY-05 dollars threshold and \$150M FY-05 dollars objective."<sup>247</sup> This statement was significant in and of itself because of the use of the term CAIV or Cost as an

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<sup>246</sup> LCS Solicitation, N00024-03-R-2309, Section C, entitled "DESCRIPTION/SPECIFICATIONS/WORK STATEMENT," dated 10 February 2003, C-1.

<sup>247</sup> Ibid.

Independent Variable. This showed very clearly to the potential bidders at the very beginning of the LCS acquisition program that cost of significant interest to the government. CAIV is part of an acquisition strategy that seeks to control (or minimize if possible) life-cycle costs across the entire life-span of a weapon system beginning with the acquisition phase.<sup>248</sup> Formerly in looking at acquisition programs, the government focused on cost, schedule and performance.

Performance was the fixed variable, meaning that cost and schedule could be adjusted as long as the delivered system met (or exceeded) the goal performance parameters. Using CAIV, the performance is allowed to rise or fall along with the schedule and cost. This allowed the government more flexibility and potentially lower costs than was possible with performance set in stone.<sup>249</sup> The pricing was to include all of the design, outfitting and testing of the initial Flight 0 LCS ship.

The initial portion of the state of work addressed the basic requirements and desired performance compared to the minimum required performance. Much of this requirements information was contained in Section C, Attachment J-4, and J-8-1 of the solicitation package. Attachment J-4 is the “Preliminary Design Interim Requirements Document Serial Number N763F-S03-026 For Littoral Combat Ship (LCS) Flight 0 PRE ACAT.” This document basically represents the design specifications sort of akin to the infamous ‘milspec.’ Looking at Table 3 following, we can see many of the key requirements that started as desired capabilities in Fleet Tactics and carried through the concept studies and other preliminary documents. The first

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<sup>248</sup> The definition of CAIV per the DAU is: “Methodology used to acquire and operate affordable DoD systems by setting aggressive, achievable Life Cycle Cost (LCC) objectives and managing achievement of these objectives by trading off performance and schedule as necessary. Cost objectives balance mission needs with projected out-year resources, taking into account anticipated process improvements in both DoD and industry. Definition available online at: <https://dap.dau.mil/glossary/pages/1673.aspx>. Accessed 21 Dec 2016, 0841 EST.

<sup>249</sup> Ellen Barber, Defense Acquisition University (DAU), Business, Cost Estimating and Financial Management Department, DAU Teaching Note, “COST AS AN INDEPENDENT VARIABLE (CAIV),” dated February 2011.

key requirement that we can see is the “Total Price per Ship.” This goes back to the number of platforms needed and the desired cost per hull.<sup>250</sup> There are also the line items for crew size and accommodation requirements. These continued to point out the desired minimum manning in order to push down overall costs for the LCS. The second repetitive item that shows up is the required ‘sprint’ or maximum speed. Of note, the minimum or threshold level is 40 knots in a specific sea state (winds and wave height). And the desired capacity is 50 knots in the same sea state. What was missing or not addressed in the list of design parameters was the network-centric capability. This was however, addressed in several other sections of the solicitation that we will review later in this chapter. What was added or gained much greater emphasis was the requirement to adapt the ship to perform alternate missions, which translates into the mission package change out time limit. Another important parameter to note in Figure 4 is the desired payload size. This is important as the desired and required metric tonnages are not large and the difference between the two, 30 MT all total, is very small compared to normal U.S. Navy warship displacements. The last key item to note in this figure is the required ‘Operational Availability.’ This translates into a percentage of time that while on a deployment or not in a maintenance period (usually called an ‘availability’ by the Navy); the ship must be available for operational missions at least 85 percent of the time. This equates to a cost-savings because it reduces the load on other ships/hulls and thus reduces the absolute number of hulls required to meet the Navy’s mission requirements.

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<sup>250</sup> “Naval Transformation Roadmap: Power and Access...From the Sea,” (Washington, DC: Department of the Navy, 2003), 19. Sea Lance, NPS Engineering Study, 19. “Littoral Combat Ship: Concept of Operations” (Newport, RI: Navy Warfare Development Command, February 2003), 5, 6, 23. See also Government Accounting Office, “Military Personnel: Navy Actions Needed to Optimize Ship Crew Size and Reduce Total Ownership Costs,” (Washington, DC: Government Accounting Office, June 2003). Robert O. Work, “Naval Transformation and the Littoral Combat Ship,” (Washington, DC: Center for Strategic and Budgetary Assessments, February 2004), 51, 53, 79.

### 3.1 Critical Design Parameters

LCS Flight 0 Critical Design Parameters		
Category	Threshold Level	Objective Level
Total Price per Ship	Meet CAIV target in the RFP	Exceed CAIV target in the RFP
Hull Service Life	20 Years	30 Years
Draft at Full load		
Displacement	20 feet	10 feet
Sprint Speed at Full Load		
Displacement in Sea State #	40 Knots in Sea State 3 (note 1)	50 Knots in Sea State 3 (note 1)
Range at Sprint Speed	1,000 nautical miles (note 2)	1,500 nautical miles (note 2)
Range at Economical Speed	3,500 nautical miles (>18 knots) with payload	4,300 nautical miles (20 knots) with payload
Aviation Support	Embark and hangar: one MH-60R/S and VTUAVs, and a flight deck capable of operating, fueling, reconfiguring, and supporting MH-60R/S/UAVs/VTUAVs	Embark and hangar: one MH-60R/S and VTUAVs, and a flight deck capable of operating, fueling, reconfiguring, and supporting MH-60R/S/UAVs/VTUAVs
Aircraft Launch/Recover	Sea State 4 best heading (note 1)	Sea State 5 best heading (note 1)
Watercraft Launch/Recover	Sea State 3 best heading with in 45 mins. (note 1)	Sea State 4 best heading with in 15 mins. (note 1)
Mission Package Boat type	11 Meter RHIB	40 ft High Speed Boat
Time for Mission Package Change-Out to full operational capability including system OPTTEST	4 days	1 days
Provisions	336 hours (14 days)	504 hours (21 days)
Underway Replenishment Modes (UNREP)	CONREP, VERTREP and RAS	CONREP, VERTREP, and RAS
Mission Module Payload (note 3)	180 MT (105 MT mission package / 75 MT mission package fuel)	210 MT (130 MT mission package / 80 MT mission package fuel)
Core Crew Size	50 Core Crew Members	15 Core Crew Members
Crew Accommodations (both core crew and mission package detachments)	75 personnel	75 personnel
Operational Availability (Ao)	0.85	0.95

Note 1: Sea State parameters are defined in Appendix A

Note 2: Includes Payload - Taking into account the focused mission nature of the LCS, payload is defined as the heaviest possible Mission Package and core mission systems, excluding ship's fuel.

Note 3: Mission package payload is defined as all non-core systems, vehicles, helos, ordnance, and associated personnel, equipment, and containers to perform a single mission. This includes fuels to operate the mission package.

*Table 2- LCS Design Parameters* <sup>251</sup>

<sup>251</sup> LCS Solicitation, N00024-03-R-2309, Section J-4, dated February 10, 2003, 4 of 17.

If we look at section 3.0.2 “Modularity,” we can see the increasing emphasis placed on the mission modules and the scalability or flexibility that is a stated key attribute for the LCS class. As this section states:

“The modular Mission Packages are a central feature of the LCS design and will provide the main war fighting capability and functionality for specific mission areas.”

This clearly delineates the importance of the mission packages and the desired capability to modify the functionality of the ships to focus on specific missions, like mine warfare or ASW. This is very much of a departure from the previous Navy preference for multi-mission platforms with the ability to undertake various missions using only installed systems. Throughout the required parameters there was a distinct emphasis on marrying organic or installed capabilities with expanded equipment modules to improve mission capacity.

Speed remained extremely important throughout this section of the solicitation. In particular, on the last page when addressing the requirement to meet the Cost as Independent Variable (CAIV) goals there was a list of discriminators provided. Discriminators in contracting serve to highlight the advantages or better quality of a contractor’s offering whether equipment or services as compared to other competitors submitting on a government solicitation. In this specific case the first of the listed discriminators was “top speed.”<sup>252</sup> The second was performance in seaway (rough water) both at loiter and cruise speed further emphasizing the importance of speed.

And just in case anyone missed the importance of speed in the response to the solicitation, the following figures depict the PowerPoint slides that were included as Exhibit B in the government package. This exhibit was entitled “ONR/NWDC Sponsored Technology Demonstration Programs and

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<sup>252</sup> LCS Solicitation, N00024-03-R-2309, Section J-4, 16.

Experimentations.”<sup>253</sup> The slides were meant to summarize the series of physical and/or modelling and simulation experiments and tests conducted by the Office of Naval Research and NWDC over the preceding decade or so. Two of the platforms depicted were basically leased from commercial vendors for physical experimentation and two were expected to be either leased or constructed by companies for testing by the Navy. In fact, the Navy had been experimenting with new hull forms for higher speed ships since at least the 1990s, first with the ‘Sea Shadow’ program then with the High-Speed Vessel (HSV) which was actually adopted for service by the Navy and Army as the Joint HSV.<sup>254</sup> Including these slides in the solicitation package served again as a very strong signal that speed mattered, and that the successful

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<sup>253</sup> LCS Solicitation, N00024-03-R-2309, Section J, List of Attachments, and Exhibition B “ONR Development of Small High-Speed Vessels”, PowerPoint brief.

<sup>254</sup> Sea Shadow was actually intended for stealth vice speed experimentation but her surface effect, split hull design (see X-Craft in Figure 5 above) served to provide data on new hull forms and higher speeds. For more on Sea Shadow see:

Stalking the seas with stealth. (1993). *Machine Design*, 65(11), 14. Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/217155916?accountid=12967>

S. Ashley. (1993). Stealth ship undergoes sea trials. *Mechanical Engineering*, 115(6), 68. Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/230154217?accountid=12967>

US financial network: Northrop Grumman recognized as clean business of the year and Lockheed martin

receives funding for final year of sea shadow operations. (20 Mar 2006). M2 Presswire Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/444693591?accountid=12967>

M.A. Dornheim. (1993). U.S. navy unveils sea shadow stealth vessel. *Aviation Week & Space Technology*,

138(17), 23. Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/206040194?accountid=12967>

M.A. Dornheim. (1993). Sea shadow eludes radar. *Aviation Week & Space Technology*, 138(18), 43. Retrieved

from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/206030347?accountid=12967>

B. Newman. (24 Feb 2009). The navy has a top-secret vessel it wants to put on display --- sea shadow and its

satellite-proof barge need a home; plotting in providence. *Wall Street Journal* Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/399126360?accountid=12967>

All accessed 28 Nov 2016, 1200 EST. See also: Ken W. Sayers *Uncommon Warriors 200 Years of the Most*

*Unusual American Naval Vessels* (Annapolis, MD: Naval Institute Press, 2012).

For more on the JHSV see: US NAVY: Construction commences on first joint high-speed vessel. (21 Dec 2009).

M2 Presswire Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/446122704?accountid=12967>

US DOD: Contracts. (23 Sep 2005). M2 Presswire Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/444126616?accountid=12967>

US DOD: DoD news briefing -- part 2 of 2. (23 May 2002). M2 Presswire Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/445891935?accountid=12967>

US DOD: Contracts. (23 Oct 2002). M2 Presswire Retrieved from

<http://proxy.lib.odu.edu/login?url=http://search.proquest.com.proxy.lib.odu.edu/docview/443873301?accountid=12967>

All accessed on 28 Nov 2016, 1300 EST.

offeror must include speed as a key system attribute in their proposal. They are included in Figures 7 and 8 following this section.

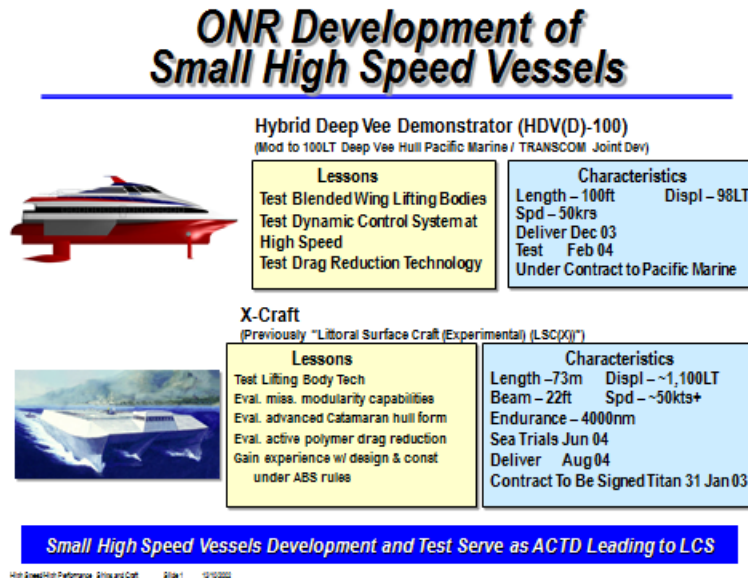


Figure 7- Exhibit A from the LCS Solicitation (Slide 1)

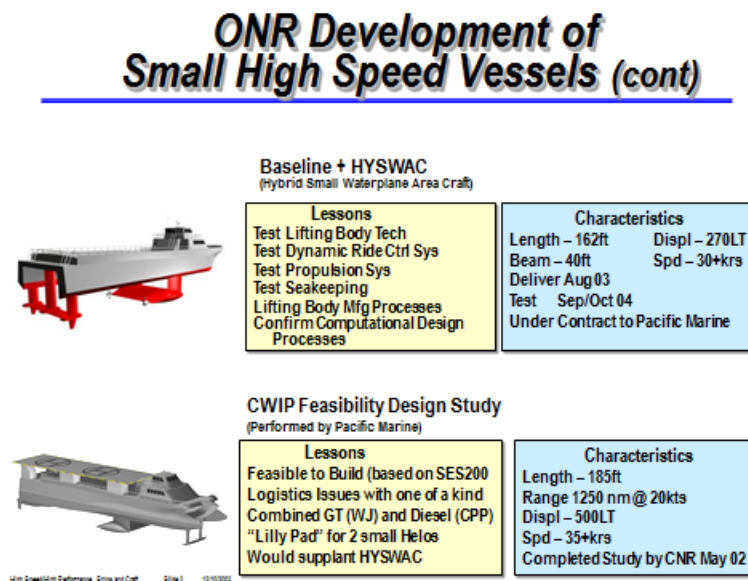


Figure 8- Exhibit A from the LCS Solicitation (Slide 2)

## THE CONCEPT OF OPERATIONS



The really surprising thing about this specific solicitation is the amount of conceptual material and information included in it. By this I mean that government requests for proposals or quotes often have broad and general descriptions in them with required quality attributes of the products or services to be provided. However, they don't often have the very, very broad concept materials like the CONOPs included in the formal solicitation for the government requirement. More often albeit in slightly different government markets e.g. architecture and engineering, professional services and engineering services, the design specifications are either already provided to the bidders or a comparatively stricter set of design/performance parameters are presented. The most pertinent example of this that comes to mind is the design contract versus a design-build/design-bid-build contract. In a design contract, the government solicits reputable and capable firms to design an architecture or construction engineering project (most often a building or structure like an aircraft runway). The winning bidder does the research, site surveys, calculations, drawings and basically delivers a set of design plans or blueprints to the government to be actually built or erected by the government or another commercial company as part of a separate contract. The design plus bid or build contracts have the prime contractor both design and erect or bid out the construction of the planned infrastructure. There is very little that is undefined i.e. required floor space in square feet, number of offices, heating, ventilation, and air conditioning (HVAC) etc. There is some room for creativity but there are also many definable factors that the government will specify, and this limits the flexibility of designers.

In the case of the LCS solicitation, in many ways the government had far fewer parameters, many of which were (and are) to be honest difficult to quantify because of volume and weight trade-offs required in ships or surface platforms. Because there were fewer hard and fast definable factors, the bidders were in effect given a much larger degree of freedom to design the system of systems to satisfy the government's requirements. But as mentioned earlier, the nature of balancing the various components and systems of the ship with the allowable volume and weight necessitates a certain amount of freedom and flexibility in the design of the vessel. The more volume the ship has i.e. the larger the

hull, then the larger the engines that can be installed in that volume. However, the larger size increases weight which in turn requires more powerful engines which are generally larger and heavier to reach the desired speed. Also, designers need to consider the amount of fuel which can be stored which again leads to the issue of more volume equates to more weight thus yet again requiring more horsepower to reach designed speeds. It is a very careful balancing act, trading off capabilities to reach the most effective compromise possible. In the case of the LCS class, these trade-offs were fixed by the desired and required draft, speed, and cost of the resulting ships. The 20-foot maximum draft<sup>255</sup>, minimum maximum speed of 40 knots, and the required range of action without refueling placed some very tight design parameters on the bidders to achieve. Based on this, they had to be allowed a higher degree of latitude than in many other government procurement programs to craft their own designs to meet the specifications.

In the next section of the solicitation, Attachment J 9 Option Items, we can see many of the same themes mentioned earlier running through this portion of the RFP package. Section C provides Design Specification and Performance Work Statements, and especially Option Item 0004 – Final System Design<sup>256</sup>. This Contract Line Item Number (CLIN) addresses the test and evaluation of the delivered physical platforms preceded by two Critical Design Reviews. But in addition to the design reviews and op-testing, the contractor is directed to ‘report and utilize Total Ownership Cost (TOC) reduction measures for the new, proposed system...’<sup>257</sup> Later in the section, the government also directs the contractor to show how the proposed ship design incorporates and successfully supports life cycle supportability considerations.<sup>258</sup> This in effect

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<sup>255</sup> Draft or how deep down into the water column a ship’s hull extends is in direct relation to the volume of water the hull displaces. This is, in turn, directly related to both the shape of the hull but more importantly to the weight of the hull (which is equal to the weight of water that it displaces).

<sup>256</sup> LCS Solicitation, N00024-03-R-2309, Section J-9, dated 10 February 2003, 5.

<sup>257</sup> Ibid, 7.

<sup>258</sup> Ibid, 14.

means that the design needs to be fiscally manageable over the entire life-span of the system, from cradle to grave. Here again, we see the drive to control and if possible drive down the fiscal cost of the LCS program writ large. This holds true almost by inference in the section of this attachment that addresses the automation, damage control, and maintenance requirement reduction desires of the customer. Or to quote directly from the solicitation, to “maintain optimized manning levels.”<sup>259</sup> In addition to this unstated goal of minimizing manning to reduce costs, solicitation enjoins the contractor to “affordably” modernize and upgrade LCS systems.<sup>260</sup> This is hard to truly quantify, meaning just how affordable will specific upgrades or improvements be? But it does re-emphasize the Navy’s desire to acquire a cheap or lower cost ship compared to previous ship classes. As does the direction in this section that the contractor “shall ensure the straight forward and inexpensive accomplishment of technology insertion, technology refresh, scalability, and other modernization and disposal efforts.”<sup>261</sup> Of note, the government was also very careful to delineate the amount of potential growth on the options listed in Section J-9 by addressing priced orders and undefinitized orders.

Any priced order required that the contractors provide price quotes or estimates to the contracting officer.<sup>262</sup> If awarded, the contractor and contracting officer were to negotiate the price and delivery schedule – leaving some room for adjustment but the underlying government inference is that this will result in orders that either in terms of timeliness of delivery or cost were advantageous to the government. The terms were similar for undefinitized orders. An undefinitized order is one for which the contract terms, specifications, or price have not been

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<sup>259</sup> Ibid, 13.

<sup>260</sup> Ibid.

<sup>261</sup> Ibid, 14.

<sup>262</sup> Ibid.

agreed upon before performance is begun under the order.<sup>263</sup> In the case of undefinitized orders, the contractor and contracting officer were bound by a maximum cost ceiling. The contracting officer (CO) was to provide an estimated ceiling above which the government will not pay while the contractor in responding is tasked to provide a maximum ceiling amount as part of the response. There is still some room for maneuver for both parties because both by definition and because this was very early in what would amount to a prototyping stage for LCS, the scope in terms of time and cost for “new” work or new work orders would be very difficult for either party to determine with any level of accuracy or precision. What this all really amounts to though is that the government strove very hard to manage costs in the solicitation phase of the LCS acquisition while acknowledging that designing and building new ships, especially ones intended to be such a radical departure from previous Navy surface platforms was bound to create increased risk (of failure or problems) and this equated to increased cost to the government.

## THE NAVY OPEN ARCHITECTURE GUIDANCE

Networking the LCS platforms and systems and by extension the required software was such an important part of the concept that it warrants some discussion as it was presented in RFP. In section J-10 of the solicitation package there were several documents addressing the software and systems integration requirements applicable to the LCS acquisition. The first of these was the “Design Guidance for the Navy Open Architecture Computing Capability.”<sup>264</sup> This document was incredibly important to the entire LCS acquisition because it really drove the

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<sup>263</sup> Defense Federal Acquisition Regulations Supplement, part 217.7401. Available online at: [http://www.acq.osd.mil/dpap/dars/dfars/html/current/217\\_74.htm#217.7401](http://www.acq.osd.mil/dpap/dars/dfars/html/current/217_74.htm#217.7401). Accessed 23 Nov 2016, 1310 EST.

<sup>264</sup> “Design Guidance for the Navy Open Architecture Computing Capability.” (Dahlgren, VA: Naval Surface Warfare Center Dahlgren, 01 October 2002).

requirements on how these ships were to be “network-centric” systems. However, this was not the only key issue that the guide addressed; it also strongly reiterated the cost control or cost performance required of the architecture (software and hardware) systems to be procured. While much of the preceding text has dealt with system acquisition and ship design it was not meant to down-play the importance or the cost of investment in the Information Technology (IT), both hardware and software associated with ACAT level I programs. LCS is definitely an ACAT level I program, and the amount of software involved in the installed, modularized, and associated off-board systems is huge. The point to make here is that the cost of the LCS acquisition or just about any major weapons system is not just caused by the hardware but also by the software required to operate that hardware. And over the life-cycle of a weapons system, the cost to update, upgrade, and ‘fix’ software is not inconsequential by any measure especially across a number of platforms, whether airframes, sea-frames, armored fighting vehicles, or communications systems.

For the Department of Defense, “architecture” means the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.<sup>265</sup> An open system is defined as:

“A system that implements sufficient open specifications for interfaces, services, and supporting formats to enable properly engineered components to be utilized across a wide range of systems with minimal changes, to interoperate with other components on local and remote systems, and to

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<sup>265</sup> Per the Institute of Electrical and Electronics Engineers (IEEE) Standard 1471-2000 and the Defense Acquisition University, Acquisition Community Connection. Available on-line at: <https://acc.dau.mil/CommunityBrowser.aspx?id=22108&lang=en-US>. Accessed 05 Dec 2016, 0852 EST.

interact with users in a style that facilitates portability.” – DoD Open Systems Joint Task Force<sup>266</sup>

This includes both hardware and software. From our perspective and for this portion of the chapter, the key component of this is the software portion. The NOA Guide focuses very much on the software and programming involved in Navy systems especially at it pertains to the LCS program. The guide states that the design goals for Navy systems “include enhanced Human Systems Integration (HIS) and optimized manning.”<sup>267</sup> This is another example of the intended and desired cost-control associated with LCS both from the stated design goal of minimum manning and the intended benefit of minimum manning, reduced operating and life-cycle costs. A following key policy statement emphasizes the ability to rapidly and affordably maintain, refresh, and upgrade systems throughout their life-cycle.<sup>268</sup> It is the affordability requirement that again highlights the importance of cost to all Navy acquisitions not just the LCS class.

The Navy’s guide goes on to discuss the attributes of open architectures. These are systems of systems that use widely accepted and available specifications, standards products and design practices for systems so that these systems are interoperable easily modified and extended, both in capabilities and life-spans.<sup>269</sup> Here again, we can see the emphasis on cost management as easily modified and extended systems are generally less costly than those that are not. But we also revisit the idea of network-centric systems in that they are interoperable with other systems, one of the key requirements for the Streetfighter concept and the actual LCS class. The intent of the guide’s approach is to manage, and control problems associated with technical

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<sup>266</sup> LCS Solicitation, N00024-03-R-2309, Section J-10-1, dated 10 February 2003, 4.

<sup>267</sup> Ibid, 1.

<sup>268</sup> Ibid.

<sup>269</sup> Ibid.

refreshes (updating or improving the hardware and/or software), mission capability upgrades and the total ownership cost of acquired systems.<sup>270</sup> Here again, while it is the last of the intended benefits, we see the importance of costs to the Navy. The physical challenge that the Navy faces is that any weapons system, immediately upon fielding is obsolescent. The NOA guide is meant to address, at least in part, the challenge of providing surface combatants like the LCS with warfighting upgrades to avoid obsolescence and to keep pace with the threat while still containing the total cost of ownership to the Navy.<sup>271</sup> So basically the Navy is attempting to balance the cost of maintaining premier capabilities in its warships with the need to apply fiscal resources across the entire Navy (and DoD) enterprise through applying open architectures to all systems procurements. The legacy challenge is that milspec and proprietary systems and software are expensive to replace and upgrade but again, the threat continues to become increasingly complicated and capable. This equates to a requirement or a “must do” to maintain a certain level of capability in Navy systems to defeat the predicted or perceived threats.<sup>272</sup> The Navy states in the guide that the funding required to upgrade systems is in effect a major budget barrier to continued system development to fleet support.<sup>273</sup> This statement in many ways forms the very core of the challenge that the Navy faces and why controlling costs has been so very critical to the LCS acquisition. Regardless of the willingness of the administration in power, the Secretary of Defense, or Congress to fund the Navy’s shipbuilding program, individual ships are growing progressively more expensive. As Drezner, et al pointed out in “Are Ships Different?” the length of time to design and build, the complexity, the low numbers of production units, and

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<sup>270</sup> Ibid.

<sup>271</sup> Ibid, 2.

<sup>272</sup> Ibid, 3.

<sup>273</sup> Ibid.

the high unit costs all contribute to the overall expense of ship acquisitions.<sup>274</sup> Another attribute that significantly increases the cost of warships is the requirement for high speed. The size of the propulsion plant and accompanying cost for the machinery plus the increased fuel costs significantly increase both production and life cycle costs.<sup>275</sup> Yet another contributing factor since the end of the Second World War has been the huge increase in the amount of electronics mounted on and in warships. According to one Rand Corporation study for the U.S. Navy, 35 to 57 percent of the cost of a warship was the cost of the equipment compared to material costs of 11 to 15 percent.<sup>276</sup> This same study found that power density has caused a huge increase in the size and cost of combatant ships.<sup>277</sup> The Rand authors posited that power density is a better proxy for complexity compared with power generation capacity because it is indicative of how many systems are put on a ship of a given size. For surface combatants over the past three decades, there has been a 40 percent increase in average power density.<sup>278</sup> This equates to an equivalent increase in the cost of building a warship.

The NOA Guide points out those non-standard products providing unique advantages or otherwise unavailable functionality and performance flexibility or a cost-benefit to the Navy are not forbidden but they need to satisfy the special characteristics noted.<sup>279</sup> However, the goals of the program are to provide the Naval Warfare Systems (NWS) with both the benefits of assured technical performance and reduced life-cycle costs, affordable tech refresh costs, and reduced

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<sup>274</sup> Drezner, et al, "Are Ships Different?" xi.

<sup>275</sup> Moran & Russell, *Maritime Strategy and Global Order*, 225.

<sup>276</sup> Mark V. Arena, Irv Blickstein, Obaid Younossi, Clifford A. Grammich, "Why Has the Cost of Navy Ships Risen? A Macroscopic Examination of the Trends in U.S. Naval Ship Costs Over the Past Several Decades." (Santa Monica, CA: Rand, 2006), 28.

<sup>277</sup> Arena, et al, "Why Has the Cost of Navy Ships Risen?" xv. Power density is defined as electrical power generation capacity in kW divided by Light Ship Weight (LSW) tons. LSW or light displacement is the weight of the ship (in tons) including all permanent items. It does not include variable loads such as crew, stores, and fuel.

<sup>278</sup> Ibid, 38.

<sup>279</sup> Navy Open Architecture Guide, 7.



upgrade cycle time; all of which equate to reduce overall life-cycle costs for procured systems and equipment.<sup>280</sup> In short, the Navy categorically states in the guide that it will implement warfare systems that meet operational performance requirements and that are affordable. There is no inference that performance will be sacrificed for cost, but this inference could be drawn if resources became particularly constrained in future acquisitions. In fact, the stated requirements for computing capability, again encompassing both the hardware or computers themselves and the software to run them, are robust. While maintaining the requirement for affordability and maintainability, the required NWS computing systems are expected (or required) to continue operating under “battle conditions” that include exposure to shock, fire (or high temperatures), and salt-water spray.<sup>281</sup> These are all well documented conditions that U.S. Navy warships have been subjected to in historical combat situations and are not likely to change in future conflicts. The one area that the NOA Guide does not specifically address and that has come under much closer scrutiny recently is the issue of cyber-attack. Without veering too far afield on this topic, which is actually very important, the use of open architectures does increase in some ways the vulnerability to cyber-attack of Navy computing systems.<sup>282</sup> However, it also makes it easier to craft patches and protective programming to defend systems from attacks or intrusion. The ability of technicians and programmers to access the systems and their resident software enables more experts to support trouble-shooting, repairs, and improved security programs.

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<sup>280</sup> Ibid, 8.

<sup>281</sup> Ibid, 15.

<sup>282</sup> For a more popular ‘take’ on the issue of computer and warfare systems, see P. W. Singer and August Cole, *Ghost Fleet: A Novel of the Next World War* (New York: Houghton Mifflin Harcourt, 2015).

The following section of the RFP included the Navy Open Architecture Computing Environment (NOACE) Technologies, Standards, and Products guide.<sup>283</sup> This guide reinforced and expanded on the issues and guidance provided in the NOA Guide. This document's stated purpose was to provide initial and preliminary standards and product selection guidance for the Navy Open Architecture (NOA) program's Navy Open Architecture Computing Environment (NOACE).<sup>284</sup> It re-stated the NOA program's goal as developing unified Navy product line using a common computing environment with a common set of warfighting functions shared across multiple platforms.<sup>285</sup> Here again, we see the intent of distributed or network-centric ships or platforms as one of the key discriminators for Navy acquisition in general and the LCS program in particular. But again, the Navy is also trying to avoid losing functionality while saving money because the end of the section mentioned above notes the intent to retain the "unique sets of warfighting functions associated with each ship class."<sup>286</sup> The overarching definition of the computing environment in this section of the document is that of a compatible set of standards based, Commercial off the Shelf (COTS) computing infrastructure components. These components will form a framework (or architecture) upon which warfighting and support applications (generally software) are to be built in accordance with the NOA rules and regulations.<sup>287</sup> The use of COTS is particularly notable because it has and continues to be one of the Navy's and the entire Department of Defense key policy ingredients for taming costs in acquisition programs.<sup>288</sup> Later in this guide, the Navy discusses Information Assurance (IA)

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<sup>283</sup> LCS Solicitation, N00024-03-R-2309, Section J-10-1, dated February 10, 2003. Document itself is entitled "Navy Open Architecture Computing Environment Technologies, Standards and Products" and is dated 02 October 2002.

<sup>284</sup> Ibid, 1.

<sup>285</sup> Ibid.

<sup>286</sup> Ibid.

<sup>287</sup> Ibid.

<sup>288</sup> For COTS references, see LCDR Michael H. Anderson, USCG and Dr. Eric Rebentisch. "Commercial Practices – Dilemma or Opportunity?: Risks — Yes, But Ultimately, Substantial Reward." *Program Management* (Mar/Apr

again as in the NOA guide. The basic argument that the Navy applies to IA while adopting commercial standards is that commercial best practices for products are less likely to inhibit their performance because market competition drives commercial developers to field systems that will both meet their operators' performance needs while also protecting the operators' proprietary information and data.<sup>289</sup> Products that do not provide these capabilities will be driven out of the market by lack of demand. So, in a somewhat ironic sense, considering the nature of the American national defense monopsony-oligopoly market, the DoD is relying on market efficiency conditions outside of the national defense one, to provide sufficiently robust and efficient products. The following two attachments in the J-10 section of the RFP are spreadsheets containing standards, specific equipment, product manufacturers, advanced technology demonstrations, and Research, Development, Test, and Evaluation (RDT&E) stakeholders. These data are to inform the potential bidders on specific options required and desired in the solicitation response as well as identify potential beneficial items and technology

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1998): 16-21. Available online at: <http://www.dau.mil/pubscats/pubscats/PM/articles98/andersma.pdf>. Accessed 08 February 2017, 1200 EST. LTC Deborah J. Chase, USA, Robert R. Copeland, and Ronald J. Ferrell. "Comanche Crew Station Development:"Mockpit" Lets Comanche Fly in Simulation Long Before Actual Aircraft Production." *Program Management* (Sep/Oct 2000): 58-60. Available online at: <http://www.dau.mil/pubscats/PubsCats/PM/articles00/Chass-o.pdf>. Accessed 08 February 2017, 1250 EST. Luke Campbell. "COTS: Is it Just a "check" for Your Program? Or Are You a Real Part of Acquisition Reform?" *Program Management* (Mar/Apr 2000): 16-20. Available online at: <http://www.dau.mil/pubscats/PubsCats/PM/articles00/campma.pdf>. Accessed 08 February 2017, 1320 EST. Briefing by Dr. Robert Zarnich, Director PEO IWS 5A, Advanced Undersea Systems Development, "ASW ENTERPRISE OPEN ARCHITECTURE Briefing." 21 February 2006. Available online at: [https://acc.dau.mil/adl/en-US/44946/file/13047/Presentation\\_7\\_ASW\\_OA\\_Overview.pdf](https://acc.dau.mil/adl/en-US/44946/file/13047/Presentation_7_ASW_OA_Overview.pdf). Accessed 08 February 2017, 1335 EST. David J. Carney and Patricia A. Oberndorf. "The Commandments of COTS: Still in Search of the Promised Land." Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA 15213, {djc, po}@sei.cmu.edu. Date UNK. Available online at: [https://acc.dau.mil/adl/en-US/24403/file/2848/TEN\\_COMM.pdf](https://acc.dau.mil/adl/en-US/24403/file/2848/TEN_COMM.pdf). Accessed 08 February 2017, 1400 EST. Lt Col William P. McNally, USAF. "Will Commercial Specifications Meet Our Future Air Power Needs?" *Acquisition Review Quarterly* (Summer 1998): 297-316. Available online at: [http://www.dau.mil/pubscats/pubscats/AR\\_Journal/arq98/mcnally.pdf](http://www.dau.mil/pubscats/pubscats/AR_Journal/arq98/mcnally.pdf). Accessed 08 February 2017, 1430 EST. The DAU Guidebook formerly has a section addressing COTS- Chapter 5, 5.3 Sustainability but the current version addresses COTS in passing in chapter 6 addressing Information Technology (IT) acquisitions. Available online at: <https://www.dau.mil/tools/dag>. Accessed 13 September 2017, 0856 EDT.

<sup>289</sup> LCS Solicitation, N00024-03-R-2309, Attachment J-10-1, 23.

for their responses.<sup>290</sup> The overall goal of section J of the solicitation was to inform and influence the potential bidders. The inform piece was about the overarching network architecture and how it is intended to function. The influence piece was intended to make sure that the bidders knew that costs were a significant factor for the network portion of the system and that whatever the bidder proposed as a solution had to function and function well within the parameters and network-centric architecture as described in the attachments. These attachments again however serve to highlight two of the critical themes running throughout the LCS acquisition, price (or cost) and networked systems and platforms.

The section following the architecture inserts also served to emphasize the goal of cost reduction and/or control in this acquisition program. In section J-11, the Navy provided inferred guidance to the bidders by including the Performance Based Logistics (PBL) Guidance document.<sup>291</sup> This was a directive that the FY 03 Defense Policy Guidance directed all of the services to establish a PBL for all new weapons systems acquisitions and to retrofit to all ACAT I and II fielded systems. The basic goal of PBL is to improve logistics to the warfighter while maintaining or reducing the cost for this support. As in the preceding sections addressing the software and hardware of the design, this PBL document focuses on “improving the total life cycle support and cost.”<sup>292</sup> Here again, we can see the Navy’s goal of not necessarily buying LCS “on the cheap” but striving to control costs as far as possible in advance of actually purchasing and then maintaining the class over its entire life-cycle.

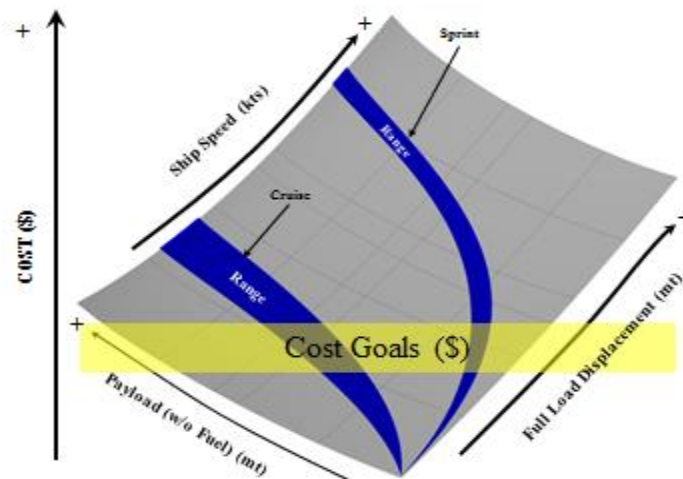
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<sup>290</sup> LCS Solicitation, N00024-03-R-2309, Sections J-10-3 & 4, dated 10 February 2003.

<sup>291</sup> LCS Solicitation, N00024-03-R-2309, Section J-11, dated 27 January 2003.

<sup>292</sup> Ibid, 1-2.

Attachment J-12 (see Figure 7 below) further hammered home the point about controlling costs. This serves to both emphasize the desired price controls but also the government's recog-



*Figure 9- Attachment J-12 Cost vs Performance* <sup>293</sup>

inition that the stated design goals would come with increased costs. The graphic represents this acceptance because it details the relationship between ship size and speed and the predicted cost of production. The short version is that the faster and therefore the larger the ship, then the higher the cost to produce it (and likely the higher the cost to design it as well). It may be an inference, but it is likely a good one that the intent is to reduce or manage as much as possible consistent with attaining minimum performance goals the expected cost per hull of the winning design.

<sup>293</sup> LCS Solicitation, N00024-03-R-2309, Section J-12, Untitled.

The remainder of the solicitation package is not immediately applicable to this analysis other than to serve as proof that certain acquisition requirements from the FAR and DFARS remain applicable regardless of the nature or size of the acquisition. While Section L-2 was relatively standard ‘boiler-plate’ FAR/DFARS on “Provisions Included in the Full Text” it also included several references to earlier acquisition documents that re-enforced the quest for cost control and flexibility in performance and/or construction standards.<sup>294</sup> The opportunity to provide updated or non-military standards for the LCS flight 0 design was provided through reference to a NAVSEA document empowering “ALTERNATIVES TO SPECIFICATIONS OR STANDARDS (NAVSEA) (AUG 1994).”<sup>295</sup> This paragraph allowed bidders to show how using or not using ‘old’ standards or specifications was “advantageous to the government” and provide how alternative, recommended newer or non-government (i.e. commercial) standards would satisfy the requirements as described in the solicitation. Again, the inference here is that the government wanted to save some money by enabling the commercial bidders to make their case(s) for alternative and hopefully cheaper solutions that would satisfy the requirements. The last paragraph of this attachment addressed another potential cost-saving measure through the use of Non-Developmental Items (NDI).<sup>296</sup> In short, if there is some piece of equipment or software already in service, for sale, or needing some minor modification(s) to satisfy the

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<sup>294</sup> LCS Solicitation, N00024-03-R-2309, Section L-2, “PROVISIONS INCORPORATED IN FULL TEXT.”

<sup>295</sup> Ibid, L-2-2.

<sup>296</sup> Ibid, L-2-5. The solicitation defines NDI as:

- (1) Any item of supply that is available in the commercial marketplace;
- (2) Any previously developed item of supply that is in use by a department or agency of the United States, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;
- (3) Any item of supply described in paragraph (1) or (2) that requires only minor modification in order to meet the requirements of the procuring agency; or
- (4) Any item of supply that is currently being produced that does not meet the requirements of paragraph (1), (2), or (3) solely because the item:
  - (i) Is not yet in use; or
  - (ii) is not yet available in the commercial marketplace.

requirement of a Research and Development (R&D) or conventional milspec item, then the bidder could recommend the substitution to the government. And rather than infer money savings as a goal, the Navy came right out and stated: “The intent of the NDI alternative is to provide the Navy with effective and economic solutions to its essential operational requirements.”<sup>297</sup> The solicitation package combines two hard to achieve but complimentary goals, design and build a system that performs as required and provides that performance at a bearable fiscal cost. The specific proposal response items and assessment criteria bear this out.

## THE RESPONSE REQUIREMENTS (AKA “THE PROPOSAL”) AND THE ASSESSMENT CRITERIA

In most cases of government RFPs and RFQs, the soliciting agency will spell out the specific response sections, to include permissible page lengths, that it wants from bidders. The government will also tell the bidders how their respective proposals will be evaluated. This held true in the LCS Flight 0 solicitation. The response section (Section L-3) laid out very clearly what responding offerors were required to submit in their proposals.<sup>298</sup> This was to be a Firm Fixed Price (FFP) award to the offeror who provided the “best value” to the government.<sup>299</sup> The vendors bidding on the LCS were directed to provide three volumes in their proposals to include a Technical Volume (I), a Price Evaluation Requirements Volume (II), and a Standard Form 33 (SF-33) Solicitation Set and Subcontracting Plan Volume (III). The below table (Table 4) shows that Volume I and certain required appendices had page limits while the other two volumes did not have a page limit.<sup>300</sup>

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<sup>297</sup> Ibid.

<sup>298</sup> LCS Solicitation, N00024-03-R-2309, Section L-3, “ADDITIONAL INSTRUCTIONS AND CONDITIONS AND NOTICES TO OFFERORS.”

<sup>299</sup> Ibid, L-3-1.

<sup>300</sup> Ibid, L-3-2.

VOLUME	TITLE	SECT –L PART	PAGE LIMIT	PAPER COPIES (ORIG PLUS COPIES)	DISKS
I	Technical	II	120	20	3
Appendix 1	General Arrangement Drawing Booklet and Releasable Artist Concept		6	20	Included on Technical Disk
Appendix 2	Weight Report		10	5	Included on Technical Disk
II	Price Evaluation Requirements	III	N/A	10	3
III	SF-33 Solicitation Set and Subcontracting Plan		N/A	2	3

*Table 3- Response Proposal Required Contents*

The Technical Volume requirements included a Management Factor with five sub-factors to be addressed by the bidding firms. These sub-factors included capabilities and qualifications (1.1), ability to meet CAIV targets (1.2), the bidders' management approach (1.3), and the bidder's data management approach (1.4), and the usual past performance (1.5).<sup>301</sup> The way these factors are articulated, their ordering, and their weighted value in the assessment evaluation are important because they reflect the Navy's striving to achieve the desired performance capabilities but to do so at an economically feasible cost. According to the Evaluation Factors for Award, the technical factor is more important than the pricing factor and the most important of the technical factors is the management one. It outweighs all of the others. In turn, factors 1.2

<sup>301</sup> Ibid, L-3-5 to L-3-10.



to 1.4 all outweigh 1.5 or past performance.<sup>302</sup> These factors and the evaluation criteria serve to highlight the Navy's focus on finding an offeror that is capable of producing a complex warship, hence the 'capabilities and qualifications' factor but can also adjust the cost by balancing it against the desired traits, thus the CAIV 'management' factor. The other technical sub-factors serve to describe the actual nuts and bolts of how the bidder will design and build the LCS but also how that bidder identifies and mitigates risks e.g. schedule slippages, cost overruns, software failures. In fact, though it has the least value in the assessment scoring, past performance is specifically retained to enable the Navy "to determine the offeror's performance risk."<sup>303</sup>

After management, the second of the important technical factors was technical approach itself. This included three major sub-factors, the preliminary design and systems analysis approach, the systems engineering approach, and the systems architecture development and implementation approach.<sup>304</sup> These factors also reflect the quest to balance cost with capabilities but also serve to highlight one of the consistently sought capabilities of the LCS from concept to commissioning; the idea of networked platforms and systems. Admittedly, the systems analysis and systems engineering is easily applied to the hardware associated with surface ships but the increasing ubiquity of computer controls, sensors, and the software to run them makes their application to electronics and software at least as important. This becomes especially true in the area of systems architecture development and implementation. The preliminary design and analysis was all geared towards creating a design capable of performing the specified mission

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<sup>302</sup> LCS Solicitation, N00024-03-R-2309, Section M, "EVALUATION FACTORS FOR AWARD," M-2.

<sup>303</sup> Ibid.

<sup>304</sup> LCS Solicitation, Section L-3, L-3-10 to 11.

areas and in accordance with the LCS CONOPS discussed earlier.<sup>305</sup> The technical approach was required to address the specifics of the Hull, Mechanical, and Engineering (HM&E) equipment, the mission packages, and the Human Systems Integration (program) that the bidder intended to apply.

## THE PRECEDENT

The request for bids that the government sent out was a very unique acquisition strategy for the Navy – because it was based on a set of performance specifications. The more traditional or standard way that the Navy had acquired ships, the FFG-7 or CG-47 classes for example, involved significant engineering and Research & Development (R&D) investments well before the first steel or aluminum was cut for the hull. The current DD-1000, formerly DD(X), involved expenditures of \$5-6 billion before the contract was awarded for construction.<sup>306</sup> Previous Navy ship acquisitions were not done using design specification style acquisition strategies. The strategies used for the FFG-7, DD-963, CG-47, LHD, and new CVN class ships all involved both significant R&D allocations before the solicitations for construction were sent out. They also included detailed design contracts where the Navy provided much of the design parameters, blue prints, and plans. The TICONDEROGA cruisers were an evolutionary design that used the hull form and engineering plant of the preceding SPRUANCE class. On top of these was mounted the Aegis combat system.<sup>307</sup> They also shared many of the sub-systems from the preceding destroyer class including the guns, torpedo tubes, and sonar sensors. The DDG 51 class used the weapons system from the cruisers and mounted it on a modified hull form. The engineering plant was also modified but again in an evolutionary vice revolutionary way; the

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<sup>305</sup> See pages 29-31 above.

<sup>306</sup> Telephone interview with Senior Navy Officer, 18 January 2017, 1400-1500 EST.

<sup>307</sup> Ibid.

main engines and auxiliary generators remained the same but the space layout and some of the control and auxiliary systems were changed or improved. The same is true in many ways of the current LHD/LHA class ships. The WASP and AMERICA class are a direct linear descendent of the first Landing Helicopter Assault (LHA) class, USS TARAWA and her sisters commissioned between 1976 and 1980. Their immediate predecessors were the IWO JIMA class of helicopter carriers (LPH) serving from 1961 to 2002. These ships are highly representative of the incremental design changes that the Navy applied to succeeding ship classes. The physical layout of the succeeding classes was changed but generally in a minor way when compared to preceding classes. The same was true of the engineering plants, where it was not until 2001 that USS MAKIN ISLAND (LHD 8) was laid down without a steam plant. Instead, the last ship of the WASP class was designed and outfitted with gas turbine engines. This design continuity clearly reflects the traditional Navy approach to ship design and construction. And the LCS acquisition was and is a decided break from this tradition.

Referring back to the previous chapter, the Navy had previously come to the bidders with a more detailed package formulated with the potential bidders more often than not.<sup>308</sup> Most of the material or engineering specifications are already determined; hence the famous of infamous “milspec” or military specification, and the remaining definitions are limited in scope. These were not the terms in which the LCS solicitation was couched. This RFP was not an “I do not know exactly what I want but I will know it when I see it!!” sort of request. It was however, a distinct departure from the process and methodology the U.S. Navy used to procure previous classes of ships.

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<sup>308</sup> See Figure 3, specifically the Technology Maturation & Risk Reduction Phase. See also Figure 4 for the Navy’s “Two Pass/Six Gate System,” notably the “Technology Development Phase” prior to releasing an RFP at Milestone B.

The basic thrust of the solicitation was for cheap, fast, and single mission capable platforms to be designed and delivered within rather stringent capability parameters. The overarching goal was affordability with speed (of the platform but to a lesser extent delivery) coming a very close second. Price was to be kept low (relatively) through limiting the platform hull size and through minimal manning. The minimal manning was in some ways the overriding factor for consideration because smaller ships require smaller crews and crews are often the most expensive operating cost for an individual ship or any other naval weapons system for that matter. The other crucial design variable that the bidders had to satisfy was the speed of the ship. As discussed earlier, the engineering plant required to drive a hull at 40 knots would become the overriding technical factor in designing the LCS and in crewing the ship. In some ways, the LCS parallels the A-10 Thunderbolt II (more commonly referred to as the "Warthog") which has been described as an airplane designed around a gun. Similarly, the LCS class could be described as a propulsion plant around which was constructed a ship. The government's solicitation was clear if not precise regarding the desired performance parameters to include managing costs, making the ship go fast, and providing the platform to carry the desired capabilities. The following chapter will show that the Navy got what it asked for but did not and does not like it.

## CHAPTER 4

### THE ROAD TO INITIAL OPERATIONAL CAPABILITY

This chapter will delineate the path from solicitation to fleet introduction of the LCS. It will in effect show how the Navy has taken a concept and made it a reality.<sup>309</sup> How much of a reality is an on-going debate which this chapter will also serve to highlight to the reader. The first section looks at the timeframe from contract award to ship launch. The second portion describes and examines the propulsion plant problems and casualties that the class, regardless of hull type has faced and what has been done to improve the performance and reliability of the engineering plant to date (April 2017). It will also provide context to these propulsion engineering challenges through some significant historical examples of other Navy ship class acquisitions. Some of these examples are recent and some are more dated but as in the earlier cited episode of the Swedish ship VASA, marine engineering and naval architecture tend to present particularly difficult technical problems. The final section of this chapter will describe the development and testing accomplishments to date with the mission packages. It is also intended to highlight just how hard it is to design these systems because of space and weight limitations and the required system capabilities. The final section will start to bridge the transition from technical to organizational challenges and the theory of organizational behavior.

### THE LCS PROGRAM – AFTER MILESTONE A

The release of the solicitation for LCS design and build proposals marked Milestone A for this program. And again, turning back to the previous chapter, we need to remember the

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<sup>309</sup> Note: The author is studiously avoiding the term “operationalize” which is just not a verb.

“flexibility inherent in the system” for ship building programs where production decisions are sometimes made before the Technology Development Phase and Integrated System Design are completed.<sup>310</sup>

“Shipbuilding programs may be initiated at milestone A in order to start ship design concurrent with sub-system and component TD.”<sup>311</sup>

The contracts were awarded to two bidders. One was a partnership between Lockheed Martine and Fincantieri (in the form of the Marinette Shipyard in Marinette, Wisconsin) and a team of General Dynamic Information Technology (GDIT) and Austal Shipbuilding, a joint company formed by the Australian firm Austal and the U.S. firm Bender Shipbuilding and Repair Company, that operates a shipyard in Mobile, Alabama. The awards were made on 27 May 2004.<sup>312</sup> USS FREEDOM (LCS 1) was delivered to the Navy and commissioned into service on 08 November 2008. USS INDEPENDENCE (LCS 2) was commissioned in January 2010. Both ships have made extended deployments to the Pacific region since commissioning, FREEDOM in 2013 and INDEPENDENCE in 2014. The road to IOC has not however been a smooth one for either variant of the LCS.<sup>313</sup> Figure 10 shows the difference in appearance and to a degree design between the two variants.

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<sup>310</sup> See preceding Chapter 2, “Flexibility in Acquisition,” 58.

<sup>311</sup> SECNAVINST 5000.2E, “Department of the Navy Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System,” Office of the Secretary of the Navy, Washington, DC, 1 September 2011, 1-28.

<sup>312</sup> Ronald O'Rourke, “Navy Littoral Combat Ship (LCS)/Frigate Program: Background and Issues for Congress,” (Washington, DC: Congressional Research Service, 05 January 2016), 3.

<sup>313</sup> IOC as defined by DAU: “In general, attained when selected units and/or organizations in the force structure scheduled to receive a new system have received it and have the ability to employ and maintain it. The specifics for any particular system IOC are defined in that system’s Capability Development Document (CDD) and Capability Production Document (CPD).” Available online at: <https://dap.dau.mil/glossary/pages/2048.aspx>. Accessed 24 January 2017, 0853 EST. The LCS 1, a more traditional single-hulled platform is the product of the Marinette/Lockheed Martin team. The trimaran hull iteration is the Austal version.



*Figure 10- LCS 1 (top) and LCS 2* <sup>314</sup>

## ENGINEERING CHALLENGES

The LCS class, whether built by Marinette or Austal employed a revolutionary, for naval ships, propulsion system. In order to reach the desired 40 knot top speed, the only viable alternative for a ship of roughly 3300 to 3500 tons (LCS 2 and LCS 1 versions respectively)<sup>315</sup> was to use water jets vice the more traditional propeller system.<sup>316</sup> There has been a constant challenge in marine engineering to translate the rapid rotation of high speed turbines into lower rate rotations that ships' screws or propellers can use to develop thrust and move the hull through the water. Higher speed or higher Rotation per Minute (RPM) turbines are more efficient in turning thermal energy from steam boilers or fuel-air combustion in gas turbine generators like the LM2500 series engines into mechanical energy for propulsion. However, these high RMPs

<sup>314</sup> U.S. Navy photo. Available online at: [http://www.navy.mil/view\\_image.asp?id=93659](http://www.navy.mil/view_image.asp?id=93659). Accessed 24 January 2017, 1248 EST.

<sup>315</sup> Displacements listed on the U.S. Navy Littoral Combat Ship Fact File web-page. Available online at: [http://www.navy.mil/navydata/fact\\_display.asp?cid=4200&tid=1650&ct=4](http://www.navy.mil/navydata/fact_display.asp?cid=4200&tid=1650&ct=4). Accessed 24 January 2017, 1257 EST.

<sup>316</sup> Telephone interview w/ Senior Navy Officer, 18 January 2017, 1400-1500 EST.

are often too high for large diameter shafts and screws to effectively and efficiently turn into mechanical thrust for moving hulls. Navies around the world have used reduction gears since the introduction of turbines for propulsion to translate higher RPMs into usable propeller rotations for warships. Reduction gears are generally bulky and heavy sets of machined gears and pinions that take up a lot of space and generally increase the displacement of a ship by several tons. The propulsion system installed in the LCS class has eliminated the need for reduction gears but still requires the conversion of mechanical energy into usable thrust. The use of water jets, akin to air-breathing jet engines in that the rotation, compression, and expulsion of a medium (liquid water vice vaporous air in this case), creates thrust has made reduction gears unnecessary. This new water jet propulsion system while removing the requirement for reduction gears has however suffered from teething problems since the launch of the LCS hulls. In 2010 one of four Rolls-Royce water jet propulsion units was replaced and in 2012 a shaft seal failed, which also required replacement.<sup>317</sup> This level of mechanical reliability is not unusual for new marine propulsion systems, but it has made the LCS class an easy target for its critics. Despite numerous critics and critiques however, the LCS class has been deploying to the western Pacific since 2013.

## FIRST DEPLOYMENT

USS FREEDOM (LCS 1) deployed to the Western Pacific centering on Singapore in March 2013. The first leg of the trip was marred by power losses that forced the ship to stop over for a more extended stay in Guam than had been planned.<sup>318</sup> In April 2013, while in port Singapore, sea water intrusion contaminated the lubricating oil system reportedly in the main

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<sup>317</sup> Sam Fellman, "Lube oil system problems sideline LCS 1 in Singapore," *Navytimes.com*, 30 April 2013.

<sup>318</sup> Michael Fabey, "U.S. Navy Works Through Freedom Diesel Generator 'Deficiency'", *Aerospace Daily & Defense Report*, 30 July 2013.



reduction gears but more likely in the shaft bearings for the main propeller shaft(s).<sup>319</sup> On 21 May 2013, FREEDOM's engineering watchstanders found sediment in the ship's lubricating system forcing the ship to return to the Changi Naval Base.<sup>320</sup> Whether this was organic matter, metallic 'chips' carved from the machinery itself, or other foreign matter in the oil is unclear but based on the fact that the ship got back underway shortly after this casualty, it was likely just dirt or some other non-metallic 'bits' in the lube oil. Then on 20 July 2013, while participating in an exercise with several other navies, including that of the Republic of Singapore, FREEDOM suffered a main propulsion engineering casualty that forced her to return to port.<sup>321</sup> The ship had been preparing for a vertical replenishment at sea and these sorts of events usually require all of the ship's propulsion and engineering systems to be up and running.<sup>322</sup> The return to port while undoubtedly caused by the engineering casualty was a reasonable and standard safety measure under the circumstances.<sup>323</sup> The ship returned to Changi Naval Base and an initial assessment identified exhaust leaks in turbochargers for the ship's diesel generators that caused one generator to overheat and shut down. There were also reportedly problems with electrical load-

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<sup>319</sup> Kevin Baron, "USS Freedom breaks down, but not going down," *E-Ring.foreignpolicy.com*. Available online at: [http://e-ring.foreignpolicy.com/posts/2013/04/29/uss\\_freedom\\_breaks\\_down\\_but\\_not\\_going\\_down](http://e-ring.foreignpolicy.com/posts/2013/04/29/uss_freedom_breaks_down_but_not_going_down). Accessed on 09 January 2017, 0937 EST.

<sup>320</sup> Christopher P. Cavas, "Engine problem forces LCS Freedom back to port," *Defensenews.com*, 22 May 2013.

<sup>321</sup> David Lerman, "Navy Littoral Combat Ship Needs More Scrutiny, House Panel Says," *Bloomberg.gov*, 25 Jul 2013. Available online at: <https://www.bloomberg.com/news/articles/2013-07-25/house-panel-seeks-more-oversight-of-littoral-combat-ship>. Accessed on 09 January 2017, 0927 EST.

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<sup>322</sup> A vertical replenishment at sea involves a helicopter carrying a load of cargo in a net or nets slung underneath the aircraft. The helicopter approaches this ship, hovers over the landing deck, and lowers the net(s) containing the cargo to the deck. Once the net(s) and sling cable(s) are grounded (removing the large static electricity charge generated by the helicopter's rotary wings), the net is unhooked from the cable, the helicopter departs, and the cargo boxes and crates are moved to storage by the ship's crew.

<sup>323</sup> For shipboard evolutions where the loss of propulsion could result in collisions or groundings, like a helicopter lowering supplies to the ship (vertical replenishment) or navigating in a shallow, confined channel, ships usually set an engineering condition called "Restricted Maneuvering." The engineering systems required to be on-line during restricted maneuvering are determined by the Chief Engineer and the ship's Commanding Officer and are listed in a document under the CO's signature entitled "Restricted Maneuvering Doctrine" and have the force of a lawful order. In restricted maneuvering situations, normal casualty response procedures are adjusted in an effort to maintain propulsion sufficient for the ship to increase the distance between it and any hazards. Once 'safe' the engineers will effect casualty control procedures intended to avoid mechanical or electrical damage to the propulsion machinery.

shedding between online generators, which is the process of prioritizing and shutting down (or shedding) non-essential systems.<sup>324</sup> In October, the ship's crew discovered sea water contamination in the starboard steerable water jet hydraulic system.<sup>325</sup> This was followed by another minor engineering casualty in November when a steering indicator for the port steerable water jet was found to be operating incorrectly during pre-underway steering checks.<sup>326</sup> The system itself was working fine but the position repeater on the bridge, potentially providing steering information to both the helmsman and to the Officer of the Deck (OOD),<sup>327</sup> was not indicating the jet's position correctly. This was reportedly due to a damaged feedback cable in the system. This first deployment served to highlight many of the predicted and some of the not-so-predicted engineering challenges associated with the LCS class.

Despite these engineering challenges, FREEDOM did exercise at sea with other U.S., coalition, and partner nation ships. This included Cooperation Afloat Readiness and Training (CARAT) exercise programs with naval units from Thailand, Indonesia, Malaysia, Singapore, Bangladesh, Brunei, Cambodia, the Philippines and Timor-Leste. While some might consider CARAT exercises as rather simplistic events including basic seamanship, navigation, and ship-handling events, they are prime venues for U.S. Navy units to show their skills in the skills that are crucial to professional mariners. They also serve as opportunities to operate with current and potential allies, gauge these same navies' skills, and to develop professional and personal relationships with these same current and potential allies at the individual level. FREEDOM

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<sup>324</sup> Matthew M. Burke, "USS Freedom back in action after sidelined by maintenance issues," *Stars and Stripes*, 26 July 2013. Available online at: <http://www.stripes.com/news/pacific/uss-freedom-back-in-action-after-sidelined-by-maintenance-issues-1.232291>.

<sup>325</sup> Christopher P. Cavas, "LCS Freedom sidelined in port again," *Defensenews.com*, 25 October 2013.

<sup>326</sup> Christopher P. Cavas, "Steering Problem Keeps LCS Freedom in Port," *Defensenews.com*, 10 November 2013.

<sup>327</sup> On U.S. Navy ships the helmsman is the person who physically steers the ship, generally by turning the ship's wheel as in a car while the OOD is responsible for the safe navigation and general operation of the ship underway. The OOD is often also the Conning Officer who tells the helmsman in which direction to steer the ship.

also participated in the Southeast Asia Cooperation and Training (SEACAT) exercise program in September 2013 and made several port calls during her deployment. Besides these training and Theater Security Cooperation Plan (TSCP) events, the first LCS class ship to deploy also conducted real-world operations, specifically providing Foreign Humanitarian Assistance by delivering supplies to the armed forces of the Republic of the Philippines after Typhoon Haiyan<sup>328</sup> as part of Operation DAMAYAN.<sup>329</sup> FREEDOM also conducted passing exercises (PASEX) with two Brunei and one Bangladeshi naval unit.<sup>330</sup> In another key for the ship class, FREEDOM swapped crews in Singapore, completing the turnover on 06 August 2013.<sup>331</sup> This was one of the key entering arguments in the concept of LCS, the ability to rotate crews bringing in new fresh sailors when embarked crews were worn down by the long hours of work and watchstanding. The Navy, at least in the form of the Surface Force Commander, Vice Admiral Copeman considered the ten-month deployment by FREEDOM and her two embarked crews a success:

“USS Freedom’s (LCS 1) maiden 10-month deployment validated the Navy’s overall concept of operations and provided us with valuable feedback on its operation, manning, and logistics. The insights gained on the deployment will be used to further improve the operational flexibility, maintainability and efficiency on future deployments for this newest class of ship in the U.S. Navy.”<sup>332</sup>

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<sup>328</sup> GAO report 14-447, “LITTORAL COMBAT SHIP: Deployment of USS Freedom Revealed Risks in Implementing Operational Concepts and Uncertain Costs,” July 2014, 9.

<sup>329</sup> Commander, Logistics Group Western Pacific Public Affairs, “USS Freedom (LCS 1) Delivers HA/DR Supplies to Tacloban, Philippines,” U.S. Navy Press Release, 25 November 2013. Available online at: [http://www.navy.mil/submit/display.asp?story\\_id=77877](http://www.navy.mil/submit/display.asp?story_id=77877). Accessed 27 February 2017, 1338 EST.

<sup>330</sup> U.S. 7th Fleet Public Affairs, “Freedom Departs U.S. 7th Fleet on Asia-Pacific Deployment,” story number: NNS131209-13, Release Date: 12/9/2013 4:17:00 PM. Available online at: [http://www.navy.mil/submit/display.asp?story\\_id=78143](http://www.navy.mil/submit/display.asp?story_id=78143). Accessed 27 February 2017, 1343 EST.

<sup>331</sup> Mark D. Faram, “LCS Freedom completes first crew swap,” *Navy Times*, 06 August 2013.

<sup>332</sup> VADM Tom Copeman, “USS Freedom Deployment A Success,” *Navy Live: The Official Blog of the U.S. Navy*, 06 Jan 2014. Available online at: <http://navylive.dodlive.mil/2014/01/06/uss-freedom-deployment-a-success/>.

For all of the bad publicity aimed at USS FREEDOM, this was a success considering the miles steamed to get in and out of the Seventh Fleet area of operations and the specific mission and tasks completed by the ship's crews during the ten months spent away from homeport. It was not an unqualified success, but it did serve to provide "valuable feedback" to the Navy on this "newest class of ship[s]" and to support the theater engagement plans of the Combatant Commander, U.S. Pacific Command.

## THE LINGERING ENGINEERING CHALLENGES

While the first LCS deployment was underway, USS INDEPENDENCE (LCS 2) was experiencing propulsion challenges as well. Getting underway from Naval Station San Diego on 21 June 2013, she experienced a sea water cooling casualty that forced the shut-down of her main propulsion gas turbine engines.<sup>333</sup> There have reportedly also been problems with the INDEPENDENCE variant's power generation equipment and propulsion drive-train components.<sup>334</sup>

The Navy has both acknowledged the problems and stated that fixes had been identified: "The SSDGs," says Navy Undersecretary Sean Stackley, are "probably the most significant design deficiency we're dealing with today. We do have reliability issues that we have identified. We have fixes in place on the follow ships. As LCS-1 continues its deployment, we'll be incorporating those fixes on LCS-1 to address that issue."<sup>335</sup> One of the major problems was that the diesels were supposed to run for 850 hours until a failure occurred but the LCS ships were

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<sup>333</sup> Michael Fabey, "Second Littoral Combat Ship Gets Back Under Way After Problem," *Aviation Week Intelligence Network*, 25 Jun 2013, [www.awin.aviationweek.com](http://www.awin.aviationweek.com).

<sup>334</sup> Tony Capaccio, "Navy Littoral Ship Reliability in Doubt, Tester Says," *Bloomberg.com*, 16 January 2014. Available online at: <https://www.bloomberg.com/news/articles/2014-01-16/pentagon-said-to-order-cutting-littoral-ships-by-20>. Accessed 24 January 2014, 1440 EST.

<sup>335</sup> Fabey, "Freedom Diesel Generator 'Deficiency.'"

only getting 400 hours between failures.<sup>336</sup> There were also some design issues with the cooling system, maybe the diameter or geometry of the piping was not allowing sufficient cooling water flow to maintain the needed temperatures. There is also a reported problem with the governors on the diesel engines that maintain the number of piston strokes required to support a given electrical load on the generators. All of this is not surprising nor was it unexpected by the Navy. To quote a senior naval officer “The five things that I briefed [to more senior Navy officers and leaders] were going to break. They broke.”<sup>337</sup>

The Navy undertook several initiatives to address the LCS class engineering challenges including a flag officer level council, an engineering program review, and hiring more engineers to oversee new ship construction. The LCS Council was established by the CNO in August 2012 with a charter to “rapidly and decisively resolve impediments to the LCS program’s success.”<sup>338</sup> The members were all 3-staff flag officers including the Director, Navy Staff; the Principal Military Deputy to the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN(RDA)); the Commander, Naval Sea Systems Command (NAVSEA); and the Commander, Naval Surface Force, U.S. Pacific Fleet (CNSP).<sup>339</sup> The seniority and composition of this council reflects the importance with which the CNO views the success of the LCS program in general, and the program’s engineering success in particular. The engineering

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<sup>336</sup> Ibid.

<sup>337</sup> Telephone interview with senior naval officer, 18 Jan 2017.

<sup>338</sup> Department of the Navy, Chief of Naval Operations, “Littoral Combat Ship Council Charter,” Sep 2012.

<sup>339</sup> The Director of the Navy Staff functions as the operational and administrative leader for the personnel assigned to the Office of the CNO (OPNAV). Commander of NAVSEA is the lead systems engineer for the surface and subsurface systems that the Navy buys, operates and maintains. The Principle Military Deputy to ASN (RDA) is working directly for and with the Navy’s chief acquisition officers. CNSP serves as the lead type commander (TYCOM) for the Navy’s entire surface force thus the additional title of Commander Naval Surface Force (SURFOR); in essence he owns all of the Navy’s surface ships until and after they are deployed to a Geographic Combatant Commander’s Area of Responsibility (AOR). Even then, he has administrative control (ADCON) duties as a subordinate of the CNO, to provide certain levels of maintenance and material support to deployed surface units.

program review is being supervised by Naval Sea Systems Command (NAVSEA) and includes reviewing both design and operational data.<sup>340</sup> This review is intended to identify both material and systemic defects or potential defects before they become actual failures or breakdowns. The Navy has also invested significant time and resources into providing and improving the engineering training that LCS crews receive. The training contract awarded to Cubic Systems to develop courseware material includes the curriculum, teaching materials, individual class guides, and the software to use in the virtual ship facility out in San Diego, CA.<sup>341</sup> Not only have new training facilities been brought online but the training curriculum and personnel rotations have been revised to strengthen individual and crew training.<sup>342</sup> And finally the Navy awarded a contract (N00024-14-C-4313) to General Dynamics, Bath Iron Works, Bath, Maine to provide planning yard services in support of both variants of in-service Littoral Combat Ships.<sup>343</sup> The idea behind a planning yard is that the contractor (or public shipyard) serves as a central manager for engineering, planning, ship configuration, material and logistics support to maintain and modernize a given class of ships. Despite strident claims to the contrary, the Navy has not ignored the engineering casualties and perceived short-falls suffered by the LCS class. However,

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<sup>340</sup> Marc Selinger, "Navy Nears Design Fix For Some Littoral Combat Ships," *Defense Daily*, 08 Dec 2016. Available online at: <http://www.defensedaily.com/navy-nears-design-fix-for-some-littoral-combat-ships/>. See also Marc Selinger, "NAVSEA Conducting 'Engineering Review' Of Littoral Combat Ship," *Defense Daily*, 03 Nov 2016. Available online at: <http://www.defensedaily.com/navsea-conducting-engineering-review-of-littoral-combat-ship/>.

<sup>341</sup> Megan Eckstein, "PEO LCS To Release Class Maintenance RFPs Soon As Fleet Intro Begins," *Inside the Navy*, 22 Feb 2013. Available online at: <https://defensenewsstand.com/topic/ships-&-submarines?page=18>. Valerie Insinna, "LCS Training Strategy Mixes Education and Video Games," *National Defense Magazine*, December 2013. Available online at: <http://www.nationaldefensemagazine.org/archive/2013/December/Pages/LCSTrainingStrategyMixesEducationandVideoGames.aspx>.

<sup>342</sup> David Larter, "LCS crew is stuck in Singapore for the holidays," *Navy Times*, 16 Dec 2016. Available online at: <https://www.navytimes.com/articles/lcs-crew-is-stuck-in-singapore-for-the-holidays>.

<sup>343</sup> Associated Press, "Navy awards \$100M contract to Maine shipyard," 26 Aug 2014. Available online at: <http://www.greenbaypressgazette.com/story/money/2014/08/26/navy-awards-m-contract-maine-shipyard/14655089/>.

none of the solutions are going to be rapid panaceas and it will take some time to fix the problems with the LCS engineering plant.

## PREVIOUS ENGINEERING CHALLENGES

The LCS class of ships were not the first ones that the U.S. Navy commissioned employing electrical propulsion plants. In the early years of the Twentieth century, a collier, USS JUPITER was outfitted with a turboelectric drive. This drive used boiler produced steam to run a turbine generator that powered a motor directly connected to a propeller.<sup>344</sup> The main alternative was using reduction gears to reduce the high rotations per minute (RPM) of steam turbines mechanically to a more efficient, lower RPM to drive the propellers. The test-bed was sufficiently successful that the Navy chose to install a turboelectric propulsion system in USS NEW MEXICO (BB 40). In fact, the system was deemed so successful that the next fourteen battleships laid down by the Navy used it for their main propulsion.<sup>345</sup> There were some challenges associated with this first electric propulsion system notably weight and volume. Also, it became obvious after the fact that the hatchways on the battleships were not large enough to allow the generators to be removed without cutting out larger accesses.<sup>346</sup> This turboelectric system was obviously not the same type of propulsion plant as has been fitted on the LCS class. It was however, as groundbreaking in its time as the hydro jet system installed in LCS. The biggest difference is that the turboelectric system was tested on a naval platform while hydro jets had been used commercially and successfully. This is only part of the story because the LCS

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<sup>344</sup> Norman Friedman, *U.S. Battleships: An Illustrated Design History* (Annapolis, MD: U.S. Naval Institute Press, 1987), 125.

<sup>345</sup> *Ibid*, 126.

<sup>346</sup> *Ibid*, 127.

propulsion system is required to push ships upwards of 40 knots while the battleships required a top speed of 21 to 22 knots.

Another new class of ships, the NORTH CAROLINA battleships had a significant propulsion related issue that delayed their operational employment in the Second World War. While both ships had been commissioned by the summer of 1941, neither had been able to achieve their maximum power trials because of excessive longitudinal vibration.<sup>347</sup> A series of fixes using different propellers and more structural bracing topside were tried but the problems persisted until at least 1943.<sup>348</sup> These problems had in fact delayed the deployment of both NORTH CAROLINA and her sister-ship WASHINGTON to the Solomons Island campaign in the Pacific.

While not intending to be an apologist for or fan of the ships, the author would be remiss if he did not point out that these sorts of engineering problems are neither unique to LCS nor uncommon in the U.S. Navy's surface force. The fact that the reader ought to bear in mind is that naval engines, of whatever type, are intended to drive large hulls through the water at relatively high speeds. This puts a lot of stress and strain on warships' engineering plants and thus leads to periodic failures through high pressures, corrosion, and high temperatures. Some of the casualties onboard FREEDOM were design faults but at least as many were due to running the engineering plant up to its designed limits, for extended periods of time. And ultimately regardless of the reliability issues, the U.S. Navy got the speed and displacement that they wanted.

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<sup>347</sup> Ibid, 275.

<sup>348</sup> Ibid, 275-76.



The SPRUANCE class destroyers which were commissioned into the fleet beginning in 1975 also suffered from perception issues early on in their introduction to the fleet. They were criticized for being too big compared to the visible armament of two five-inch guns and one Anti-Submarine Rocket Thrown Torpedo (ASROC) launcher.<sup>349</sup> What most critics did not comment on was the design that allowed for expansion and installation of new systems and weapons once they were available.<sup>350</sup> Throughout the life-span of the class the weapons systems, especially for surface and strike warfare were updated with new missiles, launchers, electronic warfare and cryptographic systems.<sup>351</sup> They also failed to realize that the new engineering plant while not hugely more efficient in terms of fuel consumption was more efficient and more importantly was infinitely more flexible in terms of starting and acceleration when compared with the high pressure steam systems installed in previous USN destroyers and cruisers.<sup>352</sup> It also incorporated a sound reduction system with systems that generated bubbles which masked the noise from the engineering spaces (called “Masker”) and one that generated air bubbles along the edge of the propellers, reducing noise created by cavitation (called “Prairie”). This made the SPRUANCE class significantly quieter than preceding classes which in turn made them much

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<sup>349</sup> Robert D. Holzer, “Birthing Ships is Never Easy; Give LCS A Break,” *Breakingdefense.com*, 07 June 2013. Available online at: <http://breakingdefense.com/2013/06/birthing-ships-is-never-easy-give-lcs-a-break/>. See also, Michael C. Potter, *Electronic Greyhounds: The Spruance-Class Destroyers* (Annapolis, MD: Naval Institute Press, 1995), 83-91.

<sup>350</sup> Potter, *Electronic Greyhounds*, 76, 91.

<sup>351</sup> *Ibid*, 123-126, 128-129, 130-139, 144.

<sup>352</sup> Based on the author’s at sea service on two steam powered and one gas turbine powered ship, the difference in ‘light off’ (actually starting the engines) requirements was immense. On a steam ship, the boilers were lit off at least 24 hours before the ship was scheduled to get underway, the main engines were warmed up using the high-pressure steam from the boilers starting roughly four to six hours before underway, and once warm the main engines had to be run forward and backward constantly until the ship actually started to maneuver away from the mooring. The constant spinning of the mains was required to avoid bowing the rotors from excessive heating on one side. In comparison, given roughly one or two hours of warming up the lubricating oil for the engines and within about 15-20 minutes of the gas turbine engines starting, a gas turbine ship was ready to answer all bells.

more effective anti-submarine (ASW) platforms than their predecessors from both a sensor effectiveness and counter-detection perspective.<sup>353</sup>

The same sorts of criticism greeting the introduction of the OLIVER HAZARD PERRY (FFG 7) class frigates and the TICONDEROGA (CG 47) class of cruisers. In the case of the FFG 7 class, the then General Accounting Office issues a report in January 1979 that addressed several perceived short-comings in the class. GAO stated that the FFG 7 “program has been characterized by significant cost growth, schedule delays, shipbuilding claims, and deficiencies in the performance of naval ships.”<sup>354</sup> This statement sounds like it could be a summary for the LCS program, thirty years later. The GAO director went on to note that in order to build the number of hulls required by the Navy, significant design controls were exerted on the size and cost of the class. This equated to sacrificing systems and capabilities in order to get a certain number of hulls.<sup>355</sup> In yet another comment that echoes the criticism of LCS was the issue of ship survivability. The FFG 7 in general was susceptible to splinter damage from topside explosions, shock induced damage from hits and near misses, and had inadequate protection against chemical and biological hazards.<sup>356</sup> In the case of the TICONDEROGA class, there were significant and voluminous complaints or concerns regarding how top-heavy and unstable the ships were because of the radar panels being mounted so high up on the superstructure.<sup>357</sup> Dipping further back into U.S. warship design history we can find even more examples where new classes of ships were derided by the experts. The first series of heavy cruisers built under

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<sup>353</sup> Potter, *Electronic Greyhounds*, 44, 72, 76, 91, 99-103, 146, 149, 154, 160.

<sup>354</sup> Statement of Jerome H. Stolarow, Director, Procurement and Systems Acquisition Division before the Subcommittee on Priorities and Economy in Government Joint Economic Committee on The Navy’s FFG-7 Class Frigate Shipbuilding Program, and Other Ship Program Issues, 03 January 1979, 1.

<sup>355</sup> *Ibid*, 7.

<sup>356</sup> *Ibid*, 13.

<sup>357</sup> Holzer, “Birthing Ships,” *defense.com*.

the strictures of the 1922 Washington Treaty were generally underweight, meaning that displacement that could have been used for improved machinery, weapons and/or survivability went unutilized.<sup>358</sup> It also meant that the stability and sea keeping of the ships was less than optimal, according to a contemporary Royal Navy observer there was a short and deep roll on these ships that gave “a sharp violent motion to the ship in any sort of a sea in a way which [was] very disconcerting to gun pointers and naturally reduces the accuracy of their fire.”<sup>359</sup> While the first tranche of ships built for the U.S. Navy were adequate as proven by their wartime service they were still called “tinclads” and “eggshells armed with hammers” by contemporary writers. The second series of cruisers designed and built starting in the late 1920s were better positioned to take advantage of the un-used weight that their predecessors revealed and were thus much better protected with armor. However, the treaty limitations adopted as a result of the Washington and London (1930) treaties meant that the Navy had only 10,000 tons of displacement to work with a speed requirement dictated by the cruiser’s intended missions. Again, as with the LCS, the Navy had to make difficult decisions and ultimately sacrificed increased protection for the required speed.<sup>360</sup>

These historical examples are not provided as some sort of apologia for the challenges faced by the LCS class. They are however presented as evidence that designing and building ships, including the various engineering and weapons systems they carry, is not a simple or easy process. As noted in a preceding chapter, at least one masterpiece of the naval architect’s art capsized and sank before its maiden voyage.<sup>361</sup> The real point made in this section is that new

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<sup>358</sup> Norman Friedman, *U.S. Cruisers: An Illustrated Design History* (Annapolis, MD: Naval Institute Press, 1984), 130.

<sup>359</sup> *Ibid.*

<sup>360</sup> *Ibid.*, 143.

<sup>361</sup> See Chapter 2, p. 60 for the account of VASA and the importance of stability in ships.

classes of U.S. Navy ships, from battleships, to cruisers, destroyers, and LCS have all met with less than enthusiastic welcomes from pundits and have almost invariably suffered from some sort of design failure that required rectification. Most, if not all, were ultimately ‘fixed’ and the ships provided good service both in peace and war to the U.S. Navy.

## THE MISSION PACKAGES

While engineering challenges remain a concern, the lack of fully functioning mission packages is a critical short-coming for a warship. There have been incremental testing and development steps completed in the mission module design and implementation since the arrival of the first LCS hull in 2008 but critics and champions alike, agree that the mission modules have lagged behind the platforms since the start. As in the preceding section, the LCS like most other new ship classes has and is receiving criticism because of its weapons or lack thereof. One ought to bear in mind however, that preceding classes notably the SPRUANCE destroyer, received significant upgrades and installations of new weapons and sensors throughout the class’s service life. The lag between the development of the sea frames and the mission packages remains one of the key criticisms levelled at the LCS program and has some validity. At congressional hearings in April 2016 the Navy laid out the road map to fielding the mission packages (MP):

“The LCS Mission Modules program continues to field capability incrementally as individual mission systems become available in order to fill these critical warfighting gaps. The SUW MPs are being introduced in three phases, providing capability to address Fast Attack Craft and Fast Inshore Attack Craft in the littorals and maritime security and escort roles previously assigned to Oliver Hazard Perry class Frigates and Cyclone class patrol ships. MCM MPs are being fielded in four phases delivering capability to address maritime mines and to replace legacy Avenger class Mine Countermeasures ships and MH-53E Sea Dragon helicopters that are nearing the end of service life. The ASW MPs will be delivered in a single

phase and provide counter-submarine capability in littoral and deep water environments, High Value Unit (HVV) ASW escort and barrier patrol capability.”<sup>362</sup>

The mission modules (and entire LCS program) was slated for a Milestone B review in the summer of 2012 but this was pushed back to late spring of 2013.<sup>363</sup> The Continuing Resolution (CR) which the DoD labored under in 2013 was potentially pushing the IOC of several mission modules to the right, with the most impact on the mine countermeasures package.<sup>364</sup> There was some good news regarding this package as the Knifefish unmanned underwater vehicle (UUV) completed an important design review in April 2013.<sup>365</sup> And the Navy was hopeful of completing a ‘full dress rehearsal’ with the existing mine warfare package in the summer of 2014.<sup>366</sup>

For the (anti-) surface warfare package (ASuW) the cancellation of the Army’s non-line-of-site missile in 2009 while not crippling, significantly disrupted the delivery of a fully capable ASuW mission package. The Navy had intended to experiment with applying the Griffen missile<sup>367</sup> as a stop-gap but instead turned to the Longbow Hellfire, originally developed as an

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<sup>362</sup> Statement of the Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition) and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources and Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command, Before the Subcommittee on Seapower of the Senate Armed Services Committee on Department of the Navy Shipbuilding Programs, April 6, 2016, 16-17.

<sup>363</sup> Jason Sherman, “Navy Plans ‘Late Spring’ Target To Review, Set Cost For LCS Mission Module Acquisition,” *Inside Defense.com*, 19 March 2013. Available online at: <https://defensenewsstand.com/topic/ships-%26-submarines?page=17>. Mike McCarthy, “LCS Mine Hunting Package Slipping, Navy Officials Say,” *Defense Daily.com*, 9 May 2013. Available online at: <http://www.defensedaily.com/lcsmine-hunting-package-slipping-navy-officials-say/>.

<sup>364</sup> Megan Eckstein, “Extra sailors a big help in Freedom deployment LCS Mission Packages May See Delay In IOC Because Of CR Restrictions,” *Inside the Navy/Inside Defense.com*, 15 March 2013. Available online at: <https://defensenewsstand.com/topic/ships-%26-submarines?page=17>.

<sup>365</sup> Christopher P. Cavas, “LCS Progress: Program Matures, But Some Systems Lag,” *www.navytimes.com*, 3 June 2013.

<sup>366</sup> *Ibid.*

<sup>367</sup> *Ibid.* See also Michael Fabey, “New Mission Packages Eyed For LCS,” *Aviation Week*, 26 June 2013. Available on-line at: <http://aviationweek.com/blog/navweek-return-lcs-past>.

anti-tank weapon for the Apache Longbow helicopter.<sup>368</sup> USS FORT WORTH completed a successful test of the second phase of the ASuW package development process in October 2013.<sup>369</sup> More recently, there has been a concerted effort on the part of the Navy to provide the LCS with a surface-to-surface missile (SSM) over the short term. In July of 2016 USS CORONADO (LCS 4) successfully launched a Harpoon SSM and she had already successfully launched a Kongsberg SSM in 2014.<sup>370</sup> There was also a test-firing of Hellfire missiles from USS MILWAUKEE (LCS 7) in February 2017 off the Virginia coast.<sup>371</sup> These are all however just temporary fixes for the required capability of engaging hostile surface targets, preferably at long range, that the LCS class has. In order to address this short-fall, Navy recently released a draft RFP and a formal solicitation for an over-the-horizon weapons system (OTH WS).<sup>372</sup> Unfortunately the specifics of the desired weapon system are enclosed in a classified Top Level Requirements Document (TLRD)<sup>373</sup> but we can surmise that the goal is to develop a longer

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<sup>368</sup> Sam LaGrone, "Navy Axes Griffin Missile In Favor of Longbow Hellfire for LCS," *USNI News.org*, 09 April 2014. Available online at: <https://news.usni.org/2014/04/09/navy-axes-griffin-missile-favor-longbow-hellfire-lcs>. Michael Fabey, "U.S. Navy Readies LCS For Important Mine-Hunting, Missile Tests," *Aviation Week*, 27 August 2014. Available online at: <http://aviationweek.com/awin-only/us-navy-readies-lcs-important-mine-hunting-missile-tests>.

LT Kaitlin Smith, "Don't Give Up On The Littoral Combat Ship," *cimsec.org*, 10 January 2017. Available online at: <http://cimsec.org/dont-give-littoral-combat-ship/30215>.

<sup>369</sup> PEO LCS Public Affairs, "LCS Surface Warfare Package Completes Live-Fire Test," *Navy.mil*, 07 November 2013. Available online at: [http://www.navy.mil/submit/display.asp?story\\_id=77522](http://www.navy.mil/submit/display.asp?story_id=77522). See also, News desk, "LCS 3 'Fort Worth' Validates Surface Weapon Package, UAS Operations on Sea Trials," *Defenseupdate.com*, 17 November 2013. Available on-line at: [http://defense-update.com/20131117\\_lcs\\_surface\\_warfare\\_missio\\_package.html](http://defense-update.com/20131117_lcs_surface_warfare_missio_package.html).

<sup>370</sup> Christopher P. Cavas, "LCS Missile Shoot is 'Successful' - But a Miss," *Defense News*, 20 Jul 2016. Available online at: <http://www.defensenews.com/story/defense-news/2016/07/20/lcs-harpoon-missile-rimpac-coronado/87371686/>.

<sup>371</sup> Marc Selinger, "LCS Conducts First Hellfire Missile Firings," *Defense Daily*, 07 Mar 2017. Available online at: <http://www.defensedaily.com/lcs-conducts-first-hellfire-missile-firings/>. See also, NAVSEA Office of Corporate Communications, "Navy Conducts Successful Missile Test Firing," 10 Mar 2017. Available online at: [http://www.navy.mil/submit/display.asp?story\\_id=99275](http://www.navy.mil/submit/display.asp?story_id=99275).

<sup>372</sup> Naval Sea Systems Command, Solicitation N00024-17-R-5430, "Over-the-Horizon Weapon System," dated 08 Feb 2017. As a tangential observation, Lockheed Martin has been working on a Long Range Anti-Ship Missile (LRASM) as a replacement for the rather venerable Harpoon since 2011. Timeline and press release info is available online at: <http://www.lockheedmartin.com/us/products/LRASM/mfc-lrasm-pressreleases.html>.

<sup>373</sup> Federal Business Opportunities (FBO), Over-the-Horizon Weapon System Request for Proposal, Solicitation Number: N00024-17-R-5430. Available online at:

ranged missile than the current potential SSMs with capabilities against threat surface platforms that are also ‘better’ than the current systems available. In short, the Navy is seeking a long-term fix to address the current gap in LCS capabilities for the ASuW mission module.

The plug and play nature of the LCS has been one of its main weaknesses according to various critics throughout the program’s life-cycle. These critics voice concerns about cost, capabilities, complexity and the rapidity of change out as the major negative attributes of the intended mission package for the LCS class. The lengthy development time has only added to the critics’ complaints as they note that the basic components required for the intended core missions of the LCS of mine warfare, anti-submarine warfare and surface warfare remain in development almost eight years after the first ship was delivered to the Navy in 2008.<sup>374</sup> In many ways the technical and engineering challenges in developing and fielding the mission packages are greater than the propulsion issues that have apparently dogged the LCS class. Akin to the geometry and weight dictated by an engineering plant capable of 40 knots, the mission packages have certain volumetric and mass limits that they simply cannot exceed. In turn, they also have performance requirements that they must meet. This has and continues to represent an interesting challenge for the contractors developing, testing, and fielding the mission packages.

The LCS was intended and designed to be a limited mission platform with equipment and personnel that would be added in order to perform expanded missions to be provided by a “mission package.”<sup>375</sup> The main missions or ‘focused missions’ for which packages were to be

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[https://www.fbo.gov/index?s=opportunity&mode=form&id=e3a6f01cfeaca4284271eca7652ec8e0&tab=core&\\_cview=0](https://www.fbo.gov/index?s=opportunity&mode=form&id=e3a6f01cfeaca4284271eca7652ec8e0&tab=core&_cview=0).

<sup>374</sup> Matthew Cox, “GAO Recommends Navy Pause LCS Program,” 23 Jul 2013. Available online at: <http://www.military.com/daily-news/2013/07/23/gao-recommends-navy-pause-lcs-program.html?comp=7000023317828&rank=1>. Accessed 17 Jan 2017, 0909 EST.

<sup>375</sup> LCS Solicitation, N00024-03-R-2309, Section J, Attachment J-8.1, “Littoral Combat Ship Concept of Operations,” and Attachment J-8.2, “Littoral Combat Ship Concept of Operations (CONOPS),” Slide 2.

developed were anti-surface, anti-submarine, and (anti-) mine warfare. And to add to the complexity the Navy intended that these mission packages would be capable of rapid change out, meaning that an LCS could be configured to say hunt mines and then in a matter of hours or days,<sup>376</sup> would have the modules swapped out and proceed back to sea to hunt submarines. These were the major warfare ‘missions’ that the Navy intended would require increased equipment and people but there were several additional missions that were felt to be inherent; these included Special Operations Forces (SOF) employment, mobility, and to an extent Command, Control, and Communications (C3).<sup>377</sup> Based on the installed habitability, storage volume, communication, and sensor systems, these inherent missions could be conducted with no additional, significant changes to the basic ship. However, taking on the other core missions was going to require a relatively sizable increase in both equipment and people to accomplish successfully.

One of the key intended attributes of the mission packages was that they were going to be built based on networked off-board, unmanned systems.<sup>378</sup> This is a significant issue from a design perspective because while they might operate while off of the ship, they would still need to be stored onboard and lifted into and out of the water in order to function. Thus, some of the key systems became important variables in the weight and stability, power, and maintenance

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<sup>376</sup> The timeline for mission package swap-out remains a significant bone of contention between the champions and the detractors of LCS. And the Navy has had to reconsider the desired capability of changing modules in hours to potentially taking 2-3 full days to complete. See Christopher P. Cavas, “LCS: Quick Swap Concept Dead,” *Defensenews.com*, 14 July 2012. Available online at: <http://www.defensenews.com/article/20120714/DEFREG02/307140001/LCS-Quick-Swap-Concept-Dead?odyssey=tab%7Ctopnews%7Ctext%7CFRONTPAGE>. See also “The End of the Beginning for LCS,” *InformationDissemination.com*, 16 July 2012. Available online at: <http://www.informationdissemination.net/2012/07/end-of-beginning-for-lcs.html>. Michael Fabey, “NavWeek: Return Of LCS Past,” *Aviation Week*, 14 June 2014.

<sup>377</sup> LCS Solicitation, N00024-03-R-2309, Section J, Attachment J-8.1, “Littoral Combat Ship Concept of Operations, pp. 14-19.

<sup>378</sup> LCS Solicitation, N00024-03-R-2309, Section J, Attachment J-8.2, “Littoral Combat Ship Concept of Operations (CONOPS),” Slide 2.



calculations for the ships. The designers needed to ensure that once loaded the off-board systems had sufficient space and were secured safely to prevent physical damage from movement at sea. They also needed to be accessible to the outside and have cranes or some sort of lowering and lifting system to move them from the LCS deck to the water and back. There was also a requirement that the ship's engineering plant be powerful enough to provide electrical power to operate the off-board systems and added auxiliary gear e.g. cranes, hydraulic pumps, that would be needed to support the underwater vehicles.

The following figures serve to illustrate the variety of systems involved in the three main mission packages and give some idea of the volume of material, sensors, and the supporting systems required to operate the whole system of systems. Figure 8 below illustrates the number of both underwater and airborne platforms to be used in mine hunting and neutralization. This includes the MH-60S helicopter with several different potential mission packages installed on it and the MQ-8B Firescout unmanned aerial vehicle (UAV). There are several iterations of this mission package that will add capabilities in upcoming FYs. For instance, the Firescout will be outfitted with the coastal battlefield reconnaissance and analysis system (COBRA), a capability to search for buried mines and mines in the surf zone.<sup>379</sup> There is also a completely autonomous system "Knifefish" that will be used for mine hunting and neutralization but likely not until FY 19 or later (01 Oct 2018 and on).<sup>380</sup>

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<sup>379</sup> Sam Lagrone, "LCS Mission Packages: The Basics," *USNI News*, 21 August 2013. Available online at: <https://news.usni.org/2013/08/21/lcs-mission-packages-the-basics>. Accessed 25 January 2014, 0955 EST.

<sup>380</sup> Valerie Insinna, "Navy To Use Unmanned Boat, Knifefish UUV To Replace Troubled LCS Minehunting System," *Defense Daily*, 6 April 2016. Available online at: <http://www.defensedaily.com/navy-to-use-unmanned-boat-knifefish-uuv-to-replace-troubled-lcs-minehunting-system/>. Accessed 25 January 2017, 1355 EST.

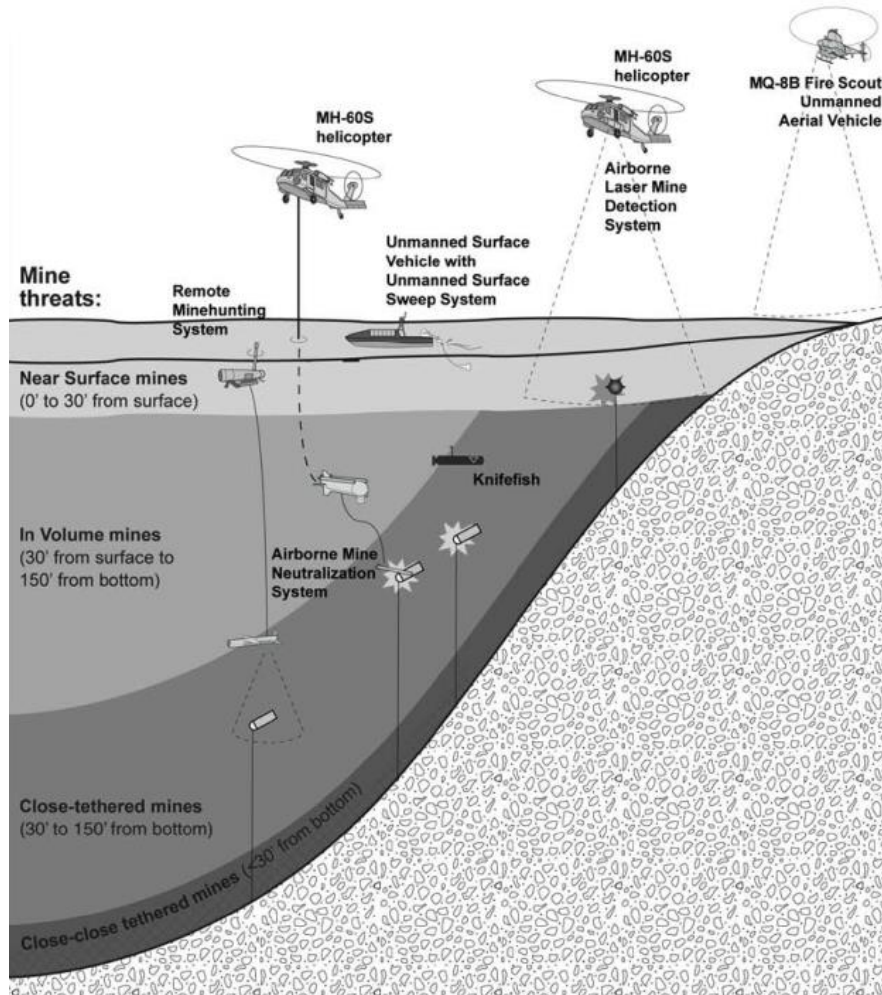


Figure 11- Mine Countermeasures Package <sup>381</sup>

Something else to bear in mind in this investigating this mission module is the scope, size, and complexity of the ships and systems that the LCS mine countermeasures package is intended to replace. The AVENGER (MCM 1) class minesweepers in spite of claims to the contrary once all of the equipment and personnel were factored in, represented a fiscal value (in roughly 1999 dollars) of \$250 million. Despite concerns regarding the cost growth in the LCS

<sup>381</sup> Sam Lagrone, "LCS Mission Packages: The Basics," *USNI News*, 21 August 2013. Available online at: <https://news.usni.org/2013/08/21/lcs-mission-packages-the-basics>. Accessed 25 January 2014, 0955 EST.

cost per hull to a roughly \$440 million cost, this would seem to be a good economic choice, especially in terms of the single mission nature of the MCM 1 class, their top speed of 14 knots (vice 40), and their 25 plus years of service. The AVENGER class included a hull mounted, variable depth sonar, a Mine Neutralization Vehicle (MNV), and mine sweeping gear. All of these capabilities are scheduled to be replicated in the LCS's mission package to a greater or lesser extent. In another explanatory figure below (Figure 12), one can see the size of the minesweeping gear (in particular the white floats and the cutting cables in the middle foreground) that is being replaced albeit with some loss of raw physical cutting capability.



*Figure 12-MCM 7 Preparing Minesweeping Rig, Exercise FOAL EAGLE 12<sup>382</sup>*

The following picture of the Remote Mine Hunting System with a AN/AQS-20A sonar body mounted below it (Figure 13), serves to highlight that the new systems are large in and of themselves and will probably be larger than the MNS that was installed on the AVENGER class ships. The development of unmanned underwater autonomous system is of great interest to the

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<sup>382</sup> U.S. Navy photo by Mass Communication Specialist 2nd Class Devon Dow\Released.

Navy writ large and especially to the LCS program. The focus is very much on the LCS program because of their stated mission requirement to conduct MCM operations. Autonomous platforms serve to reduce the risk to the personnel involved as well as the ‘mother-ship’ that controls and services the systems.<sup>383</sup> An interesting though maybe tangential point about the developing MCM packages is that the Navy is looking at systems that will operate both within the water column meaning underwater vehicles but also surface systems operating on top of the water column where most of the mine targets are likely to be operating.<sup>384</sup> While development is still lagging according to some the Navy remains optimistic that LCS minehunting packages will be ready for fielding and deployment by 2020.<sup>385</sup> On a cautionary note however, the Office of the Secretary of Defense’s (OSD) Director, Operational Test and Evaluation (DOT&E) has expressed significant reservations regarding the individual testing of the MCM systems in the past. According to a 2014 report the systems performance and reliability of the RMS was overly optimistic. The DOT&E stated that: "These tests were not conducted in an operationally realistic manner."<sup>386</sup> Again, without seeming to be an apologist for the laggardly appearing MCM mission module, it is important to keep in the mind the number of systems and the volume that these systems take up as currently configured in and on a ship’s hull. Developing the same

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<sup>383</sup> Sandra Jontz, “Full Speed Ahead for Autonomous Countermining Technologies,” *Signals*, 01 Feb 2017. Available online at: <http://www.afcea.org/content/?q=Article-full-speed-ahead-autonomous-countermining-technologies>.

<sup>384</sup> Hope Hodge Seck, “Navy’s Drone Boat May Take On Missions Beyond Minesweeping,” *DefenseTech.org*, 25 Jan 2017. Available online at: <http://defensetech.org/2017/01/25/navys-drone-boat-may-take-missions-beyond-minesweeping/>.

<sup>385</sup> Hope Hodge Seck, “LCS Minehunting Package Near Completion,” *DoD Buzz*, 12 Jan 2017. Available online at: <http://dodbuzz.com/2017/01/12/lcs-minehunting-package-near-completion/>.

<sup>386</sup> Mike McCarthy, “Testing Of Littoral Ship’s Mine Hunting System Unrealistic, Pentagon Office Says,” *Defense Daily* 30 Jan 2014. Available online at: <http://www.defensedaily.com/news/lcs-defense-daily-testing-of-littoral-ships-mine-hunting-system-unrealistic-pentagon-office-says/>. See also, Shannon Hayden, “The US Navy’s New Ships Are Supposed to Hunt Mines But Can’t Actually Find Them,” *Vice News*, 07 Sep 2015. Available online at: <https://news.vice.com/article/the-us-navys-new-ships-are-supposed-to-hunt-mines-but-cant-actually-find-them> and Statement by J. Michael Gilmore Director, Operational Test and Evaluation Office of the Secretary of Defense Before the U.S. House of Representatives Armed Services Committee on The Navy’s Littoral Combat Ship Program, House Armed Services Committee, 08 Dec 2016. Director, Operational Test and Evaluation Office of the Secretary of Defense, FY 14 Annual Report, US Navy Programs, Littoral Combat Ship (LCS), January 2015.

capabilities and fitting them into a somewhat smaller volume is a not insignificant engineering challenge.



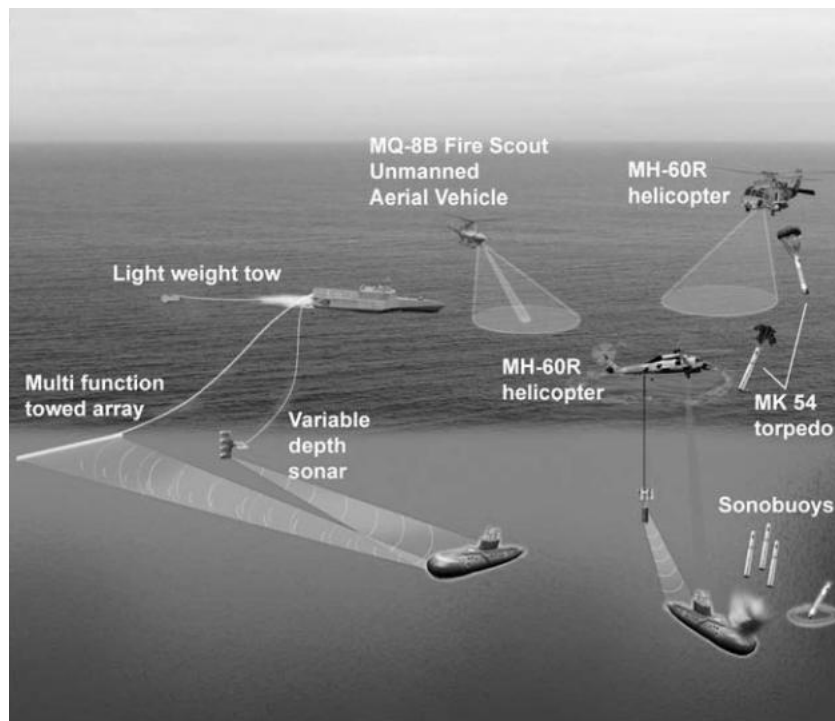
*Figure 13- RMS recovery aboard LCS 2* <sup>387</sup>

This somewhat exhaustive section is intended to highlight the complexity and the sheer engineering challenges of developing a mine counter-measures mission packages for the LCS class and its variants. Basically, the Navy is trying to cram an entire set of sensors, towed and self-propelled bodies into a manageable ‘package’ that can easily be installed and removed not to mention possibly shipped to a foreign port for that installation – thereby enforcing even more

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<sup>387</sup> U.S. Navy photo by Ron Newsome/Released. Available online at: [http://www.navy.mil/gallery\\_search\\_results.asp](http://www.navy.mil/gallery_search_results.asp).

weight and volume restrictions so that the mission package is air portable. Again, this is not intended as an apology or justification for the long time-line to develop this and all of the mission packages; it is however intended to highlight that this is akin to rocket science and is certainly an ‘engineering challenge’ if the Navy wants it done right.



*Figure 14- Anti-Submarine Warfare (ASW) Package*

The above figure (Figure 14) of the ASW mission package is intended to replace the sensors and systems associated with the OLIVER HAZARD PERRY (FFG 7) class ships. While in some ways simpler than the mine warfare module, it does involve switching out various systems, the RMS for example to be replaced by the ‘Light weight tow,’ ‘Multi-function towed

array,' and the "Variable depth sonar' for hunting submarines.<sup>388</sup> Also, while the helicopter remains the same MH-60R/S, the equipment and ordnance to be mounted will be different. In fact, the ordnance, in the form of torpedoes and sonobuoys will be significantly different. ASW has historically required a large number of torpedoes and sonobuoys which in turn requires much more storage and much more secure storage onboard the ship. The explosives, fuel, and electronics used in torpedoes do not take kindly to rattling about and excessive vibration and concussions can cause leaks and malfunctions. The sonobuoys are less susceptible to shock damage but in some cases, they also require explosives in the form of explosive charges used to eject them from launching tubes. All of this means that the storage spaces on the ship need to have cradles or shelves in which torpedoes and sonobuoys can be fastened down and that are able to vent inadvertent explosions to limit damage to the hull and systems on the ship should the ordnance detonate.

One facet of the anti-submarine warfare package that has not received much attention is the computer processing power required. Sensor information in the form of detected sound or reflected sonar energy requires computer processing to filter out non-target 'noise' and to identify specific frequencies of sound. This entails more computers and more auxiliary support for powering and cooling these computers. This in turn increases the required shipboard volume, the electromagnetic signature and increased weight. There is surprisingly little comment or criticism about this potential challenge in any of the literature concerning LCS. There has been one observation regarding the weight or displacement of the class, but as with many other claims for and against the LCS there is very little hard data upon which one can make an accurate

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<sup>388</sup> Kris Osborn, "Navy pursues lightweight LCS sonar, sensors," *Defense Systems*, 01 Nov 2016. Available online at: <https://defensesystems.com/articles/2016/11/01/lcs.aspx>.

assessment.<sup>389</sup> The other challenge is that if the data processing for ASW is to be done off-board of the ship, at some shore location, then the data transmission requirements increase significantly. There have been several reported shortcomings in the LCS capability to transmit its own engineering data back and forth from the shore-based maintenance node.<sup>390</sup>

## SUMMARY

The path to IOC has been a difficult and slow one. Both the engineering plants and the mission modules have been plagued with physical and fiscal challenges since the commissioning of LCS 1. These challenges are not new and are inherent in the fielding of new weapons systems and as described above, in the fielding of new ship classes. A new class faces not only technical but organizational challenges on the road to joining the fleet. It takes time and ultimately money to fix the problems and to develop the support programs for new ships. To add to this challenge, the technical complexity of both the LCS propulsion system and the intended mission modules is significantly greater than most of the previous ship systems procured by the U.S. Navy. This chapter has served to describe the road to IOC and to highlight some of the specific challenges inherent in the fielding of the LCS class. The next chapter will address some of the organizational complexities and challenges faced by LCS and reveal some of the insights these offer to the theory of organizational behavior.

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<sup>389</sup> Tim Starks, "GAO: Littoral Combat Ship Too Fat," *Roll Call*, 30 Jul 2014. Available online at: <http://blogs.rollcall.com/five-by-five/littoral-combat-ship-too-fat-gao-reports/?dcz=>.

<sup>390</sup> Mike Fabey, "LCS Comms Issues Cited," *Aviation Week*, 14 November 2013. Available online at: <http://aviationweek.com/defense/lcs-comms-issues-cited>. Tony Capaccio, "Littoral Ship-to-Shore Communications Seen Deficient, GAO Says," *Bloomberg News*, 19 November 2013. Available online at: <https://www.bloomberg.com/news/articles/2013-11-19/littoral-ship-to-shore-communications-seen-deficient-gao-says>. Lara Seligman, "Audit: LCS should update plan before contracting for more ships GAO Report Cites Problems With LCS Ship-to-Shore Communications," *InsideDefense.com*, 22 November 2013.



## CHAPTER 5

### THE ANALYTIC MODELS

This chapter will analyze the acquisition of the LCS class through the lenses of the three models of state or government behavior as presented provided by Graham Allison and Philip Zelikow in the second edition of *Essence of Decision: Explaining the Cuban Missile Crisis*. The intent is examine this acquisition in terms of the Rational Actor Model (I), Organizational Behavior model (II), and Governmental Policies model (III). The goal is to provide some insight or explanation into how the concept of LCS was developed and made a reality from its origins in Admiral Cebrowski's Streetfighter to the ships current active and joining the fleet. This chapter will address the nature of the evidence available, its strength or fidelity and the challenges that exist to gathering additional information. Finally, it will also present an initial assessment of the original hypothesis that this dissertation started with; namely that individuals have as much impact as organizations on decision making. At the risk of pedantry, organizations are made up of individuals. And while organizations operate in accordance with certain rules or customs as described in *Essence of Decision* and elsewhere, not all individuals abide strictly by these rules. But in truth, the evidence of this is rather thin on the ground.

### THE FRAMEWORK

In trying to determine the best analytical methodology to address the how the USN acquired the LCS vice the why, one particular set of models came to mind. These were the three models introduced by Graham Allison in the first edition and expanded on by Allison and Philip Zelikow in the second edition of *The Essence of Decision: Explaining the Cuban Missile Crisis*.

While understanding that these models do have limitations they do however seem to a good fit as an analytical framework. At the risk of disrupting the flow of reasoning here, it is important to segue back to the reason behind looking at the “how” the USN acquired the LCS and not the “why.” The why was sufficiently explained in Chapter Three and was based on the number of hulls removed from the Navy inventory from 1990 until the present day. This decrease in hulls coupled with both Operation Plan (OPLAN) force requirements<sup>391</sup> and the everyday “presence” operational requirements, the Navy had and has required capabilities that it must provide to support the U.S. National Security and National Military Strategies. Hence, we have the why but the how remains murky at best. Even knowing how the process of major system acquisition is supposed to function, our view from the outside remains opaque. Thus, we need some methodology to determine the reality, albeit one offering only a certain level of real clarity or ground truth, for the “how” the Navy end up with the LCS. The linkages between an action and an outcome, the acquisition of a major weapon system brings us back to the appropriateness of the analytical models.

We are after all looking to explain the decisions or outcome of a large organization which was and is impacted by many of the same variables that states and their governments face in international relations. These models have also been tried and tested in various analyses of state behavior within the international relations system at both the structural and sub-systemic levels. For example, the Rational Actor Model was one of the cornerstones of deterrence theory,

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<sup>391</sup> OPLANs are what could be called “war” plans are based on potential combat contingencies as defined by the Geographic Combatant Commanders (GCC) or Functional Combatant Commanders. They levy force requirements on the individual services e.g. X number of fighter wings or Y number of Carrier Strike Groups that are part of the force level determinations made by the individual services. “Presence” operations i.e. normal day-to-day operations have force levels driven by GCC’s Theater Campaign Plans which address Phase Zero, steady-state operations in the GCC’s Area of Responsibility (AOR). See Joint Pub 5-0, “Joint Operation Planning,” (Washington, DC: Joint Chiefs of Staff, 11 August 2011), Chapter II

especially the Mutually Assured Destruction (MAD) concept. MAD was cornerstone of nuclear deterrence strategy starting in the 1960s and continuing at some level to the present. The works of Schelling, Wohlsetter, and Brodie, to name just a few were heavily influenced if not dependent on the idea of rational actors.<sup>392</sup> Organizational Behavior, or Model II, has less of a pedigree than RAM but has still served as a successful template for analyzing individual state behavior, especially how sub-state (national) processes impact state actions and choices at the systemic level. The last model, governmental or bureaucratic politics has provided significant insights into various international relations theoretical and case studies, most notably in the various examinations of the European Union (EU), its member states, and other states and organizations outside of the EU.<sup>393</sup> Of course the most obvious successful application of these models was by the Allison and Zelikow in their analysis of the Cuban Missile Crisis.

## THE ANALYSIS STRUCTURE

In the second edition of *Essence of Decision*, Graham Allison and Phil Zelikow re-introduced the three models of government decision-making. These models were the Rational Actor Model (RAM), the organizational behavior model, and the governmental politics model, numbered Models I through III respectively. There were three basic propositions behind the

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<sup>392</sup> For some of the classic nuclear strategy and deterrence works see: Albert Wohlsetter, "The Delicate Balance of Terror." *Foreign Affairs* 37, no. 2 (1959): 211-34. Peter Paret, and Gordon Alexander Craig, Felix Gilbert, *Makers of Modern Strategy from Machiavelli to the Nuclear Age*. Princeton Paperbacks (Princeton, N.J.: Princeton University Press, 1986). Bernard Brodie. *Strategy in the Missile Age* (Princeton, NJ: Princeton University Press, 1959). Henry Kissinger. *Nuclear Weapons and Foreign Policy*. (New York: Published for the Council on Foreign Relations by Harper, 1957). For game theory see: Thomas C. Schelling, *The Strategy of Conflict* (Cambridge, MA: Harvard University Press, 1960); and Thomas C. Schelling, *Arms and Influence* (New Haven, CT: Yale University Press, 1966). For an interesting debate regarding deterrence and the nuclear balance see Scott Sagan and Kenneth Neal Waltz. *The Spread of Nuclear Weapons: A Debate*. 1st ed. (New York: W.W. Norton, 1995).

<sup>393</sup> See Jonathan B. Slapin. "Bargaining Power at Europe's Intergovernmental Conferences: Testing Institutional and Intergovernmental Theories." *International Organization* 62, no. 1 (2008): 131-62., Sergio Fabbrini and Simona Piattoni, "Italy in the European Union: The Transformation of National Interest in a Compound Polity." *Zeitschrift für Staats- und Europawissenschaften (ZSE) / Journal for Comparative Government and European Policy*, Vol. 4, No. 2 (2006): 223-241

authors' selection of these models. The first was that scholars and practitioners of international relations actually relied on implicit conceptual models that have significant impact on how they think about problems in foreign and military affairs.<sup>394</sup> These models not only frame the analysis of the situation but also the actual perception of the situation; at the risk of stating the obvious the input variables and outcome products are driven by the concepts or maybe more accurately the perceptions of the analysts. The second proposition underlying the authors' analysis is that most analysts explain and predict the behavior of national governments through applying one model, RAM.<sup>395</sup> This means that actors' choices are framed in terms of rational decisions or selecting rational courses of action in order to achieve their specific objectives. Finally, the authors reintroduce two alternative conceptual models which they opine "provide a base for improved explanations and predictions."<sup>396</sup> The following paragraphs will provide a more in-depth parsing of just what the three models are.

## RAM

For our purposes and in the spirit of simplification in this section, RAM or model I will be used interchangeably to indicate the Rational Actor Model and U.S. Navy will be substituted for "the state" or "the government." The idea of the state represented in proxy by the government of that state acting as a unitary actor in a rational manner has been one of the most important assumptions both explicit and mostly implicit used by IR scholars since the field was formalized in the early 1950s.<sup>397</sup> Under RAM, the basic unit of analysis is the national

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<sup>394</sup> Graham Allison, Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis*, 2<sup>nd</sup> ed. (New York: Addison-Wesley Longman Inc., 1999), 3.

<sup>395</sup> *Ibid*, 4, 16.

<sup>396</sup> *Ibid*, 5.

<sup>397</sup> Jonathan Bendor and Thomas H. Hammond, "Rethinking Allison's Models," *The American Political Science Review*, Vol. 86, No. 2 (Jun. 1992), 302.

government or leadership of a state, which is treated as a unitary actor or “monolith.”<sup>398</sup> Using short-hand phrases like “The United States” or “the Crown” allows analysts to conceptualize a state as one entity in the international system, vice a conglomeration of competing internal political organizations and interest groups e.g. the president, parliament, etc. As one international relations scholar has termed it, the unitary actor, the state is a “black box.”<sup>399</sup> It enables a level of theoretical parsimony in analysis which as some scholars have pointed out may result in oversimplification but it is sufficiently robust and complex for our purposes.<sup>400</sup> Model I focuses on the actions taken by an actor are chosen as a calculated course of action to solve a strategic challenge.<sup>401</sup> In model I, the core concepts include goals and objectives, alternatives, consequences and choice. All of these concepts are predicated on one key governing assumption. The actor in question is seeking to achieve the best payoff, value maximization, or greatest utility under a defined set of essentially limiting conditions.<sup>402</sup> This assumption is based on the classical “economic man” and the rational man of modern theory, who makes optimal choices in narrowly constrained, neatly defined conditions.<sup>403</sup> There are some problems with this model in that players are assumed to have perfect information and to have considered all possible alternatives before choosing a course of action or making a decision.<sup>404</sup> For our purposes, it should suffice to frame this model as an actor faced with a problem must make a decision that will provide the most utility (in the economic sense) with certain limiting factors like time and money available obtaining.

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<sup>398</sup> Allison, Zelikow, *Essence of Decision*, 5.

<sup>399</sup> Yetiv. *Explaining Foreign Policy*. 12.

<sup>400</sup> Bendor and Hammond, “Rethinking Allison’s models,” 307.

<sup>401</sup> Allison, Zelikow, *Essence of Decision*, 15.

<sup>402</sup> *Ibid*, 17.

<sup>403</sup> *Ibid*.

<sup>404</sup> *Ibid*, 19-20. See section on Simon and “comprehensive rationality” vs. “bounded rationality.” For a more depth critique of all of the models see Bendor and Hammond, “Rethinking Allison’s Models,” 301-322.

The decision or action facing the U.S. Navy was a requirement to replace numerous aging and retired ships. There were as always, only so many dollars available in the defense budget and only so much time before the shortage of ships had significant impact on the Navy's ability to perform its missions. The expected behavior of the Navy as a rational actor would be to acquire new ships using the monies available. In order to maximize its utility, the Navy would seek to acquire the most number of ships that it could with said monies available.

## THE ORGANIZATIONAL BEHAVIOR MODEL

Model II focus on the interactions within the “monolith” to describe or define how a certain decision was made or action taken. Decisions and actions are the outcome of the result of internal response to external stimuli. The idea of the action as an outcome has some importance as we can potentially see how a selected action may appear only partially rational i.e. reflects bounded rationality<sup>405</sup> because it is the result of internal processes and compromises as opposed to a perfectly ‘rational’ action taken by a unitary actor. This is a bit of a canard but because we are looking inside the black box as it were, the actual formulation of the action or decision is more complex or nuanced and more intricate than in model I. The authors note that a government is actually a conglomeration of different organizations, each of the organizations having a life of their own.<sup>406</sup> In our case, the Navy is very much a smaller example of the government model, with numerous organizations, some subordinate to others and some not, operating with tasks and goals, or sub-tasks and sub-goals. Theoretically, the tasks and goals embraced by subordinate organizations all serve to supplement or support the intended goals of

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<sup>405</sup> Sagan and Waltz, *The Spread of Nuclear Weapons*, 46. See also, James G. March and Herbert Simon, *Organizations*, 2<sup>nd</sup> ed. (Cambridge, MA: Basil Blackwell, 1992), Charles Perrow, *Complex Organizations*, 3<sup>rd</sup> ed. (New York: Random House, 1986).

<sup>406</sup> Sagan and Waltz, *The Spread of Nuclear Weapons*, 143.

the larger organization. It is rather obvious from the historical record that this theory is not always completely accurate.

Organization behavior predicates that the action by a state or other entity is not an active decision but the outcome of various internal processes within an organization or conglomeration of organizations.<sup>407</sup> The key issue with these internal issues that often seems to result in a less than optimal or less than completely rational ‘decision’ is that large and complex organizations are heavily dependent on standard operating procedures (SOP) for reacting to situations. This results in what James March and Herbert Simon classify as the logic of appropriateness in taking an action or making a decision.<sup>408</sup> This translates into organizations often making a sort of heuristic assessment of a situation, determining how familiar the situation is to some recognized, historical standard, and applying that standard to address or process the decision or action in question.<sup>409</sup> The problem is that not all situations are actually akin to their perceived predecessors and thus SOPs may lead to an unintended or less than optimal output. It also goes a long way to revealing how and to an extent why, as Allison and Zelikow put it: “Organizations often behave in ways that seem inconsistent with a purely functional account, even one that acknowledges the idiosyncratic ways an organization might pursue efficiency.”<sup>410</sup>

There are five key points for Allison and Zelikow in addressing organizations as entities. The first and most basic is why organizations or why organize? The second point provides the answer to the first; organizations create capabilities for achieving purposes and performing

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<sup>407</sup> Ibid.

<sup>408</sup> “Introduction to the Second Edition,” in March and Simon, *Organizations*, 8. Quoted in Allison & Zelikow, *Essence of Decision*, 146.

<sup>409</sup> Ibid.

<sup>410</sup> Allison & Zelikow, *Essence of Decision*, 153.

tasks.<sup>411</sup> They are designed and intended to “do stuff” whatever that “stuff” might be. Their third point is that existing organizations, programs, and routines ultimately serve to constrain behavior. The fourth key consideration is that organizational culture within existing organizations shapes the behavior of the individuals working in those organizations. The result is that individual people are in effect pressured to abide by and act in accordance with the formal and informal norms of their respective organizations. This individual behavioral constraint has a multiplicative effect when coupled with the organizational behavior constraint in point three above. The fifth and final key point in looking at organizations is that organizations are less analogous to individuals than to technology or a bundle of technologies.<sup>412</sup> There are several ideas to highlight from these key points but the first is that while organizations may be viewed as unitary actors as in RAM, unlike the conceptually unitary actors in RAM, an organization is still the outcome of a variety of viewpoints and compromises. There is also the restriction or constraint that the organization applies to the individual thus implying conformity and a willingness to adopt or accept the organization’s goal as an entity. This is a nuanced difference between model I and II but the perspective of analysis for model I does not take into account how the unitary actor formulates his decision while model II does account for the inputs and the process of how a decision is made or an action is taken. This can reveal what the critical variables are and how they are ranked by the organization. This priority ranking through organizational processes can have significant impact on the apparent rationality of a decision or action under model II.

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<sup>411</sup> Ibid, 144.

<sup>412</sup> Ibid.



Besides these five key points, another key concept in examining model II is the competition between what they call the “paradigm of efficiency” and that of “culture.”<sup>413</sup> This has direct bearing on the issue of rationality addressed in the preceding paragraph. A paradigm of efficiency is focused on producing the most output using the least input. The organizational goal is to in economic terms “reduce transaction costs enough to offset the cost of the organization itself.”<sup>414</sup> The paradigm of culture on the other hand will drive organizational decision making or actions based on a rationality based on the organization’s ability to define its own missions.<sup>415</sup> The idiosyncratic pursuit of efficiency mentioned earlier becomes much clearer when for example the Navy is directed to clean up an oil spill and sends a bunch of sailors out with boats, hoses, and oil-absorbent pads while say the Coast Guard hires a commercial contractor to do the same task. The Navy just wants to get the task done while the Coast Guard might be more interested in avoiding bad press created by the media portrayal of its personnel cleaning up a spill because this implies Coast Guard responsibility in causing said spill. This is a simple illustrative example, but it helps to convey the difference between efficiency (accomplishing an assigned task) and culture (avoiding bad publicity). Differences in organizational culture and norms make certain decisions logical or rationale if one understands the internal preferences of a given organization.

The authors’ proceeded to analyze the paradigm of organization and the title they used the basic unit of analysis is very revealing: “Governmental action as organizational output.”<sup>416</sup> This serves to highlight the sub-process going on within the black-box that is conversely labeled

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<sup>413</sup> Ibid, 157.

<sup>414</sup> Ibid, 148. This is true of both public and private organizations with the caveat that the drive to realize or create profit will also influence a private organization’s actions and decisions.

<sup>415</sup> Ibid, 153.

<sup>416</sup> Ibid, 164.

a “unitary actor” in RAM. The following section of the analysis addresses the organizing concepts, reiterates some points mentioned earlier but also reveal some key attributes that serve to distinguish model II from model I. The first of these is the repetition that the key actors in model II are not monolithic nations or governments but constellations of loosely allied organizations which act only when component organizations perform their routines.<sup>417</sup> This serves to highlight the second point that organizations, internally and externally, operate under conditions of factored problems and fractionated powers. This means that individual organizations are tasked to deal with certain aspects of a given problem even when they have the “primary” power or capability of addressing said problem.<sup>418</sup> It also means that specialization i.e. the ability to address certain problems or take certain actions leads to differing levels of responsibility even within an individual organization. This idea leads directly into one of the overarching issues that acts as both an input into organizational behavior and an output of it, the issue of standard operating procedures.

Not only do standard procedures impact how an organization addresses a problem, they also have a very deterministic impact on what the organization does or the actions that it can take. As mentioned above, SOPs allow large organizations to address complex problems or take actions in response to the problems. They (SOPs) are driven by and designed to deal with both the complexity of the organization and the complexity of the problems faced by a given organization. The challenge is that in international relations and federal acquisition both, standard procedures again both enable but also constrain the actions that an organization is capable of taking in response to a situation. This can mean that the actions taken are not exactly

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<sup>417</sup> Ibid, 166.

<sup>418</sup> Ibid, 167.

pertinent to the situation at hand or on our case the acquisition may not match the conceptual capabilities. Another key attribute is that often organization objectives become performance targets. This can result in successful compliance with organizational objectives and organizational constraints becoming measure of success. SOPs become the framework within which organizational performance is measured as well as a framework for how performance is executed. There are several other attributes in the organizational behavior construct that are of interest including uncertainty avoidance, problem-directed searching and organizational learning and change.

Avoiding uncertainty might be considered a sub-set of standard procedures but it is not. This is an observed organizational behavior, especially in government bureaucracies where the organization cannot abide uncertainty in their environment. In fact, organizations make every effort to control their environments in order to minimize uncertainty. Allison and Zelikow call this a negotiated environment.<sup>419</sup> This is very appropriate to our case study in that the Navy and all of the services work very hard with and against each other and with all of the involved budgetary stakeholders to create as promising a fiscal environment for their needs as is possible. In fact, the Air Force is almost notorious for their skills and efforts in these public relations campaigns. The issue of problem-directed search is not necessarily looking for a problem to solve. It is an organization's efforts to adapt to a non-standard situation by searching for a solution from within the organization's existing expertise, knowledge, and physical resources.<sup>420</sup> To a certain extent this is akin to 'when one has a hammer, all problems look like nails' and the

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<sup>419</sup> Ibid, 170.

<sup>420</sup> Ibid, 171.

example of the U.S. Army's efforts to combat counter-insurgency in Southeast Asia using the technology and firepower strengths that it had is very illustrative.<sup>421</sup>

This leads us into the general propositions of Allison and Zelikow's analysis. It also feeds directly into one of the major points for the authors but also for our specific case study on LCS; existing organized capabilities influence government (organizational) choices.<sup>422</sup> To revisit the hammer and nail analogy again, the military has the capability to address a military invasion of the Homeland or of an allied nation but if the "invasion" takes the form of a crop blight or disease, the U.S. Department of Agriculture (USDA) or Centers for Disease Control (CDC) might be a more effective organization in response. This also serves to outline the issue of organizational priorities or goals influence how an organization implements actions or responses.<sup>423</sup> Again, in the case of an invasion, DoD would likely react with physical force to repel the invaders. For crop blight DoD might cordon the fields and burn the affected crops. USDA might instead, take samples, do biological studies, or experiment with bio-responses like alternative seeds or insects to displace or eat the affected plants. It becomes an issue in many ways of how the organization defines success e.g. acres burned versus spread slowed to x meters per day. Here we find a third idea from Allison and Zelikow that we have discussed previously, namely SOPs. The implementation of responses or actions tends to reflect previously established routines, from SOPs to programs to what the author's call organizational "repertoires."<sup>424</sup> DoD has various sets of standard responses to pre-determined situations like harassment at sea, close approaches to North American air-space by foreign military aircraft, and small infantry unit

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<sup>421</sup> Ibid.

<sup>422</sup> Ibid, 176-177.

<sup>423</sup> Ibid, 177-178.

<sup>424</sup> Ibid, 178-179.

ground combat. The same is true for USDA with crop blights, the CDC for disease outbreaks and for other government agencies. All of these factors obtain in the case of the Department of the Navy and the LCS. For instance, the Navy has a corporate knowledge and level of expertise in the management of ship construction. This coupled with an organizational priority to replace several different classes of ships, covering several different warfare areas influenced the Navy's selection of surface platforms – ships – to fill the impending capability gap vice using aircraft or autonomous vehicles. The implementation of the solution, replacing the aging or de-commissioned ships was very much in keeping with established Navy routines of ship-design and shipbuilding program management. The one significant change was the solicitation using performance vice design specifications, and even this could be classified as an “adaption of existing programs and activities.”<sup>425</sup>

Organizational behavior or model II serves to illustrate that sub-systemic, sub-national level analysis can reveal some important insights about how an organization creates an output. This in turn can help to explain how a seemingly irrational decision or action can be made or taken by an organization notably if one realizes that it is not a unitary actor or a featureless black-box. The challenge here is that we violate one of the basic tenets of International Relations, at least according to leading realist and neo-realist thinkers if we go below the systemic level. The price we pay for drilling down, so to speak, is the parsimony of the theoretical construct. However, this is a valid price to pay for the revelatory and explanatory capacity we gain by looking several layers deep into the system.

### MODEL III – GOVERNMENTAL POLITICS

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<sup>425</sup> Ibid, 180.

The one minor modification that we will make to this model is to substitute the word bureaucratic for governmental.<sup>426</sup> While the bureaucratic eco-system is different from the governmental, the similarities in terms of competition for resources, time, and attention are sufficiently similar that we do not risk losing much in terms of applicability and appropriateness by this substitution. As in politics, bureaucracies, notably government ones, are constantly competing for influence, for resources, and for the attention of key decision makers. Like politicians one could claim that many bureaucracies have personalities and their spokesmen and managers certainly have personalities. Bureaucratic politics like organizational behavior is a challenge for IR scholars because it is after all “messy.” Peering inside the black box reveals a complicated, intricate, and often confusing process or set of processes that may have created an outcome or action but we as scholars may remain unsure because of the complexity.<sup>427</sup> So, recognizing the potential short-comings of these models and keeping them in mind let us accept them as viable if not all-encompassing tools for analyzing the process that resulted in the acquisition of the LCS.

Even with a respectful nod to Bendor and Hammond, this model has to be the most easily applicable and relatively straight-forward of the three models from *Essence of Decision* to apply. For the purposes of this analysis the author has chosen to accept the limitations for the sake of

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<sup>426</sup> See, Morton H. Halperin, Priscilla Clapp, Arnold Kanter, *Bureaucratic politics and foreign policy*, 2<sup>nd</sup> ed. (Washington, DC: Brookings Institution Press, 2006). Conor Keane and Steve Wood. "Bureaucratic Politics, Role Conflict, and the Internal Dynamics of US Provincial Reconstruction Teams in Afghanistan." *Armed Forces & Society* 42, no. 1 (2016): 99-118. Miriam Hartlapp, Julia Metz, and Christian Rauh. "Linking Agenda Setting to Coordination Structures: Bureaucratic Politics inside the European Commission." *Journal of European Integration* 35, no. 4 (2013): 425-41. For some specifically military-focused studies see Edmund Beard. *Developing the ICBM a Study in Bureaucratic Politics* (New York: Columbia University Press, 1976). Frederic A. Bergerson, *The Army Gets an Air Force: Tactics of Insurgent Bureaucratic Politics* (Baltimore: Johns Hopkins University Press, 1980). Perry M. Smith, *Assignment--Pentagon the Insider's Guide to the Potomac Puzzle Palace*. 1st ed. AUSA Institute of Land Warfare Book. (Washington: Pergamon-Brassey's International Defense Publishers, 1989). Mike Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership 1945-1982*, Air University Press: Maxwell Air Force Base, AL, 1998, see esp. 133-146.

<sup>427</sup> Bendor and Hammond, “Rethinking Allison’s Models,” 302.

simplicity and to accept that the resultant analysis may not be as rigorous and detailed as conceptually possible. That being said, the key thesis of bureaucratic politics is decisions or outcomes are the result of bargaining games vice a more organized or defined process.<sup>428</sup> The outcomes, what the authors call “decisions” and “actions” are collages.<sup>429</sup> This hints at one of the main drawbacks to governmental politics from the academic perspective, they are messy. It is difficult to derive overarching and parsimonious theoretical constructs from messy, idiosyncratic processes, especially one often extremely dependent on the personalities involved. Framing the Navy’s decisions or outcomes regarding the LCS acquisition and fielding is no different. It may not have been as contentious as say the Affordable Care Act, but it was a political fight within the Navy bureaucracy to bring the LCS into the fleet.

Allison and Zelikow frame the governmental politics model in terms of the players, their make-up, and how they interact to create an outcome. The collages that are created are often the result of the operational environment within which the players operate, other issues intrude, real world events, and competition for attention create what are sometimes less than ideal political outcomes that leave everyone dissatisfied to some degree but are “good enough” to meet part of everyone’s requirements.

If one substitutes Navy officers for politicians, the rules of the game remain the same. It is all about bargaining between stakeholders as opposed to brokering a deal as the uniformed head of the service. The CNO may be the professional head of the service but there remain strong semi-independent satrapies among the organizations within the Department of the

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<sup>428</sup> Ibid, 255.

<sup>429</sup> Ibid, 257.

Navy.<sup>430</sup> The competition within the Navy, between the services, and among the other stakeholders in the national security community certainly provides the sort of playing field with which bureaucratic politics thrives.

## PREDICTED VERSUS OBSERVED BEHAVIOR – MODEL 1

If we insert Navy or the CNO as the unitary actor in model I the next step is to determine the value or utility maximization that the CNO was looking for in a given timeframe. In the late 1990s and early 2000s the Navy faced both decreasing numbers of hulls and a resource constrained environment i.e. less money. It was not until the attacks of September 11, 2001 that the U.S. military saw an expansion to their funding in the wake of the end of the Cold War and the resulting Peace Dividend. The Navy was thus faced with competition from the other services and other federal agencies for funding. If we frame the action or decision with a goal of maximizing the Navy's piece of the budgetary pie we can then turn to the expected behavior of the Navy. For our purposes then the expected behavior will that behavior which maximizes the number of ships by 'winning' largest ship procurement budget possible for the Navy. At the risk of going off on a significant tangent, this competition for funding is very reminiscent of two-level game logic.<sup>431</sup> The Navy after all had to 'fight' with both internal constituencies e.g. the aviation community, and against the other services e.g. the USAF for the funding.

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<sup>430</sup> See Charles Oscar Paullin and United States Naval Institute. *Paullin's History of Naval Administration, 1775-1911 a Collection of Articles from the U.S. Naval Institute Proceedings* (Annapolis, MD: U.S. Naval Institute, 1968). Julius Augustus Furer. *Administration of the Navy Department in World War II* (Washington: U. S. Government Printing Office, 1960). Thomas Hone and Naval Historical Center. *Power and Change the Administrative History of the Office of the Chief of Naval Operations, 1946-1986*. Contributions to Naval History series; No. 2. (Washington, DC: Naval Historical Center, U.S. Government Printing Office, 1989).

<sup>431</sup> See Putnam's 'two-level games' domestic and international relations impacting one another, Robert D. Putnam "Diplomacy and Domestic Politics: The Logic of Two-level Games." *International Organization* 42, no. 3 (1988): 427-60. See also David Milne, "The 1968 Paris Peace Negotiations: A Two-Level Game?" *Review of International Studies* 37, no. 2 (2011): 577-99. Stephan Kroll and Jason F Shogren. "Domestic Politics and Climate Change: International Public Goods in Two-level Games." *Cambridge Review of International Affairs* 21, no. 4 (2008): 563-83.



The observed behavior appears to justify or validate the predicted behavior of trying to maximize the size of the shipbuilding funding and to acquire the largest number of ships possible based on the funding awarded. Looking at the role of the Chief(s) of Naval Operations (CNO), most specifically Admiral (ADM) Vern Clark (2000-2005) and his successor Mike Mullen (2005-2007) during the initial acquisition phase provides some justification for the expected model I behavior. These two leaders are particularly critical because Clark was the author of the LCS and Mullen was a driving force during the development and initial acquisition steps. There are also two main factors that each share and that at least theoretically had significant impact on the design and building of LCS; each was a surface warfare officer (SWO) and each worked for then Secretary of Defense Donald Rumsfeld. The importance of their warfare community<sup>432</sup> is of significance because the early 2000s saw the pending end of life for several ship classes including the PERRY class frigates, the CYCLONE class patrol ships, and the AVENGER class mine countermeasure ships. These pending retirements totaled 79 hulls. The Navy had already seen the disappearance of roughly nine individual ship classes<sup>433</sup> during the 1990s. Coupled with these ships retired in the 1990s, the on-going disposal of the SPRUANCE class destroyers, the Navy faced a decrease of 137 combat hulls by 2015. These hulls needed to be replaced. The timeframe of Admiral Clark's and Mullen's respective tenures as CNO under Secretary Rumsfeld was important because of his attraction to the concepts of innovation and revolution. The LCS as conceived and designed was a revolutionary weapons system meant to appeal of

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<sup>432</sup> The Navy term is 'designator' while the Army and USMC would call them Military Occupational Specialties or "MOS."

<sup>433</sup> The actual number depends on how one parses the nuclear powered cruisers (CGN) that were decommissioned. I have lumped USS BAINBRIDGE (CGN 25) and USS TRUXTUN (CGN 35) together, though purists would insist that these two, one-of-a-kind ships, ought to be delineated as individual classes.

Rumsfeld's stated philosophy. It was intended to tickle his fancy and served as a sales pitch to the Secretary of Defense.

The importance of influencing the SecDef is very much in keeping with expected behavior under model I. In order to achieve their goal of more ships, the CNOs made a rational choice to maximize their (service's) benefits. Appealing to Rumsfeld's interest in innovation and revolutionary change or the Revolution in Military Affairs (RMA)<sup>434</sup> was intended to get his support and thus get the funding to buy the LCS. In the case of the LCS, the two most important variables in the equation were funding and political attention or support.

The fight for a piece of the budgetary pie is a crucial battle executed each and every fiscal year by the services. For many years in the 1950s the U.S. Air Force received a larger piece of the defense budgetary pie than the other services, averaging approximately 46% between 1954 and 1960.<sup>435</sup> This and potential racial memories of the Admiral's Revolt in the later 1940s, make the leadership of the U.S. Navy particularly loath to lose out in the funding battle in the halls of the Pentagon and on Capitol Hill. None of the services in fact enjoy losing in the funding battles within and without the DoD and all compete very, very hard against one another to secure their perceived "rightful" share. Any CNO worth his or her salt will view the pending and on-going budget clashes as an important if not critical factor in their success. This is true whether in

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<sup>434</sup> See James Hazlett and Martin Libicki. *The Revolution in Military Affairs*. Strategic Forum; No. 11 (Washington, DC: National Defense University Institute for National Strategic Studies, 1994). See also Stephen Peter Rosen. "The Impact of the Office of Net Assessment on the American Military in the Matter of the Revolution in Military Affairs." *Journal of Strategic Studies* 33, no. 4 (2010): 469-82. Diego A. Ruiz Palmer. "The NATO-Warsaw Pact Competition in the 1970s and 1980s: A Revolution in Military Affairs in the Making or the End of a Strategic Age?" *Cold War History* 14, no. 4 (2014): 1-41. Jeffrey Collins, Andrew Futter, and Ebooks Corporation. Reassessing the Revolution in Military Affairs [e-book] *Transformation, Evolution and Lessons Learnt. Initiatives in Strategic Studies--issues and Policies*. 2015.

<sup>435</sup> Lawrence J. Korb, *The Joint Chiefs of Staff: The First Twenty-five Years* (Bloomington, IN: Indiana University Press, 1976), 109. Cited in Mike Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership 1945-1982* (Maxwell AFB, AL: Air University Press, 1998), 67.

comparison with the other service or internal to the Navy. In some ways, the chief of a service is viewed like a venture capitalist fund-raiser and if he or she can't get the money that the service needs, their prestige within the service suffers. This is only amplified when the time comes to internally divvy up the dollars and in the Navy's case some stakeholders don't get as many airplanes or submarines as they wanted – individual and institutional memories tend to be long in the sea services and a poor fund-raising CNO will not be a popular leader. However, the idea of having to compete for funds feeds directly into the next major concern for Admiral Vern Clark in the early 2000s especially after September 11<sup>th</sup>, 2001, how to get the administration's attention – the transformational nature of LCS was just that thing.

The DoD under Donald Rumsfeld was absolutely fixated on “transformation.” Slapping a label like transformational, revolutionary, or “represents the very epitome of the revolution in military affairs (RMA)<sup>436</sup>” was the perfect sales pitch to Mr. Rumsfeld and his coterie.<sup>437</sup> In

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<sup>436</sup> For more both general RMA background and specifics on the late 1990s and early 2000's RMA see Jeremy Black, *War and technology* (Bloomington, IN: Indiana University Press, 2013). Rosen, "The Impact of the Office of Net Assessment," 2010. Keith L. Shimko, *The Iraq Wars and America's Military Revolution* (New York: Cambridge University Press, 2010). MacGregor Knox and Williamson Murray. *The Dynamics of Military Revolution, 1300-2050* (New York: Cambridge University Press, 2001). Hughes and Cebrowski, "Rebalancing the Fleet." United States. Department of Defense. Office of Force Transformation. Network-centric Warfare [electronic Resource] Creating a Decisive Warfighting Advantage. Washington, DC: Director, Force Transformation, Office of the Secretary of Defense, 2003. James R Blaker. *Transforming Military Force the Legacy of Arthur Cebrowski and Network Centric Warfare* (Westport, CT: Praeger Security International, 2007).

<sup>437</sup> For examples of the focus and emphasis on “transformation” in the DoD under Secretary Rumsfeld see Department of Defense. “Elements of Defense Transformation [electronic Resource].” Washington, DC: U.S. Dept. of Defense, 2004. United States. Department of Defense. Office of Force Transformation. “A Network-centric Operations Case Study [electronic Resource] US/UK Coalition Combat Operations during Operation Iraqi Freedom.” Washington, DC: Office of Force Transformation, Dept. of Defense, 2005. Rumsfeld, Donald. "INVESTING IN TRANSFORMATION." *NATO's Nations and Partners for Peace*, no. 4 (2003): 44-47. United States. Department of Defense. Office of Force Transformation. “Military Transformation [electronic Resource] a Strategic Approach.” Washington, DC: Director, Force Transformation, Office of the Secretary of Defense, 2003. "Transformation Office Realignment Makes Change Part of Pentagon Mainstream." *Defense Daily* 233, no. 37 (2007): 1. United States. Department of Defense. Office of Force Transformation. “Network-centric Warfare [electronic Resource]: Creating a Decisive Warfighting Advantage.” Washington, DC: Director, Force Transformation, Office of the Secretary of Defense, 2003. Department of Defense Transformation Hearing before the Terrorism, Unconventional Threats and Capabilities Subcommittee of the Committee on Armed Services, House of Representatives, One Hundred Eighth Congress, Second Session, Hearing Held February 26, 2004. Washington: U.S. G.P.O.: For Sale by the Supt. of Docs., U.S. G.P.O., 2005. Peterson, Gordon. "SOME THOUGHTS ON TRANSFORMATION." *Naval Forces* 25, no. 2 (2004): 6. United States. Office of the Chief of Naval Operations.

truth, trying to revise the thinking and approach of the DoD was both well-intentioned but also truly needed. Even after almost a decade, the services were still shaking off the residue of the Cold War and near peer competitors remained far away over the time horizon. A shake-up was needed. Thus, transformation came into its own – and LCS was of course transformational. One of the keys to success is matching requirements to policy whether it is merely spin-doctoring your sales pitch or actually developing a concept that is in keeping with the current administration's buzz-word of the day. LCS fit the bill in both accounts.

If using the RAM model, we look at the participant aiming to maximize their pay-off or realize the most or best gains then the CNO selling the LCS to the SecDef and Congress seems a rational strategy. It satisfied the requirement for replacement hulls in view of the previously decommissioned and pending ship retirements. It also fit the administrations' and more specifically the SecDef's concept of transformational technology especially as a money saver. By this I mean that even though the LCS as a class was not conceived as a multi-mission system at any one time, it was conceived as a platform that could be modified to cover at least individual mission areas. The time required to change out equipment and systems to accomplish the specified missions was not necessarily played up in the discussions with the people in OSD or in congress, but it was not a key selling point that received a lot of attention or hype from the Navy.

Stepping back a little and applying Model I as Allison and Zelikow did let us first look at the unit of analysis. We can still use government action as a choice. In this case the choice was to acquire the LCS or some other surface system of systems. Now admittedly, rather than a government, we specifically see a sub-systemic and sub-national entity, a military (or naval)

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Naval Transformation Roadmap 2003 [electronic Resource] "Assured Access & Power Projection --from the Sea." (Washington, DC: U.S. Navy, Chief of Naval Operations, Commandant of the Marine Corps, 2003).

service, the U.S. Navy as represented by the CNO championing this choice to the resource providers but for the sake of this analysis this suffices. The unified actor for our analysis is a national level actor, the U.S. Navy.

The problem at the national level is to compete for funding against the other services as well as the other government agencies and entities competing for federal funding. As mentioned above, there is only so much money in the federal budget, and only so much of that is doled out to the DoD. This leads to serious competition within the department to justify service needs and this service funding.<sup>438</sup> In one of the most notable examples of this sort of knife-fight was the so-called “Revolt of the Admirals” in 1949. This was a bare-knuckled effort by the Navy leadership to fight the Air Force and by extension the Office of the Secretary of Defense in the aftermath of the cancellation of the first super-carrier, USS UNITED STATES (CVA-58) for funding.<sup>439</sup> The Navy lost but was in many ways saved if not redeemed by the advent of the Korean War and increased overall military funding as a result. This revolt, if somewhat

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<sup>438</sup> For more analysis and descriptions of inter-service resource competition see Jessica Blankshain. “Essays on Interservice Rivalry and American Civil-Military Relations.” (PhD diss., Harvard University, 2014). ProQuest Dissertations and Theses. John Doyle. “Analysts Predict Defense Budget Could Lead to Interservice Strife.” *Aerospace Daily & Defense Report* 221, no. 21 (2007): 1. Bruce Carlson. “In It Together Budget Decisions Should Be Immune to Interservice Rivalries.” *Navy Times*, 26 Mar 2007, 54. Arnold Kanter. “The Organizational Politics of National Security Policy: A Budgetary Perspective.” (PhD diss., Yale University, 1975). ProQuest Dissertations and Theses. Gordon Lubold. “’08 Budget May Revive Interservice Rivalries.” *Army Times*, 12 February 2007. “Pentagon May Face In-House Rivalry For Dollars, Budget Experts Say.” *Defense Daily* 233, no. 20 (2007): 1. For an interesting historical case study on inter-service budget competition see Brian Dollery, Zane Spindler, and Craig Parsons. “Nanshin: Budget-Maximizing Behavior, the Imperial Japanese Navy and the Origins of the Pacific War.” *Public Organization Review* 4, no. 2 (2004): 135-55.

<sup>439</sup> For more on the Revolt of the Admirals see: Jeffrey G. Barlow. *Revolt of the Admirals: The Fight for Naval Aviation, 1945-1950* (Washington, DC: Naval Historical Center, 1994). Keith McFarland. “The 1949 Revolt of The Admirals.” *Parameters* 11, no. 2 (1981): 53; Harlan Ullman. “Another Revolt of the Admirals?” *United States Naval Institute Proceedings* 133, no. 2 (2007): 8. “Admirals’ Revolt: Were U.S. Navy Admirals Right to Challenge Publicly the 1949 Cancellation of the Supercarrier Project?” *History in Dispute*, edited by Benjamin Frankel, vol. 1: The Cold War: First Series (Detroit, MI: St. James Press, 2000), 3-9. Gale Virtual Reference Library, [go.galegroup.com/ps/i.do?p=GVRL&sw=w&u=viva\\_odu&v=2.1&id=GALE%7CCX2876100010&it=r&asid=9b3cee4eb6319ddd3fcfa7ce81c9bf9](http://go.galegroup.com/ps/i.do?p=GVRL&sw=w&u=viva_odu&v=2.1&id=GALE%7CCX2876100010&it=r&asid=9b3cee4eb6319ddd3fcfa7ce81c9bf9). Accessed 6 Apr. 2017. Vincent Davis, *The Admirals Lobby* (Chapel Hill, NC: University of North Carolina Press, 1967). Steven L. Rearden, *The Formative Years, 1947-1950*, volume 1 of History of the Office of the Secretary of Defense, edited by Alfred Goldberg (Washington, DC: Office of the Secretary of Defense, 1984).

excessive, serves as an illustrative example of the ends to which the U.S. military services will go in order to secure their 'just' funding. The action of choosing to acquire the LCS was based on the objective of realizing some amount of federal funds in order to purchase capabilities execute required missions like mine hunting and ASW. It may or may not have been simply a lack of other viable alternatives but the then recent notoriety of the "Streetfighter" concept and war games and the Crossbow and Sea Lance engineering studies may have influenced the decision.

The options included a variety of other more traditional platform designs, potentially more airborne systems, maybe even a slew of unmanned systems. However, each of these options had their own drawbacks including limited flexibility, time to fielding, time required to test, expense, and so forth. The basic challenge with airborne systems was duration or time on station. Aircraft can fly far and fast but their ability to linger in a geographic region is limited when compared with that of a surface platform. Plus, while many aircraft can perform multiple missions, they don't carry the same number of sensors or amount of ordnance that a surface platform is capable of carrying, even one as small as the LCS. Finally, aircraft while generally cheaper than ships are often not that much cheaper, and it takes more airframes to provide the same time-duration coverage as a ship so any savings in individual platform costs would likely be negated by the numbers required not to mention the pilot training, crew training, aircraft maintenance, fuel, etc. Unmanned systems present or presented many of the same problems but additionally would have required more experimentation, research, and development to reach the same levels of performance as surface ships or their airframe alternative. Today, almost seventeen years on from the birth of LCS, unmanned systems remain less capable than most surface platforms and the command and control of unmanned systems is a communications and

software challenge of the first order. Thus, some sort of surface platform was the ‘best’ choice or the value-maximizing one at the time.

The consequences could be a relative loss of funding or the inability to execute required missions thus increased threat(s) to national security. The choice, for the Navy, was what system to select? Bearing in mind the mantra of “Transformation” echoing through the halls of OSD and Joint Forces Command (JFCOM)<sup>440</sup>, the Navy would have been ill-served<sup>440</sup> by trying to buy more of the same; meaning more destroyers (the DDG 51 class were still in production at the time) or another traditional frigate or “new” class of destroyers. Again, the system of systems to achieve the desired effects (see Effects Based Operations or EBO)<sup>441</sup> had to be transformative and revolutionary, for certain values of revolutionary. In order to achieve certain budgetary goals, the Navy needed to select a platform that could both meet its national security responsibilities but also scratch the itch at OSD and the administration. The Navy chose the LCS, with some additional intended mix of unmanned systems to augment the class’s capabilities.

The dominant inference pattern seems to bear up under the RAM analysis in that the Navy’s selected action was the value-maximizing means of achieving its objectives. The

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<sup>440</sup> Training Transformation - Office of the Under Secretary of Defense for Personnel and Readiness, “Strategic Plan for Transforming DoD Training,” 01 May 2006. DoD Directive 1322.18, “Military Training,” 03 September 2004. “US DOD: 2004 Training Transformation Implementation Plan Approved.” *M2 Presswire*, 2004, 1. “GAO: DOD Faces Challenges in Transforming Training.” *Aerospace Daily & Defense Report* 214, no. 60 (2005): 6. Marty Kauchak, “Carrying out DoD Transformation.” *Training & Simulation Journal*, 01 Jun 2003. “DoD Transformation Planning Guidance Sets Out Pillars For Progress.” *Defense Daily* 218, no. 9 (2003): 1. Paul Schreck. “How the Joint National Training Capability Will Help Transform Marine Corps Training.” *Marine Corps Gazette* 88, No. 5 (2004): 79-84. Jim Hodges. “Building Teamwork U.S. JFCOM’s Joint National Training Capability in Full Swing.” *Defense News*, 05 May 2008. Anonymous. “JFCOM’S JOINT NATIONAL TRAINING CAPABILITY MOVES FORWARD.” *Army Logistician* 37, no. 1 (2005): 45-46.

<sup>441</sup> For effects based operations (EBO) see Edward Allen Smith, and Command Control Research Program. “Effects Based Operations [electronic Resource] Applying Network Centric Warfare to Peace, Crisis, and War.” Information Age Transformation Series. (Washington, DC: CCRP, 2002). Edward C. Mann, Gary Endersby, Thomas R. Searle, and Air University Press. “Thinking Effects [electronic Resource] Effects-based Methodology for Joint Operations.” CADRE Paper; 15. (Maxwell Air Force Base, AL: Air University Press, 2002). David Deptula. “Effects-Based Operations.” *Air & Space Power Journal* 20, no. 1 (2006): 4-5. Charles Tustin Kamps. “Effects-Based Operations.” *Air & Space Power Journal* 18, no. 2 (2004): 18.

ultimate objective was to acquire replacement ships. These ships were needed to “support conducting prompt and sustained combat operations (the worst case) in support of national security objectives.” The objective preceding replacing these ships was to secure the funding to be able to buy them. This required support from the Secretary of Defense. Thus, it behooved the Navy leadership, for our purposes the CNO as a unitary individual should suffice, to sell the LCS to the SecDef and his bureaucracy. To sell it, the CNO needed to use words and phrases that resonated with Secretary Rumsfeld. The LCS as a concept certainly fit this bill. So, we saw the CNO pitching the LCS, in effect making the choice to acquire this system of systems to meet his service’s requirements. The action served to meet his statutory and assigned mission needs.

## MODEL II - EXPECTED VERSUS OBSERVED BEHAVIOR

Turning to organizational behavior as our analytical framework, we would expect to see the desire to maximize budget awards as an organizational outcome but maybe not the decision to maximize the shipbuilding budget. But again, we are faced with a two-level game of sorts as the Navy is competing internally to justify allocating resources and externally against the other services and sometimes congress to get the Navy’s ‘fair share.’ The shift from a unitary actor to a conglomeration of interests changes not only the dynamic but also the analysis. The expected behavior as noted above remains the same at one level but becomes a lot more controversial at the internal level(s) of the organization in question. Writ large, one could state that, in general, the Navy would prefer to have more systems, people and platforms than not. The form of these desired platforms becomes the key variable. Aviators want more manned airframes, submariners more submarines and ship drivers want more ships. The internal comparison of resourcing may reveal some insights into how the organization decided on LCS as an outcome.



The observed behavior is harder to parse meaning evidence is much thinner on the ground. This is due to a variety of reasons including security classification, proprietary information controls, and a certain lack of enthusiasm to discuss this procurement on the part of those previously and currently involved. We can however tease out some details from the official record. First, the Navy continued to support the acquisition of the LCS despite documented engineering challenges, pending weapons system challenges, and a distinct lack of professional enthusiasm from many in the surface warfare community. Secondly, the Navy conducted several internal re-organizations and created new sub-organizations to foster and care for the LCS through the construction of various hulls and the introduction of the class into the fleet. Finally, the Navy is continuing the acquisition even though it is likely to be less than expected and there is already a search underway to at least design the successor class.

Again, discovery in the sense of identifying evidence is much more problematic when dealing with the LCS acquisition. Besides the various factors mentioned above, people in the military portion of the bureaucracy tend to change more often than one would expect. Most uniformed personnel spend no more than three years working on any one specific acquisition program. Service needs, and individual career requirements dictate that commissioned officers especially need to move to new billets in order to continue their knowledge and experiential growth for promotion and employment in the larger, broader service organization. We can however determine at least one evidentiary event that speaks to the tendency of organizations to react to situations even new one by applying standard operating procedures (SOP).<sup>442</sup> The normal reaction of large organizations to situations, whether normal or abnormal is to act/react in

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<sup>442</sup> Allison & Zelikow, *Essence of Decision*, 144.

accordance with establish patterns of behavior.<sup>443</sup> The specific incident from the LCS acquisition program that indirectly highlights the application of standard routines is the reaction to the intended mechanical construction standards initially intended for the ship class.

The initial intention was to construct the LCS hulls based on a commercial standard, set by the American Bureau of Shipping (ABS).<sup>444</sup> This decision came under intense scrutiny as the first hulls were commissioned and the Navy Board of Inspection and Survey (INSURV) began to inspect the ships.<sup>445</sup> A series of Navy, GAO and congressional studies highlighted the perceived shortfalls of building the hulls to a non-Navy survivability standard.<sup>446</sup> While not directly addressing the current LCS construction standard the Director of Operational Test and Evaluation told congress that planned improvements in the LCS follow ships, a multi-mission frigate “will not significantly improve the new ship's overall survivability relative to LCS.”<sup>447</sup> The Navy has responded indirectly by raising the level of survivability standards to something

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<sup>443</sup> Ibid, 43.

<sup>444</sup> Sandra I. Erwin, “Navy's No. 2 Civilian Chronicles Missteps in Littoral Combat Ship,” *www.nationaldefensemagazine.org*, 29 January 2013. Megan Eckstein, “CNO 'satisfied' with LCS cost, schedule, performance GAO Report: Navy Considering LCS Changes That Could Raise Costs,” *www.INSIDEDefense.com*, 19 July 2013

<sup>445</sup> The Navy’s Board of Inspection and Survey (INSURV) is tasked to examine commissioned U.S. Navy warships and determine if their material condition is sufficient for the ship to remain in service as a unit of the fleet. The team is led by a senior flag officer and reports directly to the CNO and Fleet Forces Command on the inspection results. From the INSURV mission statement: “The Board of Inspection and Survey conducts acceptance trials of ships and service craft for the purpose of determining the quality of construction, compliance with specifications and Navy requirements, to determine if builder responsible equipment is operating satisfactorily during the guarantee period following acceptance and to make recommendations upon their acceptance by the Navy.” Available on-line at: <http://www.public.navy.mil/FLTFOR/insurv/Pages/Mission.aspx>. Accessed 16 May 2017, 0908 EST.

<sup>446</sup> Government Accountability Office, “Littoral Combat Ship: Knowledge of Survivability and Lethality Capabilities Needed Prior to Making Major Funding Decisions,” GAO-16-201, December 2015, summary page. Department of Defense, Director, Operational Test & Evaluation, FY 2014 Annual Report, January 2015, 203.

<sup>447</sup> Lara Seligman, “DOT&E Tells Hill Upgraded LCS Won’t Meet Standards For Modern Frigate,” *Inside the Navy*, 06 July 2016. See also Anthony Capaccio, “U.S. Navy Littoral Ship Found Vulnerable to Attack,” *Bloomberg News*, 24 June 2015.

more than standard ABS commercial levels while still, as evidenced above, not meeting the entirety of the Navy's standard for survivability.<sup>448</sup>

The organization's reaction was to apply a standard and standard response by trying to apply a modified version of the normal survivability standards to the design and construction of the LCS.<sup>449</sup> These were admittedly the lowest of the Navy's survivability but still to some this was an improvement over the straight-stick commercial ABS standards. The problem with changing the standards however is that it also increased the cost per hull. The following table reflects the estimated difference in construction cost per ton in similar ships and for LCS with increasing levels of survivability.<sup>450</sup> As the table shows (Table 5), striving to attain the slightly improved survivability of the Coast Guard's National Security Cutter (NSC) would have pushed the price-tag for LCS well over the initial \$250 to \$350 million goal. The organization found itself stymied by the cost increase inherent in the improved standards, but it dusted off another SOP and went hat in hand to Congress to ask for more money, with some success.

Ship Type	Light-ship displacement	Cost to Build (FY2005\$)	Cost per Ton	Standard
JHSV	1,515 tons	\$174M	\$115,000/ton	Commercial
NSC	3,206 tons	\$529M	\$165,000/ton	Commercial +
FFG 7	3,140 tons	\$617M	\$196,000/ton	USN Lev I
LCS	2,700 tons	\$310.5M	\$115,000/ton	Commercial
		\$445.5 M	\$165,000/ton	Commercial +
		\$529M	\$196,000/ton	USN Lev I

*Table 4- Construction Cost/Ton<sup>451</sup>*

<sup>448</sup> For the USN standards see, Navy Tactical Training Publication (NTTP) 3-20.31 (series) Surface Ship Survivability, Navy Ship's Technical Manual (NSTM) Chapter 55, V1, Surface Ship Firefighting, Chapter 079, V1, Damage Control and Stability, and V2, Practical Damage Control.

<sup>449</sup> Tony Capaccio, "Winning Over Congress Means Showing Ship Can Do Doughnuts," *Bloomberg News*, 22 July 2013. [www.bloomberg.com](http://www.bloomberg.com).

<sup>450</sup> JHSV – joint high-speed vessel, NSC – National Security Cutter, FFG 7 – OLIVER HAZARD PERRY class guided missile frigates.

<sup>451</sup> Source: Robert Work, "The LCS and How we got here," 7.

The second evidence of organizational behavior contributing to the explanation of how the LCS was procured is circumstantial but involved internal re-organizations within the Navy. While not exactly providing plausibility to the bureaucracies, if successful, will produce more of it, whatever it is and seek more resources to do theory posited by some economists, the increase in internal sub-organizations does reflect attributes of model II. The basic attribute it reflects is the already mentioned reaction to circumstance by using tried and true forms or processes; in this case setting up another committee the Littoral Combat Ship Council.<sup>452</sup>

Unlike some committees however, the composition of the LCS Council is both indicative of the important that the head of the service places on the class and the influence that its members can potentially exert in establishing the LCS as a viable platform in the Navy's arsenal. The council is composed of senior flag officers, Vice Admirals all,<sup>453</sup> and is chaired by the Director of the Navy Staff (DNS). DNS represents a major center of influence and bureaucratic power in the OPNAV staff and the Navy in a wider sense. The other principals include the Commander of the Naval Surface Force, the Commander of Naval Sea Systems Command (NAVSEA), and the Principle Military Deputy to the Assistant Secretary of the Navy for Research, Development, and Acquisition (ASN(RDA)). The Commander, Naval Surface Force is responsible for the manning, training, and equipping of all of the Navy's surface combatants.<sup>454</sup> His assignment and attention to this council adds emphasis to the service's commitment to successfully acquiring, fielding, and actually operating the LCS class. The

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<sup>452</sup> Office of the Chief of Naval Operations, "Littoral Combat Ship Council Charter." September 2012. <http://navylive.dodlive.mil/files/2012/08/Littoral-Combat-Ship-Council.pdf>.

<sup>453</sup> This specific Council represents a little bit over 10 percent of the Vice Admirals in the entire service.

<sup>454</sup> This is often referred to as the Title Ten or Title 10, U.S. Code responsibility of the services. For the Navy and specifically the CNO, the man, train, equip, and support duties are listed in Chapter 505, Subsection 5032. Available online at: <https://www.gpo.gov/fdsys/pkg/CPRT-112HPRT67344/pdf/CPRT-112HPRT67344.pdf>. Accessed 17 May 2017, 1549 EST.

Commander of NAVSEA is responsible for all of the systems installed or planned for installation on the LCS and also manages much of the research and development of the systems and their upgrades. The Military Deputy to the ASN(RDA)) is the senior uniformed naval officer involved in the design and procurement of all of the Navy's equipment from uniforms to ships. Much as in the case of COMSURFOR, making these officers members of the LCS Council gives them, their subordinates, and the Navy writ-large a signal that the Navy, as an entire organization is committed to the effective implementation of the LCS as a procurement program and as a fielded system of systems.

The actual mission of the council only serves to reinforce the importance that the service applies to the LCS. The specific mission of the LCS Council is to:

“...drive action across the requirements, acquisition, and Fleet enterprises of the Navy to ensure the successful procurement, development, manning, training, sustaining, and operational employment of the LCS Class ships, their associated Mission Packages, and shore infrastructure.”<sup>455</sup>

This makes it very clear that the Navy as an organization wants the LCS to succeed and is dedicating leadership and management resources to accomplish this goal.

The supporting members of the council further bolster this intent. The primary stakeholders include the Navy lead manpower office; the Deputy CNO for Manpower, Personnel, Training, and Education, the OPNAV Director for Surface Warfare, the Commander of Naval Air (vs. Sea) Systems Command, the Director for the PEO for LCS, and several key warfare and capabilities staff officers from both US Fleet Forces and the Pacific Fleet. Again,

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<sup>455</sup> LCS Council Charter, 3.

the scope of the responsible individuals and their seniority, most of these listed stakeholders are at least two-star admirals, indicates the importance of this program to the organization. So, while the Navy has applied a standard practice as per model II, the importance of the people assigned to the committee indicates this is not just “Let’s study this for a while” - with the inference that the delay created by the studying will see the issue goes away. There is also the difference in wording where this council is not directed to study a problem but instead to guarantee the success of this “problem.”

The second indication of organizational behavior as defined by Allison and Zelikow from the Navy in regard to LCS is the internal re-organizations or what the Navy calls ‘stand-up’ of new sub-organizations within the larger organization. This is keeping with the gradual and incremental changes in organization cited in *Essence of Decision*. In this case, besides the creation of a new Council for LCS in 2012, the Navy also created a Program Executive Office, Littoral Combat Ships (PEO LCS) on 11 July 2011. What is significant besides the creation or ‘stand-up’ of a new organization, PEO LCS was created in part from the existing PEO Littoral and Mine Warfare (PEO LMW). PEO LMW was created in 2002 and had been responsible for much of the mission module equipment and engineering responsibilities that was passed over to the new PEO LCS in 2011.<sup>456</sup> The sea-frame (or hull) had been under the management of PEO Ships working in concert with PEO LMW.<sup>457</sup> However, with the creation of PEO LCS, PEO Ships like LMW passed its acquisition and maintenance duties off to the new organization with

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<sup>456</sup> In turn, PEO LMW was the successor or step-child of PEO Mine Warfare (PEO MIW) founded in 1992 which originally had the mine-hunting and mine-sweeping systems in its portfolio. From the PEO LCS web-page. Available on-line at: <http://www.secnav.navy.mil/rda/Pages/PEOLCS.aspx>. Accessed on 23 May 2017, 1440 EST.

<sup>457</sup> Anonymous. "Navy Establishes Program Executive Office for Littoral Combat Ships." *All Hands*, 01 August 2011. See also NAVSEA Office of Corporate Communications, "Navy Establishes Program Executive Office for Littoral Combat Ships." 12 July 2011. Available on-line at: [http://www.navy.mil/submit/display.asp?story\\_id=61525](http://www.navy.mil/submit/display.asp?story_id=61525). Accessed 24 May 2017, 0900 EST.

some limited amount of resources, people and money also transitioning. This lineage of PEO LCS can serve as evidence of the slow but steady organizational processes that the Navy seems to favor. Reorganization can to a certain extent stand as a proxy for incremental changes to procedures and repertoires and the idea that new activities typically consist of marginal adaptations of existing programs and activities. In addition, they serve to reflect the concept of organizations having limited flexibility imposed from both within and without. In the case of the Department of the Navy limits are not just the result of institutional or cultural drivers but also political and statutory ones from DoD, the Chief Executive, and congress.

### MODEL III - EXPECTED VERSUS OBSERVED BEHAVIOR

Despite the apparent applicability or “rightness” of bureaucratic politics in a case like the LCS acquisition, the reality is not as apparent and clear once we look a bit closer. Under model III we would expect to see a significant amount of politicking going on within the Navy to garner support for LCS in comparison to other programs. There should be horse-trading, log-rolling, band-wagoning, favor swapping, and pork barrel exchanges between different organizations and individuals within the Navy hierarchy.<sup>458</sup> The different organizations or sub-organizations involved in this acquisition program would be trading influence, resources, or actual equipment in order to bolster support for the LCS. We would expect to see program offices trading future options to support systems under development or to be developed in exchange for providing ‘political’ support to LCS in the present. This kind of support can be political in terms of public

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<sup>458</sup> For more international relations/political science oriented definitions of band-wagoning and log-rolling see: Stephen M. Walt. *The Origins of Alliances* (Ithaca, NY: Cornell University Press, 1987); John Mearsheimer. *The Tragedy of Great Power Politics* (New York: W.W. Norton and Company, 2001) 162-3. Kenneth Neal Waltz. *Theory of International Politics*. 1st ed. (Boston: McGraw-Hill, 1979); James M. Buchanan, and Gordon Tullock. *The Calculus of Consent: Logical Foundations of Constitutional Democracy* (Ann Arbor, MI: University of Michigan Press, 1962); Douglas Irwin and Randall Kroszner. "Log-rolling and Economic Interests in the Passage of the Smoot-Hawley Tariff." *Carnegie - Rochester Conference Series on Public Policy* 45 (1996): 173-200.

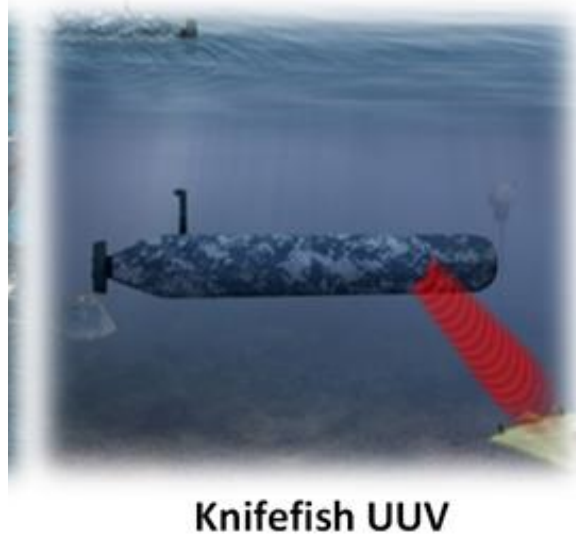
statements, point papers, or technical studies that positively endorse the intended capabilities of the LCS class. It can also be purely technical and somewhat passive in nature, where for instance the PEO for unmanned systems offers support in the form of advocating the systems that they are already responsible for which in turn will be installed onboard various platforms to include LCS. Unfortunately, most of the potential evidence for bureaucratic politics is not readily available.

What we can actually observe of the bureaucratic behaviors is indefinite, indirect, or inferential as evidence of bureaucratic politics. The strongest evidence may be found in the very beginning of the LCS acquisition, in fact before LCS became a designated ACAT program. The initial portion of design and construction funding was actually from Navy R&D funding vice the Navy's shipbuilding account.<sup>459</sup> This is indicative of a potential trade between OPNAV and the Navy's R&D community, potentially including the Office of Naval Research and NAVSEA. The specific offices involved in this are not clear, i.e. we can't immediately trace the money but again this unusual use of R&D funding could indicate a bargain between certain stakeholders in the Navy. Another example, similar to the notional one cited in the preceding paragraph, is where PEO Integrated Warfare Systems (IWS) as the responsible technical lead for the LCS ASW mission module supported the efforts of PMS 406, the PEO LCS organization responsible for several unmanned undersea vehicles to develop these systems with potential applications to non-LCS platforms. There is also some potential for internal bureaucratic politics as PMS 406

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<sup>459</sup> Telephone interview with government engineer, 01 Nov 2016, 1330 EST. Telephone interview with senior naval officer, 18 Jan 2017, 1400 EST. Note: No Navy R&D funds were spent before the award of the LCS design and build contracts; in comparison roughly \$5-6 billion were spent on the DDG 51 class before construction awards were made in the early 1980s.





***Figure 15- Graphic Representation of the Knifefish Underwater Unmanned Vehicle (UUV)***

*Source: PEO LCS, PMS 420 Brief to Navy League Sea-Air-Space Exposition, 17 May 2016.*



***Figure 16- RMMV testing underway***

*Source: PEO LCS Small Business Industry Day Brief, 13 Aug 2015*

and PMS 495, the program office for MIW systems are sharing some unmanned systems in development like the Knifefish<sup>460</sup> and the Remote Multi-Mission Vehicle (RMMV). These two systems are shown in Figures 15 and 16 above respectively. The focus is admittedly mostly on

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<sup>460</sup> Knifefish UUV Successfully Completes Mine-Hunting Evaluation, *Seapower Magazine*, 20 Mar 17.  
<http://seapowermagazine.org/stories/20170320-knife.html>

the mine-hunting mission area but there may be inferred potential to apply these underwater vehicles to submarine hunting in some scenarios. The other potential evidence of bureaucratic politics in terms of trading is the cancellation of the follow-on acquisition and the re-issuing of it at a later date. The delay in re-issuing the solicitation and the decision to not open up new, alternative supplier yards in addition to the Austal and Marinette teams resulted in significant short-term savings for the Navy. These short terms savings were re-programmed into other programs to include paying for several other Navy procurements.<sup>461</sup> The challenge is that we do not know what sort of bargaining took place within the Navy or what sort of agreements were made between the stakeholders to take this action. This is all circumstantial evidence at best and nothing but a straw man at worst. It is however, the best evidence we have indicative of some level of bureaucratic politics active in this acquisition program.

The third model is much more difficult to uncover, there remains no ‘smoking gun’ to which we can point in the case of the LCS. There is some evidence of bargaining that can be inferred from the facts available but nothing truly substantive to which one can definitively point. While this is true for the preceding models, uncovering the evidence to validate bureaucratic politics as a ‘culprit’ in the LCS acquisition is more obfuscated. This is true for two main and one minor reason. The first of the major reasons is that the acquisition program is still on-going thus subject to government and commercial proprietary rules. This also results in a certain level of unwillingness on the part of those previously and currently involved to speak candidly regarding the acquisition program. Many people who were formerly involved in the acquisition as uniformed personnel are not working on it as commercial contractors. Their continuing livelihood is heavily influenced and restricted by the LCS. The minor reason is that

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<sup>461</sup> Telephone interview with senior Navy officer, 18 Jan 2011, 1400 EDT.

some of the information and data, as mentioned earlier in this chapter, is classified or unclassified but “For Official Use Only” thus not readily available for use in this dissertation. One may be able to infer some evidence of bureaucratic politics based on the formation of the PEO, LCS in 2011. One can only infer though, that someone in the PEO Ships and LMW wanted to combine the authorities and responsibilities formerly held by the two separate offices into one “new” organization to be responsible for the LCS.<sup>462</sup>

## THE EVIDENCE OR LACK THEREOF

This leads into a somewhat longer discussion regarding the nature of the evidence and the conclusions to be drawn from it. As mentioned earlier there is no smoking gun in the records and information gathered in this dissertation to reveal complete compliance with any of the models that Allison and Zelikow described. There is however some evidence that provides grist for the analytical mill and that indicates some compliance with each of the three models from *Essence of Decision*. One caveat to bear in mind besides the current limitations on publicly available information is that this procurement is still on-going as is the introduction and integration of the LCS class into the fleet. Time or history not only provides the benefit of hindsight, it also reveals more objective data and personal accounts that can shed light on how LCS was bought and fielded.

The intended over-arching research question of this thesis was intended to be how and when individuals may have impacted or influenced the LCS acquisition. There is no hard and fast evidence or again, no “smoking gun” that we can point to and say, “There it is!” There is

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<sup>462</sup> There are however, several good studies that indicate that the Navy may not always exhibit behavior as predicted by the bureaucratic politics model. See Edward Rhodes, “Do Bureaucratic Politics Matter?: Some Disconfirming Findings from the Case of the U.S. Navy.” *World Politics*, Vol. 47, No. 1 (Oct 1994): 1-41 and Paul Mitchell, “Ideas, Interests, and Strategy: Bureaucratic Politics and the United States Navy.” *Armed Forces and Society* 25, no. 2 (1999): 243-65.

some limited anecdotal evidence regarding the role that some flag officers have played in the system design and acquisition<sup>463</sup> but it is just that unofficial anecdotal evidence – some might even say it is hearsay. On the other hand, and pertinent to the analysis of models II and III above, all of the interviews and discussions between the author and people involved in the program mention the role of different organizations within the Navy. One instance involved a reported discussion regarding the stabilized 30mm guns for the surface warfare mission package. A “faction from the N96 staff and the LCS program office” was looking to reduce costs and use a current MK38 Mod2 25mm gun that was already in the Navy’s inventory and would not require research and development investments. The contrary view stated by USFF N8/N9 and the then Surface Warfare Development Group (SWDG) was that the effectiveness of the new 30mm gun in a cost-weight-performance analysis more than justified the selection of these weapons over the existing 25mm guns. In the end, USFF N8/N9 and SWDG ‘team’ won.<sup>464</sup> No real mention was made of the opposing individuals by name, only the organizations that they represented. The same hold true for discussion regarding the engineering and other mission module discussions and correspondence that the author has had with past and current stakeholders. Other people have talked about the role of various PMS organizations e.g. PMS 420 for mission modules, PMS 505 for LCS fleet introduction, and the role of NAVSEA in the overall process but little mention is or was made of specific individuals.<sup>465</sup> So again, there is little or no evidence to back-up a hypothesis regarding the influence of individuals in this or any other procurement.

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<sup>463</sup> E-mail to the author from senior Navy officer 14 April 2016.

<sup>464</sup> Ibid.

<sup>465</sup> Telephone interview with senior government contractor, 29 April 2016. Interview between the author and senior naval officer, 09 June 2016. Telephone interview of government program manager, 01 November 2016.

## SUMMARY

So, what has this chapter done? It placed the LCS acquisition program into an analytical framework based on the three models of state behavior described in *The Essence of Decision*. It used these models to investigate the evidence available. It also attempted to show just how strongly or weakly the observed behavior of the Navy matched the expected behavior of an organization predicted by these models. There is some justification to state that the Navy did abide by the expectations of all three models and while the evidence is not overwhelming it does provide some level of justification for this conclusion. This contributes to understanding how the LCS acquisition went from a concept of a bunch of networked commercial platforms working in concert to a group of more expensive naval platforms, working with other existing naval systems with a much higher price tag and still to be verified performance. This section also addressed the evidence available and not available for investigating LCS. There are notable gaps in the data available and many people who might provide insight into the program either cannot or will not discuss it because of legal, proprietary, or security reasons. This makes the analysis more challenging but we as scholars can still draw some conclusions with some level of confidence. Finally, this chapter addressed the original research question of who and how individuals may have influenced or impacted the LCS acquisition program – and found little or no valid evidence to answer this question. It also noted that there is little justifiable evidence to even prove the validity of the question itself. At the end of the day, the best that we can do is look at the impact of the organizations involved in the procurement and draw some conclusions and inferences from their actions and the impact of these on the LCS acquisition program.

## CHAPTER 6

### RESEARCH FINDINGS OR THE “SO WHAT?”

There has been an almost decade’s long interval between the commissioning of the first LCS and the first fielding of a mission module. This is, by any reasonable standard, an excessive lag-time between initial operating capacity and fully functional capability attainment. While categorizing the LCS as a failed acquisition program may be excessive, claims of success are hard to justify at any level.<sup>466</sup> While the preceding lines may be more of a statement or recapitulation of the preceding chapters than a revelation, the delay in fielding a fully capable system of systems is the crucial issue that continues to dog the LCS program. Even if the ships themselves still suffered from the hull, mechanical, and to some lesser extent electrical shortcomings that they do, having a fully functioning set of mission modules would at least dampen the persistent critics and provide some justification for claiming at least a qualified success. However, the LCS class remains a single mission platform and even this SUW mission module is incomplete and does not meet the intended capability requirements for which it was designed. The following chapter will highlight some of the reasons pertinent to explaining this as well as re-engage the topic of grand strategy in the form of the strategic landscape or more conventionally to DoD joint doctrine, the operational environment.

There are several key findings from this study of the LCS acquisition program. These findings stretch across government acquisition, international relations, and defense planning

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<sup>466</sup> For a recent counter-argument regarding LCS program success see Carl Prine, “Once maligned, LCS program now a model in Navy” *San Diego Union Tribune*, 4 Sep 17. Available online at: <http://www.sandiegouniontribune.com/military/sd-me-littoral-ship-20170901-story.html>. Accessed 5 September 2017, 1157 EST.

topics, all of which represent topics of interest to scholars and practitioners in these fields. There is a distinct risk of developing a large gap in time between fielding a sea-frame and mounting all of the intended weapons and sensors on it to make the system of systems a “full up round.” This highlights the challenges of using Evolutionary Acquisition and Spiral Development. The choice of weapons systems for a predicted operational environment may or may not be suitable based on both the accuracy of the prediction and the actions of the participants in this environment. The case studies that follow serve to illustrate the difficulty in predicting the shape of the international system and the transitory nature the operational environment especially when the competitors begin acting and reacting to one another. None of these conclusions are revelations that have not been identified by scholars, acquisition professionals, or military planners but they do serve to add some more clarity to challenges in both acquisition and national security planning.

## EVOLUTIONARY ACQUISITION, SPIRAL DEVELOPMENT, AND THE TIME LAG

What this study reveals is that there is a significant lag time between the IOC of the LCS as a platform and the fielding of the weapons systems to arm it and complete its functional capability as an integrated weapons system. Or to put it another way, the LCS system’s full IOC has still not been achieved. This may not come as a surprise to the reader but if we look at the factors as described in the preceding chapters that contributed to this timeline, we can understand the how and the why of it. The dis-joint between platform or sea-/air-frame functionality and the functionality of the complete ‘system of systems’ could serve as a template or as a warning that may be applicable to a wider range of DoD weapons procurements especially those labeled as

“major weapons systems.” The separation of the platform or ‘carrying frame’<sup>467</sup> from the other systems that when joined create a major weapon system aka ‘system of systems,’ could serve as a cautionary tale for practitioners of both acquisition and warfare. Building a platform but not building the actual weapons, sensors, and software needed to fulfill the intended mission of said platform creates a risk that the platform cannot provide the capabilities required of it in a given timeframe – creating what the military terms “gaps and seams” in capability. The development, testing, and fielding of weapons, sensor, hulls, and propulsion need to be closely sequenced whether the hull is a ship, an airframe or an armored fighting vehicle. Building the best fighter aircraft in the world in terms of speed and maneuverability is wonderful until the missiles, guns, and radars are installed, operationally tested (optested), and the speed and maneuverability are re-tested with the added mass and weight. The physical impact of the required equipment may significantly and negatively impact the observed performance of the stripped-down airframe. Not only do the systems need to work as advertised but their impact on the physical capacity of the frame carrying them to move at the intended speed and with the intended agility needs to be tested and verified physically. Modeling and simulation and Computed Aided Design (CAD) have made huge advances in closing the gap between designed and observed performance but the final test always comes with the demonstrated physical performance of the entire system of systems, in the air, on the land or on (or under) the sea.

## EVOLUTIONARY ACQUISITION AND SPIRAL DEVELOPMENT

This case study also reveals what may represent a precautionary example for acquisition professionals and uniformed operators of the risk inherent in spiral development acquisition

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<sup>467</sup> Occasionally referred to as “the truck” or “pick-up truck” by the Navy.



programs.<sup>468</sup> While the idea of developing systems in a series of stages (or spirals), integrating and installing them as they reach a certain level of capability has notional merit, it also creates an increased risk of failure or under-performance. The over-arching acquisition concept is labeled evolutionary acquisition.<sup>469</sup> It is defined as an acquisition strategy that seeks to define, develop, produce or acquire, and field an initial hardware or software increment of operational capability with follow-on versions intended to provide increased levels of performance.<sup>470</sup> In turn, with Spiral Development (SD), the final functionality cannot be defined at the beginning of the program. Each increment of capability is defined by the maturation of the technologies and supported with the evolving capability needs of the user and continuous user feedback.<sup>471</sup> This was and is usually applied to software development and procurement for the DoD.<sup>472</sup> But as mentioned earlier, more and more complex weapons systems are completely reliant on software to function properly. So, even if the sensors, individual portions of the weapon, and the carrying frame or transport platform are built and function as designed separately, without the software to

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<sup>468</sup> Gary J. Pagliano and Ronald O'Rourke, "Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress," (Washington, D.C: Congressional Research Service, December 11, 2006). Brett Davis. "House Lawmakers Skeptical of DOD Acquisition Reforms." *Aerospace Daily* 201, No. 45 (2002): 4. Gansler, Jacques, and William Lucyshyn. "National Security Acquisition Challenges." *Strategic Studies Quarterly* 4, no. 4 (2010): 13-31. Jesse Ellman. "The Role of Evolutionary Acquisition and Spiral Development in the Failure of the Army's Future Combat System." Master's thesis, Georgetown University, 2009. ProQuest Dissertations and Theses. Ryan Novak, Trevor Sthultz, Timothy Reed, and Christopher Wood. "Evolutionary Acquisition: An Analysis Of Defense Procurement And Recommendations For Expanded Use." *Journal of Public Procurement* 4, No. 2 (2004): 238-67.

<sup>469</sup> See DoD Directive 5000.1, para 4.3.1 and DoD Instruction 5000.2, para 3.3, and USD(AT&L), "Evolutionary Acquisition and Spiral Development," Memorandum, Washington, DC: April 12, 2002 for definitions and more clarification. Of note, the most recent DoD Instruction "Operation of the Defense Acquisition System," DoDI 5000.02 dated 07 Jan 2015 (change 2 dated 02 February 2017) does not contain the terms "evolutionary acquisition" or "spiral development."

<sup>470</sup> USD(AT&L), "Evolutionary Acquisition and Spiral Development," Memorandum, Washington, DC: 12 April 2002 quoted in Manager's Guide to Technology Transition in an Evolutionary Acquisition Environment, DAU, Ft Belvoir, VA, June 2005, p.1-6.

<sup>471</sup> DAU, Manager's Guide to Technology Transition, 1-7.

<sup>472</sup> According to AcqNotes, a website for the aerospace community of interest ([www.AcqNotes.com](http://www.AcqNotes.com)), spiral development caused significant confusion in the aerospace acquisition community and is thus no longer used in Evolutionary Acquisition but is retained in software development. Available online at: <http://www.acqnotes.com/acqnote/acquisitions/evolutionary-acquisitions>. Accessed 08 August 2017, 0900 EST.

integrate them into the ‘weapons system’ and to operate them, they are just so much high-tech ballast. This is what LCS amounts to at this point; the transport system is functional and some of the mission modules are functional – sort of.... So, we have a platform with one mission module, the surface warfare one, somewhere past IOC but still lacking a key sub-system, the surface to surface missile.<sup>473</sup> The other two major mission area modules, the mine-warfare and anti-submarine warfare systems both remain in development. The spiral or parallel development of the mission modules, which have been delayed because of software, physical engineering challenges and funding issues caused by the Budget Control Act<sup>474</sup>, has resulted in what some have called a failed procurement program. Whether this condemnation is appropriate or not, there has been an almost decade’s long interval between the commissioning of the first LCS and the first fielding of one semi-functioning mission module for surface warfare.<sup>475</sup> This is, by any reasonable standard, an excessive lag-time between initial operating capacity and fully functional capability attainment for a weapons system.

There is an argument to be made that the LCS procurement was actually not a spiral development but an Incremental Development approach. This, in contrast to the SD approach, means that the final functionality can be defined at the beginning of the program, with the

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<sup>473</sup> Sam LaGrone, “Lockheed Martin Drops LRASM Out of Littoral Combat Ship/Frigate Missile Competition,” *USNI*, 24 May 2017. <https://news.usni.org/2017/05/24/lockheed-martin-drops-lrasm-frigate-missile-competition>. Jeff Martin, “Testing continues to mount Army missiles on Navy ships,” *WAAYTV.com*, 16 May 2017. [http://www.waaytv.com/redstone\\_alabama/report-testing-continues-to-mount-army-missiles-on-navy-ships/article\\_1c061162-3a92-11e7-8078-57129d8f00d2.html](http://www.waaytv.com/redstone_alabama/report-testing-continues-to-mount-army-missiles-on-navy-ships/article_1c061162-3a92-11e7-8078-57129d8f00d2.html). Combat Ship USS Jackson Completes Missile Test Off Southern California Coast, *NBC San Diego*, 03 May 17. <http://www.nbcsandiego.com/news/local/Combat-Ship-USS-Jackson-Completes-Missile-Test-Off-Southern-California-Coast-421249063.html>.

<sup>474</sup> This act passed in 2011 is often referred to as ‘sequestration.’ The continuing resolutions that congress has been forced to pass (2007-2011, 2013-date) has frozen funding resulting in gaps and shortfalls in the funding for the LCS program. These gaps are caused by both the frozen levels and the delay in obligating funds because of legal and accounting requirements. These delays in obligating funding and static funding levels have led to delays in development and testing of various systems and sub-systems in the mission modules.

<sup>475</sup> The surface to surface missile systems remains to be determined and procured. See Note 7 above.

content of each increment determined by the maturation of key technologies.<sup>476</sup> The key technologies in the LCS case are the mission modules and the sub-systems making up these modules. Even if this definition and program approach is true, it does not mitigate the fact that the bulk of the mission modules for LCS remain in the development stage of existence; the key technologies remain immature. This while the 12<sup>th</sup> ship of the class completed her builder's trials in May 2017 and the 14<sup>th</sup> ship of the class is slated for commissioning in the first or second quarter of calendar year 2018.<sup>477</sup> This gap represents or should represent, a warning to the DoD acquisition professionals and to the service operators trying to get their hands on new weapons systems that again, the timelines for platforms, sensors, and weapons systems need to be carefully monitored and adjusted, especially when a new and innovative major weapons system is in the acquisition process. This is not meant to suggest that synchronizing the various systems and sub-systems of a major acquisition program, especially if some of them are brand new technologies being developed, is simple or easy. However, the size and cost of major weapons systems and the accountability of the services to the civilian branches of government requires more accountability and visibility of the success, failure, and costs of the overall program. This makes it incumbent on the Department of Defense to manage as carefully as possible the costs versus the capabilities of new weapons systems.

Cost increases in ships, aircraft, and other DoD systems are not independent of market forces. Increases in the market cost of steel or aluminum or crude oil directly causes increases in both weapons procurement and operating costs. What DoD can control are changes in the

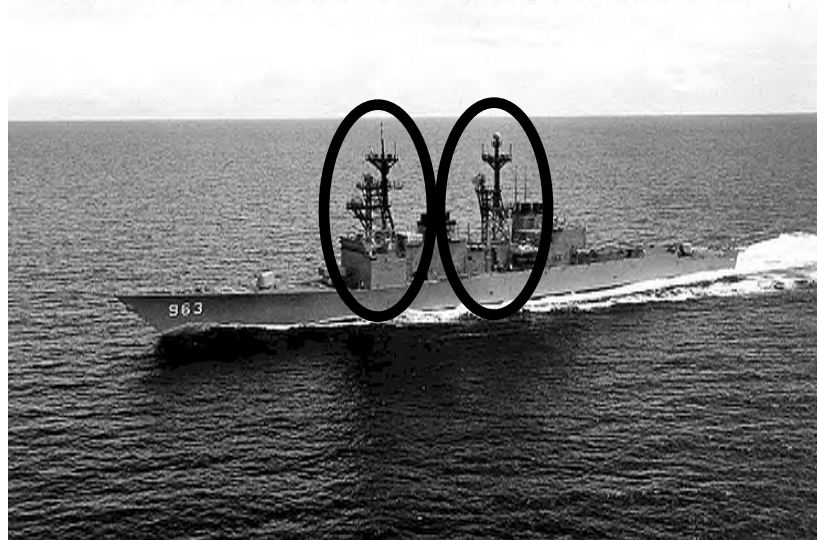
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<sup>476</sup> DAU, Manager's Guide to Technology Transition, 1-7.

<sup>477</sup> "Future USS Omaha Completes Acceptance Trials," *Seapower Magazine*, 22 May 2017. Available online at: <http://seapowermagazine.org/stories/20170522-Omaha.html>. Accessed 28 June 2017. "USS Manchester will be commissioned in Portsmouth in early 2018," *The New Hampshire Union Leader*, 27 May 2017. Available online at: <http://www.unionleader.com/war/uss-manchester-will-be-commissioned-in-portsmouth-in-early-2018>. Accessed 28 June 2017.

desired capabilities and thus what are consciously incurred cost increases vice the tyranny of the “invisible hand” or market price increases. This writer is reminded of a potentially apocryphal account of a design change to the ARLEIGH BURKE class of guided missile destroyers during the final design or initial construction phase of the lead ship. The class was reportedly designed with a standard mast standing vertically relative to the hull and waterline (see pics below) similar to the SPRUANCE class destroyers. However, during the design or actual construction phase a decision was made

Photo # USN 1164534 USS Spruance underway during her shakedown cruise, 1975



*Figure 17- USS SPRUANCE (DD 963) underway 1975. USN photo.*

by the Navy to build the class with a swept back and faceted mast as shown in the figure below.



*Figure 18- USS SHOUP (DDG 86), underway 2017. USN photo.*

The advantages of the design change were significant in terms of reduced radar cross-section and the ability of crew to access the antennas and equipment mounted on the mast using internal thus somewhat safer ladders. However, the cost was, at least anecdotally, quite significant to change the design rather late in the procurement process. The point to this example is that trading off cost increases for improved performance needs to be carefully and objectively done and some determination of the cost benefit of the change made before the contract and design are changed. The opportunity to label a change as part of adaptive acquisition or spiral development represents a risk of unintended cost increases that acquisition professionals and operators ought to monitor carefully.

## DESIGN VERSUS REALITY: THE ACQUISITION SYSTEM IN PRACTICE

What this case study also reveals is that despite or maybe because of a plethora of governing instructions, manuals, legal and regulatory requirements acquisition programs may not proceed with in accordance with the proscribed and described processes. As we saw in chapter two, there are literally thousands of pages of text describing how ‘things’ are to be procured by

the U.S. government. All of this direction does not seem to have resulted in a steady and predictable path for the LCS class of ships. Whether this is a truism that can be applied to all major weapons systems procurement programs is not absolutely clearly indicated through this single study, but it can at least serve as a point of departure for further studies, especially comparative studies of other acquisition programs like the Joint Strike Fighter or the now-cancelled Army's Future Combat System. Another program that could serve as a basis for further study is the current FORD-class aircraft carrier or the ARLEIGH BURKE guided missile destroyers. The advantage in comparing and contrasting these programs with LCS is the semi-unique nature of ship procurement which separates them from other acquisition programs. The technological and engineering challenges when a service is looking to push the performance envelope need to be considered very carefully and the required capabilities defined very clearly before an MDAP/ACAT level I-III program is pushed into the formal acquisition pipeline. Also, this close monitoring cannot be relaxed while the system is in the acquisition pipeline as noted in the preceding paragraph. The quest for better performance needs to be carefully weighed against the quest to control costs; or as the latest Defense Acquisition System instruction puts it:

“The Secretary concerned, in coordination with the Chief of the Military Service fielding the system, will balance resources against priorities and ensure appropriate trade-offs are made among cost, schedule, technical feasibility, and performance throughout the life of the program.”<sup>478</sup>

Despite careful attention to detail, program monitoring, or any potential defense acquisition reform effort the DoD remains bounded by the monopsonist nature of the market. The distortions inherent on this market make it difficult and costly to adjust programs and designs to fit emergent requirements or changes in the nature of the threat. Once the initial system design has been accepted and

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<sup>478</sup> DoDI 5000.02, “Operation of the Defense Acquisition System,” Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics (USD AT&L), Washington, DC, 02 February 2017, p. 2, para 4(d).

the price to create and manufacture and potentially maintain the system has been agreed upon changes will necessitate some adjustment to the contracted price, cost, or performance parameters. Statutory and proprietary issues generally prevent the transfer of contracts from one awardee to another excepting generally exceptional situations like bankruptcy or total failure to abide by the contract by the awarded firm. There is always either stated or implied the right of the government to terminate a contract “at the convenience of the government” but there are significant costs in these sorts of contract terminations. Often the terminated firm protests within the acquisition system, sometimes the legal system, and often the congressional delegation from the terminated company’s state starts to ask a lot of questions of DoD. Also, contracting officers tend to be a cautious and conservative lot and are far more likely to work with the incumbent almost beyond the pale to make a program successful. Finally, even if another firm is awarded the contract, they will obviously be behind the schedule compared to the former contract holder. All of this leads to a cramped market space with only a few competitors willing to provide the technological and manufacturing expertise that the government and DoD in particular need. And there is no guarantee that any firm will be able to deliver a system with different capabilities from the initial design for the same budget and cost, quite the opposite.

## THE STRATEGIC LANDSCAPE OR “OPERATIONAL ENVIRONMENT”

From the perspective of international relations and grand strategy, the LCS as a tool of grand strategy reflects the difficulty in predicting the challenges of the future, notably in terms of geography and in terms of the nature of the threat. This is especially pertinent in view of the recent shift in American focus from potential regional challenges to near-peer competitors and the so-called Pacific Pivot or shift in focus to Asia.<sup>479</sup> The LCS was designed for combat in the

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<sup>479</sup> In regard to the Pacific Pivot or re-balance see; Greg Kennedy and Harsh V. Pant. *Assessing Maritime Power in the Asia-Pacific [electronic Resource] the Impact of American Strategic Re-balance*. Corbett Centre for Maritime Policy Studies Series. (Farnham, UK: Ashgate Publishing Ltd, 2015). United States. Congress. House. Committee on Foreign Affairs. Subcommittee on Asia the Pacific, Author. *Resourcing the Pivot to Asia East Asia and Pacific FY 2015 Budget Priorities: Hearing before the Subcommittee on Asia and the Pacific of the Committee on Foreign Affairs, House of Representatives, One Hundred Thirteenth Congress, Second Session, 20 May 2014*. Shane

littorals and most specifically for a set of missions to be executed in the Strait of Hormuz, the Arabian Gulf, and the North Arabian Sea. There was some notional intent in the concept of operations for LCS that the South China Sea would also be a likely area of operations for the class, but the size of this area is significantly larger than the original regions envisioned in the design and earliest CONOPs development. LCS is less suited to operations South China Sea and the class not necessarily intended for operations in the Sea of Japan, the Northern Pacific Ocean or the North Atlantic and Mediterranean Sea. The shift in U.S. strategic focus has found the LCS concept and platform wanting, especially considering the lag in developing and deploying the mission packages. In some ways this reminds one of the aphorism that the military is always “planning to fight the last war.” While this has some applicability, it does not do justice to the transient nature of national interests which in turn drive state strategies. There are several case studies that we can examine that focus on the national or service prediction of the operational environment and the accuracy or variance of these predictions from the reality that developed.

## THE ROYAL NAVY AND PLANNING FOR THE MARITIME STRATEGIC ENVIRONMENT

The nearest case-study that we might apply in comparison is that of the Royal Navy in the Twentieth Century. In the early years of that century, the “Dreadnought Revolution” was actually just one part of what could be called the “Jackie Fisher Revolution” especially if applied in terms of the impact that Admiral John “Jackie” Fisher had on the Royal Navy from 1904-

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Kravetz. "Pivot to the Pacific-AT HYPERSONIC SPEED." *United States Naval Institute Proceedings* 142, No. 6 (2016): 62-65. Edward Timberlake and Richard Weitz. *Rebuilding American Military Power in the Pacific a 21st-century Strategy*. The Changing Face of War series (Santa Barbara, CA: Praeger, 2013). David Tier. "The Waning Grand Strategy of Democratization: Why a Pivot to the Asia-Pacific Places the United States at Greater Risk of Terrorist Attack." *Connections: The Quarterly Journal* 13, No. 2 (2014): 51-64. "Pivot Point: Re-shaping US Maritime Strategy to the Pacific." *Jane's Navy International* (Coulsdon), 01 April 2013. William T. Tow and Douglas T. Stuart. *The New US Strategy towards Asia [e-book] Adapting to the American Pivot*. Routledge Security in Asia Pacific Series; 30 (New York: Routledge, 2015).



1910.<sup>480</sup> Up to Admiral Fisher's appointment as First Sea Lord, the uniformed head of the service in 1904, the Royal Navy was somewhat mired in the customs and traditions of the service epitomized by the historic victory at Trafalgar and the Age of Fighting Sail. This is not to say the British ignored the technological changes from sail to steam that occurred between 1805 and 1904 but the technologies were not adopted systematically nor were they welcomed with open arms by a reportedly conservative service. Perhaps more dangerously, the service itself had not adapted operationally or culturally to the new demands placed on its leadership because of the increased speeds, longer gunnery ranges, and extended communications that were becoming the standards by 1900. Fisher saw both the changes in technology but also the changing strategic situation.

For almost two and a half centuries, France had been the main strategic threat facing the British Empire. This situation was altered by the rise of the German Empire in the latter half of the 19<sup>th</sup> century and radically altered by the first in a series of German Navy Laws in 1898. The growing threat of a modern and powerful surface fleet in the waters immediately adjacent to the British Isles became an issue that the Royal Navy could not safely ignore. In an interesting

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<sup>480</sup> See Arthur Jacob Marder. *From the Dreadnought to Scapa Flow the Royal Navy in the Fisher Era, 1904-1919* (New York: Oxford University Press, 1961) Vol. 1. *The Road to War, 1904-1914*. Vol. 2. *The War Years: To the Eve of Jutland, 1914-1916*. Vol. 3. *Jutland and After (May 1916-Dec. 1916)*. Vol. 4. *1917: Year of Crisis*. Vol. 5. *Victory and Aftermath*. Volume I presents the standard or traditional view of Fisher's contributions and the impact these had on the Royal Navy. John Fisher and Arthur Jacob Marder. *Fear God and Dread Nought the Correspondence of Admiral of the Fleet Lord Fisher of Kilverstone* (London: J. Cape, 1952). Nicholas A Lambert. *Sir John Fisher's Naval Revolution*. Studies in Maritime History (Columbia, SC: University of South Carolina Press, 1999). Christopher Bell. "Sir John Fisher's Naval Revolution Reconsidered: Winston Churchill at the Admiralty, 1911-1914." *War In History* 18, No. 3 (2011): 333-56. Archer Jones and Andrew Keogh. "The Dreadnought Revolution: Another Look." *Military Affairs* 49, No. 3 (1985): 124-131. Robert K. Massie, *Dreadnought: Britain, Germany, and the Coming of the Great War*. 1st ed. (New York: Random House, 1991). ----- *Castles of Steel Britain, Germany, and the Winning of the Great War at Sea*. 1st ed. (New York: Random House, 2003). John Tetsuro Sumida. *In Defence of Naval Supremacy [e-book] Finance, Technology, and British Naval Policy 1889-1914* (New York: Naval Institute Press, 2014). Charles H. Fairbanks. "The Origins of the Dreadnought Revolution: A Historiographical Essay." *The International History Review* 13, No. 2 (1991): 246-72. Ruddock F. Mackay. *Fisher of Kilverstone* (Oxford: Clarendon Press, 1973).

juxtaposition, the U.S. Navy saw a contrasting radical decline in the numbers and capabilities of its main competitor, the former Soviet Red Banner Fleets after 1989.

Fisher's reaction to the increased threat in home waters was twofold. First, he scrapped a variety of older, less effective warships whose obsolescence made them useless in potential combat against the new *Hochseeflotte*. Secondly, he significantly reduced the number of ships that the Royal Navy had formerly had scattered across the globe at various stations and instead concentrated the mass of the fleet in home waters or much nearer to the UK in the Mediterranean Fleet. The reduction in hulls which freed up significant manpower and money allowed the British government to fund the construction of new dreadnought, battle cruisers, and later super-dreadnought ships to match or overmatch the new Imperial German construction. The concentration of ships enabled the Royal Navy to train for larger fleet operations and to retain new construction ships once commissioned as opposed to dispatching them to the various fleet stations around the empire. The U.S. found itself again in somewhat the opposition situation where, to maintain presence world-wide and facing the changed nature of the threat, needed to disperse platforms to various numbered fleets around the globe. However, like the British, the scrapping or decommissioning of ships had freed up personnel and maintenance resources to potentially devote to new construction. The U.S. Navy suffers somewhat in comparison if we take the LCS as a proxy for adaption because it took over fifteen years from concept to execution. In the case of the Dreadnought Revolution, it took the Royal Navy about four years from concept to execution, although the full shift from global presence to home waters concentration did take roughly a decade to execute and was still, at least in some ways, a work in progress when the First World War broke out in August 1914. However, the bulk of the reaction to a changed operational environment was done in roughly six years. And in a more specific

comparison, the ship who gave her name to an entire generation of ship-types, HMS DREADNOUGHT was laid down, launched, and commissioned, as a complete and functional weapons system, in about 14 months.

The second episode that offers some insight as a comparison is again focused on the Royal Navy, but it occurred after the First World War and is more akin to the U.S. case, was an issue of dispersion versus concentration. The removal of the threat from Imperial Germany summarized with the scuttling of interned units of the *Hochseeflotte* in Scapa Flow in 1919 removed the immediate threat to the British Isles. However, the U.S. and Empire of Japan remained more or less comparable naval competitors and threats to the far-flung British Empire. The British were graced with several naval treaties, the most important the Washington Naval Treaty of 1922 through which most of the naval powers agreed to limit ship numbers, size and armament.<sup>481</sup> The Royal Navy was required to scrap several older and new construction battleships as were some of the other signatories. Though the threats may have been reduced the British naval commitments to defend the imperial territories were not. The British governments of the 1920s and 1930s applied the Ten-Year Rule but also took advantage of the dreadnought/super-dreadnought building holiday.<sup>482</sup> Instead the Royal Navy acquired cruisers displacing less than half of the larger super-dreadnoughts and costing probably less than half to build and certainly less to man and maintain. The “Treaty Class” cruisers provided the presence

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<sup>481</sup> See for example: Paul M. Kennedy. *The Rise and Fall of British Naval Mastery* (Atlantic Highlands, NJ: Ashfield Press, 1986). John Jordan. *Warships after Washington the Development of the Five Major Fleets, 1922-1930* (Annapolis, MD: Naval Institute Press, 2011). Thomas Hone and Trent Hone. *Battle Line the United States Navy, 1919-1939* (Annapolis, MD: Naval Institute Press, 2006). Richard J. Samuels. *Encyclopedia of United States National Security* [e-book]. Sage Reference Online (Thousand Oaks, CA: Sage Publications, 2006). Norman Friedman. *The British Battleship 1906-1946* (Annapolis, MD: Naval Institute Press 2015). Norman Friedman. "How Promise Turned to Disappointment." *Naval History* 30, no. 4 (2016): 26-31.

<sup>482</sup> *Grand Strategy, Vol I, Rearmament Policy*, N.H. Gibbs ed. (London: Her Majesty's Stationary Office, 1976), 806.

operations that the Royal Navy needed in the 1920s and 1930s. These ships also provided valuable service in combat during the Second World War but the Royal Naval found itself short of smaller anti-submarine escorts and aircraft carriers. These types of combatants were better suited for the specific high-intensity domains of warfare in the Second World War, namely ASW and air warfare.

## THE IMPERIAL JAPANESE NAVY AND SOVIET RED FLEET

There are two potential counter-factual cases that present choices in naval systems that were actually well suited and effective in the strategic environment for which they were intended and in which they were employed. The first of these was the case of the Imperial Japanese Navy between the wars.<sup>483</sup> The Japanese were faced by two main competitors who were both likely to field numerically superior fleets regardless of how much Japan invested in her Navy, the U.S. and the Royal Navy. The IJN chose a strategy that focused on the U.S. primarily and intended to attrite the attacking force as it made its approach across the vast expanse of the Pacific towards the home islands. The weakened U.S. fleet would be engaged in a Trafalgar-like fleet action resulting in decisive results.<sup>484</sup> The IJN designed its surface force to be the key ingredient in the climatic fleet action with the intent that each major unit, battleships and cruisers, would be individually a more effective fighting unit in comparison to the enemy ships. This choice of quality over quantity was in some ways a mandatory one based on the limited physical and fiscal

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<sup>483</sup> See David C. Evans and Mark R. Peattie. *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941* (Annapolis, MD: Naval Institute Press, 1997). Hiroyuki Agawa. *The Reluctant Admiral Yamamoto and the Imperial Navy*. 1st ed. (New York: Kodansha International; Distributed in the U.S. through Harper & Row, 1979). Paul S. Dull. *A Battle History of the Imperial Japanese Navy, 1941-1945* (Annapolis, MD: Naval Institute Press, 1978). Mark R. Peattie, *Sunburst the Rise of the Japanese Naval Air Power, 1909-1941* (Annapolis, MD: Naval Institute Press, 2001). Edwin P Hoyt. *Yamamoto the Man Who Planned Pearl Harbor* (New York: McGraw-Hill, 1990). Arthur Jacob Marder. *Old Friends, New Enemies the Royal Navy and the Imperial Japanese Navy* (New York: Oxford University Press, 1981).

<sup>484</sup> See Edward S. Miller. *War Plan Orange the U.S. Strategy to Defeat Japan, 1897-1945* (Annapolis, MD: Naval Institute Press, 1991).

resources that the imperial government could devote to the IJN. More importantly though, it was a strategic and operational choice made consciously by the service and consistently adhered to until the actual outbreak of the war in the Pacific.

The IJN did not formally abandon the strategy of attrition but it did find that the borders of the protective zone had been stretched well beyond the distances envisioned in the formulation of the strategy. It also found that ad-hoc commitments of forces, as in the Solomon Islands campaign disrupted its ability to mass against the later U.S. advance in the central Pacific because of the attrition that the IJN suffered from in the struggle over Guadalcanal and the islands in the Solomons group. Additionally, the alternate route of approach by forces under General MacArthur coming up the New Guinea and East Indies path created split-threat axes which the IJN would not have had sufficient resources to resist even without the grinding losses in the Southwest Pacific or from the Battle of Midway. One other capability gap had a significant impact on both IJN and the overall Japanese effort to resist the allied advance; the Japanese industrial base was too small to both maintain production of current systems and develop, field, and produce in significant numbers new weapons. For example, the “Zero” fighter totally outclassed the allied fighters it faced in 1941-1942 but starting in late 1942 both improved tactics but more importantly better Allied aircraft (both fighters and bombers) significantly reduced the effectiveness of the Zero.<sup>485</sup> Japan did field new fighters with better

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<sup>485</sup> See Henry Sakaida. *Winged Samurai: Saburo Sakai and the Zero Fighter Pilots* (Mesa, AZ: Champlin Fighter Museum Press, 1985). Saito Sakai and Martin Caidin. *Samurai!* (Garden City, NJ: Nelson Doubleday, 1978). Norman Friedman. *Fighters over the Fleet: Naval Air Defence from Biplanes to the Cold War* (Annapolis, MD: Naval Institute Press, 2016). James H. Belote and William M. Belote. *Titans of the Seas: The Development and Operations of Japanese and American Carrier Task Forces during World War II*. 1st ed. (New York: Harper & Row, 1975). Barrett Tillman. *Whirlwind: The Air War against Japan, 1942-1945* (New York: Simon & Schuster, 2010). Alan Schom. *The Eagle and the Rising Sun: The Japanese-American War, 1941-1943, Pearl Harbor through Guadalcanal*. 1st ed. (New York: W.W. Norton, 2004). Samuel Eliot Morison. *The Two Ocean War: A Short History of the United States Navy in the Second World War*. 1st ed. (Boston: Little, Brown, 1963). Samuel Eliot Morison. *History of United States Naval Operations in World War II*. 1st ed. (Boston: Little, Brown, 1947) (see especially volumes 3-5 for the Pacific battles of 1941-1943, including the Solomon Islands campaign).

protection (a specific weakness of the Zero) and other aircraft over the course of the Pacific campaign but never in large numbers. The IJN surface force continued to be an efficient and effective force but the open ocean carrier battles that followed the Solomons campaign were not the correct operational environment for surface engagements. The IJN had a fleet that was well suited for the operational environment for which it was intended. However, as the operational environment evolved, and the enemy got his vote, this tactical and technological edge was ground down and ultimately lost. This highlights the fact that operational environments can be envisioned, and systems designed to perform well in them. However, it also highlights the transitory nature of the operational environments and the importance of adaption and the ability to evolve for weapons systems after a conflict has begun.

The other case study that may apply is that of the Soviet Navy during the Cold War. The various Red Banner Fleets were intended to choke the NATO countries in Western Europe by re-fighting, successfully this time, the submarine campaigns of the two world wars in the North Atlantic and Western Approaches. The platforms that the Soviet Union designed and fielded in the 1950s through the 1980s were well suited to execute this intended strategy in the envisioned operational environment. The surface fleet was designed quite intentionally to support the submarine fleet through attacking and reducing NATO's anti-submarine escorts. The expansion of the Soviet fleet in the 1960s and 1970s was designed to negate or at least reduce the threat from U.S. carrier-borne aviation to protect surface units so that they could, in turn support the submarine force attacking Atlantic re-supply convoys. If one examines the design of the MOSKVA class helicopter cruisers, the number of surface-to-air missile launchers and anti-aircraft guns indicates the threat posed by NATO aircraft to Soviet surface ships and their design to defend against this threat. Another telling design feature was found on the Modified KASHIN

class destroyers and earlier classes of Soviet destroyers, where the surface to surface missiles were mounted to be launched from aft section of the ship. This was purportedly so that they would be facing away and steaming away from the aircraft carriers which were their primary targets while launching their surface-to-surface missiles.<sup>486</sup> In addition to this, all Soviet surface combatants mounted some type of air-to-air defense, mostly missiles but sometime guns, regardless of how small the ships were; this speaks directly to the threat that the Soviet Navy considered naval aviation to be. It also reflects Soviet efforts to design their ships to be effective and survivable in the operational environment that they thought would obtain in the North Atlantic in a war with NATO. The Soviet naval strategy was overtaken by economic events much as the RN and IJN suffered but resulting from the relatively peaceful implosion of the Soviet Union in 1989-1991 versus major global conflicts. Funding dried up and the ships, submarines, and aircraft of the former Red Banner Fleets were laid up, sold, or scrapped. Soviet designs however had been well suited to perform and potentially survive in the operational environment that the Soviet (and NATO) high command expected in a conflict during the Cold War. This is admittedly a hypothetical assessment because unlike the observed performance of the IJN systems in 1941-1943, there was no actual combat period from which we could assess the actual effectiveness of the Soviet naval systems. In contrast to the Royal Navy cases, these two examples show that operational environments can be predicted with some level of accuracy, but they reinforce the idea of the transitory nature of the operational environment. Even if a state designs its weapons and strategy to succeed in a predicted strategic landscape the landscape will

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<sup>486</sup> See, Stewart Menaul and Ray Bonds. *The Soviet War Machine: An Encyclopedia of Russian Military Equipment and Strategy* (New York: Chartwell Books, 1976), 137 and 112-153. J.E. Moore (ed.). *Jane's Fighting Ships 1979-80* (New York: Arco Press, 1979), 529-530.

change because as mentioned earlier the enemy gets a vote or competitor states act and react to moves by others.

The Royal Navy and the British governments before both World Wars were not poorly served by the tools of grand strategy that they thought met their strategic needs but these platforms, dreadnoughts and cruisers respectively, were not ideal for the threats that developed during the wars, submarines and later aircraft and submarines. These weapons platforms were not new but the improvements in performance, range, and weapons between 1918 and 1939 created a new level of threat from both aircraft and submarines. The ships that the British had on hand fulfilled their missions and were adaptable enough to provide some of the required mission capabilities but the operational environment that successive governments and the RN had predicated their planning on, besides even the notorious Ten-Year Rule and the various disarmament conferences was not exactly as they had foreseen. Neither of the wars against Germany and her partners was unforeseen, though the first was maybe a bit more overt in its nascence but the ferocity and longevity of the both struggles took British political and naval leadership by surprise. The nature of these wars and the technological development that was applied by both sides caused significant and somewhat unexpected losses among RN warships. The emergence of the submarine and the mine as effective weapons in 1914, again while not unexpected, created additional threats to the British battle-line. In 1939, the aircraft was added to this threat matrix and in both historical cases, the RN's major ship type suffered significant losses that might not have occurred if the environment for which they had been designed did not morph into a much deadlier one. This is the true key issue of these case studies and the application to LCS, predictions, even very good ones, of future strategic landscapes may miss intricacies or complexities that make the chosen tools of grand strategy less effective or increase



the cost of using them in ways or under conditions for which they were not designed. Alongside this is that weapons development and tactics are never stationary, to use a favorite military aphorism that seems oft forgotten, “The enemy gets a vote.” Threats will increase and change as combat occurs and as operators gain more experience. The missiles, torpedoes, mines, and ordnance that the LCS is designed to confront are likely to be either more effective or supplanted by some other, unexpected weapon.

The preceding paragraph is a bit of a statement of the obvious but the point that the tools of grand strategy are designed for a future that is at best estimated and at worst flat-out not considered. The reality will likely only bear a passing resemblance to the estimate whether it is done by the U.S. DoD or a science fiction author. The point is not so much to reiterate “We cannot know the future” but to state that the defense equipment purchased today may or may not be as successful as intended because conditions change. These changes can be tactical as pointed out in the preceding chapters or they could be truly strategic as for example the shift in British strategic focus from the French as the most likely enemy to the German Empire.

## WHAT CAN BE DONE?

First and foremost, military and political planners need to realize that the operational environment, military, political, meteorological, etc. is by its very nature, transitory. The facts that obtain today may or may not do so tomorrow. In the military, the planning term used to describe how planners deal with this is “branches and sequels.” The main plan has branch plans that are activated if a certain set of conditions applies or if and as conditions changes. Sequels are follow-on to branches and are used if the conditions remain stable. If not, one revisits the branches to select a more appropriate and hopefully effective model. From a weapons systems

perspective, designing in 'room' for upgrades whether mechanical or electronic is one way to address changes in threat systems or mission requirements.

In point of fact, the basic concept that LCS was designed to embody is another path to mitigate changes in the operational environment. Developing platforms that can be reconfigured to conduct a range of missions, with varying suites of weapons and sensors installed and swapped to fit the mission is another conceptually sound method of risk mitigation. It is however, as noted earlier dependent on the availability of functioning mission packages. There are other drawbacks to this approach as well. The time required to change mission modules and the geographic location of those modules and a facility in which the equipment can be off- and on-loaded represents a risk to quick execution. It may take longer to remove, install, and align new modules or take longer to get required modules to the ship's location than expected. Understanding these temporal and physical risks allow planners and operators to adjust scheduling and operations accordingly but the so-called 'tyranny of distance' remains a challenge for naval planners despite the U.S. Navy persistent forward presence globally.

Another option in contrast to a platform capable of performing multiple missions one at a time is the concept of fielding truly multi-mission platforms. As noted earlier, this had been the U.S. naval tradition for many years, at least since the beginning of the First World War. Ships were generally designed and equipped to carry out missions in several different areas, notably destroyers and frigates, the nearest analogs to the LCS. These ships were generally optimized for one mission, ASW but they were designed to have some capacity to perform surface and anti-air warfare to survive in the operational environment. It seems that the latest intended Navy ship acquisition program the frigate program (RFI: FFG(X) - US Navy Guided Missile Frigate

Replacement Program<sup>487</sup>) will return to this design paradigm. Having a ship equipped with various systems capable of performing different warfare missions makes it more effective potentially per unit but as we noted earlier, it also exponentially increases the per-unit cost. This is a solution to the risk, but the fiscal climate and available resources do not make this an optimal choice.

From the political perspective, managing conflict by adjusting the timing of conflicts and working to control the sequencing is another potential method for mitigating risk in the operational environment. While not always possible this at least offers some buffer for military forces if required to move to the threatened area or theater, often called “posturing” in DoD parlance. This returns us to the concept of grand strategy and utilizing all of the tools of national power, here in general the diplomatic skills and resources of the government. This may also serve to highlight the importance of diplomacy to both military and political leadership to gain time for a proper and proportional response in the military sphere if required. This potential solution is much more reliant on national level resources that may or may not be available or effective. It also pre-supposes that the diplomats can have some influence on the outbreak of hostilities.

Another possible method of adjusting to change in the operational environment is to take advantage of it by adjusting one’s operational approach or TTP. Things as basic as changing the geometry of physical approach to the scene of combat, hiding behind weather fronts, using alternate weapons or sensors or different platforms to execute missions form some examples of adapting or leveraging change in the operational environment. This is in many ways an echo or a

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<sup>487</sup>Solicitation Number: N0002418R2300. Available online at: [https://www.fbo.gov/index?s=opportunity&mode=form&id=83f2cfc75089c523d254000489a4a04a&tab=core&\\_cvi=1](https://www.fbo.gov/index?s=opportunity&mode=form&id=83f2cfc75089c523d254000489a4a04a&tab=core&_cvi=1). Accessed 5 September 2017, 1205 EST.

parallel to the idea of asymmetric warfare.<sup>488</sup> While asymmetric warfare has been more broadly applied to terrorism and insurgency in the recent past for obvious reasons, it still has application to more conventional, force-on-force military engagements. Many experts consider the Iranian military to have developed an asymmetric approach to deterring and potentially fighting the U.S. Navy in the Persian Gulf. Specifically, the Iranian armed forces have developed numerous small, high-speed boats, backed by anti-ship cruise missiles, submarines, and mines to threaten the U.S. Navy in areas where it lacks the weapons, tactics, or the operational space and time to effectively counter the threat.<sup>489</sup> In turn, the U.S. can adopt asymmetric tactics and operational maneuver to adapt to changes in the operational environment, whether more accurate hostile weapons, expanded threat sensor coverages, or changing alliance members to cite just a few examples. The other option that has recently raised cries of alarm from DoD leadership because of the threat to U.S. systems is the idea of cyber-attack.<sup>490</sup> The challenge here is that it

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<sup>488</sup> For asymmetric warfare see Robert Bunker and Minerva Chair. "The Complexity of Modern Asymmetric Warfare." *Parameters* 43, No. 4 (2013): 144-45. Raymond B. Mharapara, Lucky Bassie Bangidza, and Steven Gwekwerere. "Asymmetric Warfare: Experiences, Perspectives, Inkling and Challenges with a Focus on Zimbabwe." *Austral: Brazilian Journal of Strategy and International Relations* 3, No. 5 (2014): 97-115. Toshi Yoshihara and James Holmes. "Asymmetric Warfare, American Style." *United States Naval Institute Proceedings* 138, No. 4 (2012): 24-29. Army Asymmetric Warfare Office. *Army Asymmetric Warfare Office*. Washington, DC: Army Asymmetric Warfare Office, 2008. Anthony H. Cordesman and Center for Strategic International Studies. *Terrorism, Asymmetric Warfare, and Weapons of Mass Destruction Defending the U.S. Homeland* (Westport, CT: Praeger, 2002).

<sup>489</sup> Caitlin Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," *International Security*, Vol. 33, No. 1 (Summer 2008), 82–117. Mua Awad. "Iranian Midget Subs Pose Arabian Gulf Threat." *Defense News*, 11 Nov 2013. Anthony H. Cordesman and Martin. Kleiber. *Iran's Military Forces and Warfighting Capabilities the Threat in the Northern Gulf* (Westport, CT: Praeger Security International, 2007). Steve Coughlin. "Defeating the Nautical CHEAP SHOT." *United States Naval Institute Proceedings* 141, No. 6 (2015): 36-40. Massimo Annati. "Part I: The Threat: The Iranian Navy And The 'Naval Pasdaran': Asymmetric Warfare Mastered By The Gatekeepers Of The Gulf." *Naval Forces* 30, No. 1 (2009): 28.

<sup>490</sup> Regarding cyber-attack and cyber-warfare issues see, Pekka Lehto, Martti Neittaanmäki, and SpringerLink Content Provider, and Neittaanmäki, P. *Cyber Security [electronic Resource]*. Intelligent Systems, Control and Automation: Science and Engineering. Cham: Springer International Publishing, 2015. Jayson M. Spade, Jeffrey L. Caton. *China's Cyber Power and America's National Security [electronic Resource]* (Carlisle Barracks, PA: U.S. Army War College, 2012). United States. Congress. House. Committee on Armed Services. Subcommittee on Emerging Threats Capabilities, Author, United States. Congress. House. Committee on Armed Services. Subcommittee on Terrorism, Unconventional Threats, Capabilities, and United States. Congress. House. Committee on Armed Services. Subcommittee on Intelligence, Emerging Threats Capabilities. *Cyber Operations [electronic Resource] Improving the Military Cybersecurity Posture in an Uncertain Threat Environment: Hearing before the Subcommittee on Emerging Threats and Capabilities of the Committee on Armed Services, House of*

presupposes that hostile systems are as reliant on software to operate as U.S. and allied weapons, sensors and communications systems. The DoD's joint doctrine system cautions against assuming away an enemy strength and by extension one ought not assume away an enemy vulnerability. Based on this, cyber-warfare, attacking the software and computers that enable the command and control of weapons systems offers another possibility of mitigating or addressing change in the operational environment. This potential adaption policy is however potentially more susceptible to the transitory nature of the environment as it is very likely that a hostile force will notice when its radars do not detect aircraft or when missiles fail to explode. But again, warfare is often about moves, counter-moves, counter-counter-moves and so on; it represents an opportunity to address the shifting landscape of the operational environment however fleeting the opportunity may be.

One final approach to adapting to a changing battlespace to use the term in vogue previous to operational environment,<sup>491</sup> the DoD has pursued what were called non-material or non-technological solutions. These were included in the rather bulky term DOTMLPF-P<sup>492</sup> or Doctrine, Organization, Training, materiel, Leadership and education, Personnel, Facilities, and Policy. In the late 1990s and through the early 2000s, the emphasis, at least in the DoD and former-Joint Forces Command was on the doctrine and training headings of this term. The Army focused to an extent on the Leadership piece as they began investigating and working on what

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*Representatives, One Hundred Fourteenth Congress, First Session, Hearing Held March 8, 2015.* 2015. United States. Defense Science Board. Task Force on Resilient Military Systems. *Task Force Report [electronic Resource] Resilient Military Systems and the Advanced Cyber Threat.* 2013. Dean Cheng. *Cyber Dragon [e-book] inside China's Information Warfare and Cyber Operations.* Praeger Security International (Series). 2017.

<sup>491</sup> "Battlespace" as a joint doctrinal term was in turn preceded by the Army doctrinal term "battlefield."

<sup>492</sup> See CJCSI 3170.01, Joint Capabilities Integration and Development System (JCIDS). Available online at: [https://dap.dau.mil/policy/Documents/2015/CJCSI\\_3170\\_01I.pdf](https://dap.dau.mil/policy/Documents/2015/CJCSI_3170_01I.pdf). Accessed 05 September 2017, 2120 EST. The JCIDS Manual. Available online at: [https://www.dau.mil/cop/rqmt/\\_layouts/15/WopiFrame.aspx?sourcedoc=/cop/rqmt/DAU%20Sponsored%20Documents/20150212%20Approved%20JCIDS%20Manual%20with%20errata%20through%2020150327.pdf&action=default&DefaultItemOpen=1](https://www.dau.mil/cop/rqmt/_layouts/15/WopiFrame.aspx?sourcedoc=/cop/rqmt/DAU%20Sponsored%20Documents/20150212%20Approved%20JCIDS%20Manual%20with%20errata%20through%2020150327.pdf&action=default&DefaultItemOpen=1). Accessed 05 September 2017, 0922 EST.

was called mission-type orders, telling subordinates what needed to be done but not how to do it. All of the services and the National Defense University looked at the joint professional military education at the various staff and war colleges to investigate potential non-material solutions to waging war and peace. While material remained one of the terms this was supposed to be focused on non-acquisition things that could be purchased commercially and either weaponized or adapted to military requirements often called ‘Commercial-off-the-Shelf’ (COTS). Utilizing this analytical framework to look for efficiencies so to speak could offer some ways of dealing with changes in the operational environment. The areas that this author would highlight for the best possibilities are Training and Leadership and education. Any weapons system is only as good as the people that employ and operate it. Teaching operators, leaders, and followers that “the enemy gets a vote” and “No plan survives first contact with the enemy” could potentially provide a buffer against human surprise as the battlespace changes. While these pithy phrases seem just another set of buzz-words or phrase so adored by the U.S. DoD, there are some deep-seated lessons to be learned from them and developing officers and men who are flexible and adaptable would go a long way to making the instability of the operational environment less of a threat and more of an opportunity.

In an attempt to answer a perennial question, “What is the optimal match between a weapons system and the operational environment?” there are three main attributes of a weapons system to address. First the system ought to be flexible enough to perform under the predicted conditions of the expected operational environment while retaining sufficient performance to operate in an expanded or changed operational environment. This could be a reserve of speed, extra range, or back-up computers to name a few that with changes in weather, target range, and counter-measures still enable the system to find, fix, and kill the enemy. The second attribute

that a weapons system requires is the ability to adapt to the changing operational environment. This equates to sufficient volume, mass, control systems, and overall design features that enable upgrades when changes in the operational environment are so significant that the systems flexibility just will not achieve the intended and desired effect upon the enemy. The final attribute that would mark the optimal match between a weapons system and the operational environment is dependability. This means that regardless of weather, enemy actions, counter-moves, the weapons system works as advertised. The challenge is getting all of these characteristics into a weapons system with a definite budget and delivery schedule. Real world threats, dead-lines, and fiscal resources force weapons system designers, operators, and acquisition professionals to accept some lesser combination of flexibility, adaptability, and reliability.

## ORGANIZATIONAL BEHAVIOR MODELS REVISITED

One another level, this case study could serve as a very strong example of government or state actions as the output of processes. The transition of LCS from the initial concept of a series of cheap but fast networked platforms operating in concert with one another and other maritime assets to the current platform and mission module configuration could shed light on how the process morphs ideas based on both internal and external variables. The internal variables are rather clear from the Navy perspective, most notably the rejection of commercial material specifications for the ships and the adoption of modified Navy material standards for firefighting and damage control. The other variable addressed in the preceding paragraphs highlights an external variable, the perceived change in the strategic environment that impacted the current acquisition. This recent shift to a more traditional geo-strategic or geo-political challenge from

near-peer competitors has had significant impact on the DoD and on the Navy's acquisition execution and planning. This has directly impacted the Navy's LCS acquisition program and contributed to the decision to curtail the entire LCS procurement and replace it with a frigate acquisition program.<sup>493</sup> The previous historical case studies highlight another potentially interesting path for future research, examining weapons acquisition programs in light of changing strategic perspectives. How does a perceived shift in the nature or the scope of threat a state thinks it is facing impact the weapons that it acquires and what significance does this have for political and military leaders? Or in some ways more topical, framed in terms of the defense market, what impact(s) do changes in the strategic landscape have on commercial defense firms? Has the nature and speed of technological development changed the very nature of change in the international system?

From the acquisition perspective one interesting question that this program raises is whether or not there is a "point of no return" where the investment in the procurement and expected return on investment outweighed or began to outweigh the institutional incentive to abandon a program? Despite collecting a large amount of data there is again no smoking gun that provides a specific and definitive answer to this question. We can hypothesize that the point of no return in this case was when the Navy decided that the follow-on sea frame acquisition should be cancelled and re-issued. The Navy could have abandoned the whole program at this point but

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<sup>493</sup> Megan Eckstein, "Stackley: More Capable Frigate Requires Full and Open Competition, But LCS Builders May Have Cost Advantage." *USNI*, 12 May 2017. Available online at: <https://news.usni.org/2017/05/12/stackley-capable-frigate-requires-full-open-competition-lcs-builders-may-cost-advantage>. Accessed 28 June 2018. Sydney J. Freedberg, Jr., "Beyond LCS: Navy Looks To Foreign Frigates, National Security Cutter." *Breaking Defense*, 11 May 2017. Available on line at: <http://breakingdefense.com/2017/05/beyond-lcs-navy-looks-to-foreign-frigates-national-security-cutter/>. Accessed 28 June 2017. Bill Riales, "Austal Looks at LCS Redesign for Frigate," *WKRK*, 18 May 2017. Available online at: <http://wkrk.com/2017/05/18/austal-looks-at-lcs-redesign-for-frigate/>. Accessed 28 June 2018. Sydney J. Freedberg, Jr., "LCS: HASC Seapower Chair Praises Frigate Delay." *Breaking Defense*, 4 May 2017. Available online at: [http://breakingdefense.com/2017/05/lcs-seapower-chairman-praises-frigate-delay/?\\_ga=2.197073772.1538672250.1493964904-671527529.1483508113](http://breakingdefense.com/2017/05/lcs-seapower-chairman-praises-frigate-delay/?_ga=2.197073772.1538672250.1493964904-671527529.1483508113). Accessed 29 June 2017.



instead chose to re-address the intended long-term production plan and in the short-term, re-program some of the money to other acquisition programs. Unfortunately, there is no evidence besides the new RFQ for production from both Austal and Marinette issued by the Navy to indicate that this really was a point of no return for the program. The evidence in the form of budgetary and capabilities memoranda, meeting minutes, point papers, and PowerPoint briefs from within OPNAV itself and between OPNAV and the other Navy stakeholders are not currently available. This is definitely an opportunity for further study by both acquisition professionals and naval historians to see if there is a discernable point in the Navy's LCS acquisition where there was no turning back.

## SUMMARY

To steal an oft-quoted phrase attributed to Napoleon Bonaparte, "Ask me for anything but time." This is extremely apropos for this study because we have seen how the time difference between fielding a ship and fielding the systems required for that ship has contributed to a gap in mission capabilities for the LCS. We have also seen how the transitory nature of the strategic landscape impacts even the 'correct' weapons procurement plans of military services and states. The impact of Evolutionary Acquisition and spiral development has contributed to the disjoint between the launching of the sea-frames and the installation of the intended weapons and sensor systems. In turn, this time-lag has definitely reinforced the perception of the LCS as a failed acquisition program and a less-than stellar addition to the Navy's surface force. The selection of this tool of grand strategy and its focus on mission capabilities in one geographic area has revealed a level of risk based on the evolving nature of the operational environment, especially when we look at just how quickly this environment changes once 'battle is joined' and the contestants begin struggling to dominate a battle space. As General André Beaufré put it:

“These unquestionably complex problems [national security] have a double nature; on the one hand they are current and require each day practical decisions of considerable moment; on the other hand, they are related to hypothetical future situations.”<sup>494</sup>

There are also a couple of interesting questions regarding the design compared to the reality of procurement and the determination of a cancellation point for a major acquisition program – “Is it too Big to fail?” None of these revelations are exactly earth-shattering but they are interesting and do represent topics of interest for students of acquisition and international relations to potentially investigate further.

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<sup>494</sup> André Beaufré. *Strategy for Tomorrow* (New York: Crane, Russack, & Co., Inc., 1972) x.

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## APPENDIX A

### THE INTERVIEW PROCESS

#### Interviewing Process

The researcher applied Snowball sampling, requesting that interview subjects identify other likely subjects to interview. The proposal for conducting research using human subjects was reviewed and approved according to the ODU Procedures for Review of Human Subjects Research. After the ODU Arts & Letters Human Subjects Review Committee reviewed and approved (#95026201) my interview intent and process, I used or leveraged people I had served with in the Navy, the Navy Reserve or worked with as a contractor since 1989. The initial question was addressed to a former ship-mate who was still working for the Navy and he pointed me towards several folks who had potentially been involved in the LCS procurement and continuing fleet introduction program. I then contacted subjects using e-mail, telephone and Linked-In© to ask if they had experience in the LCS procurement and were willing to talk with me about it. I also used personal contacts, Linked-In© and google to locate contact information for Admirals Mike Mullen and Gary Roughead and several former Commanders, Naval Surface Forces to ask them if they would be willing to be research subjects. I was not however able to identify anyone in the contracting organization that would be willing or able to discuss LCS because of legal, proprietary, and contractual issues.

Those subjects who were willing and able to discuss the procurement received a copy of the survey sheet and a physical or phone interview meeting was scheduled. The meetings were done one on one with only the researcher and the interviewee in the room or on the phone. Once

the survey questions were addressed, the discussion shifted to a more general question and answer session about the LCS. After the interview, I typed up a set of notes and observations and provided these to the interviewee for review and correction as desired. Once a final set of notes was complete, the researcher used these as reference material for writing the dissertation.

## APPENDIX B

### THE INTERVIEW QUESTIONNAIRE

#### Interview Schedule

##### Introduction

The following questionnaire is presented as part of academic research into the U.S. Department of Defense/Department of the Navy (DoD/DON) acquisition procurement system, focusing on a case study on the Littoral Combat Ship (LCS). The study will examine the balance in procurement decisions between organizational behavior models based on Allison and Zelikow's 1991 edition of the book *The Essence of Decision: Explaining the Cuban Missile Crisis* and the observed, recorded or perceived role of individuals in the on-going procurement program for the LCS class for the U.S. Navy. The specific intent of the questionnaires and interviews is to collect anecdotal and contemporaneous data concerning how organizations and individuals and which specific organizations and individuals have been involved in LCS procurement decisions.

The specific intent of the questionnaires is to leverage the respondents' knowledge of and expertise in the LCS acquisition program to identify key organizations and/or individuals who may have had significant influence on the program at any stage. The focus is not to identify "good" or "bad" roles in this specific procurement but to identify key stakeholders and how they interact within the DoD and DON's acquisition program structure. The underlying research goal is to compare the influence of organizations with the influence of individuals and then to compare this influence with the more generally accepted theoretical models of organizational behavior used by Allison and Zelikow in *Essence of Decision*. The deeper goal is to potentially provide some insight to the services and to the acquisition community about how the acquisition process works, how generic organizations and generic individuals with the acquisition community and services may interact, and to identify potential recommendations for adjusting the DoD/DON acquisition process.

Your participation as a respondent is completely voluntary, you may withdraw from participation at any time, and all of your answers will be kept strictly confidential. If any information or observations that you provide are cited in the resulting dissertation, you will not be identified by name, rank, or specific billet. A set of generic titles, e.g. senior defense official, naval officer, government contractor, etc. will be used along with the time and date of the interview or correspondence when the information was provided. Please note that while every effort will be made to protect your specific identity and those of the individuals to whom you refer and who were or are acquisition process participants, there is some risk that readers may be

able to identify both your identity as a respondent and the identities of the individuals referred to in the interview.

If you are willing to participate, the following set of questions serve to set the framework within which a phone or face to face interview would take place. The interview is intended to take no more than 45 minutes of your time at your convenience. It is also not intended to be merely a recitation of the questions below but to present you the opportunity, as a Subject Matter Expert (SME) to discuss the acquisition program and process for the Navy's newest combatant class. Again, your participation is completely voluntary, you may withdraw from participation at any time, and your time and attention are greatly appreciated.

### Littoral Combat Ship (LCS) Procurement Questionnaire

- 1) How were or are you involved in LCS procurement?
  - a) Specific billets?
  - b) In what organizations (NAVSEA, OPNAV, PEO, etc.)?
- 2) What are or were some of the key Navy organizations involved in the initial decision to procure LCS?
  - a) What are or were some of the key Navy organizations involved in the decision(s) to procure Mission Packages (modularity)?
  - b) What were the Navy organizations involved in these decisions?
  - c) What other procurement decisions, either major program or major system, have been made over the course of the program esp. since IOC and deployment to the fleet?
  - d) How has the IOC and first deployment(s) of LCS impacted procurement?
- 3) Were there some stakeholders -meaning organizations - that you perceived to have greater impact on design and/or procurement decisions?
  - a) Were there specific people – pls identify by using a generic title or job description or rank/rate & pseudonym i.e. LCDR “Jones” or CAPT “Smith” – whom you perceived to have had a greater impact on design and/or the procurement process compared with other individuals or to organizations?
  - b) What is the balance between organizational inputs and inputs from specific people?
  - c) Where does the balance change through the procurement process?

4) How closely did or has LCS procurement follow the notional procurement process - from requirement definition through source selection to award?

a) How did the number of competitors impact the process?

b) How did the Navy's actions impact the process?

5) Who else should I or could I talk to IOT gain some insight and get other perspectives on the questions above?

6) If you could 'fix' the process – what are three critical things to change?

## VITA

Mr. Murphy holds a bachelor's degree in history with departmental honors and a minor in political science from Tulane University and a Master's in International Business Studies from the Darla Moore School of Business at the University of South Carolina. He is a graduate of the U.S. Naval War College, College of Distance Education, the Joint Forces Staff College, Advanced Joint Professional Military Education program and a Level III qualified Joint Staff Officer. He is a 28-year veteran of the U.S. Navy and Navy Reserve and works as a government contractor in the Hampton Roads region.