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THE ARSENAL SHIP AND THE U.S. NAVY: A REVOLUTION IN MILITARY AFFAIRS PERSPECTIVE

by

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December, 1996

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The thesis concludes that the Arsenal Ship is a viable platform for meeting the U.S. Navy's requirement for littoral power projection to meet the strategic and technological requirements of the 21st century. While there are limitations to the Arsenal Ship, the program is conceptually sound and the Arsenal Ship demonstrator program should be pursued.

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This thesis examines one of the U.S. Navy's major capability initiatives aimed at addressing the changed strategic and technological environment since the end of the Cold War. This initiative is known as the Arsenal Ship. This thesis considers operational concepts for use of the Arsenal Ship; it examines some of the cost and technical issues that have been raised, and it reviews possible alternatives.

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EXECUTIVE SUMMARY

This thesis examines one of the U.S. Navy's major capability initiatives aimed at addressing the changed strategic and technological environment since the end of the Cold War. This initiative is known as the Arsenal Ship. This thesis considers operational concepts for use of the Arsenal Ship; it examines some of the cost and technical issues that have been raised, and it reviews possible alternatives.

This thesis addresses these questions in seven chapters. Chapter I is the introduction. Chapter II discusses the fundamental changes in U.S. naval strategy following the end of the Cold War. It points out that the Navy's basic preoccupation with security on the high seas has shifted toward a strategy of joint operations conducted from the sea. Basic national guidance for planning and programming Navy operations from the sea is premised on the requirement that U.S. military forces be able to fight and win two near-simultaneous major regional conflicts (MRCs).

Chapter III discusses the so-called Revolution in Military Affairs (RMA). It specifically focuses on what some military planners believe will be a vastly enhanced U.S. capability to engage in "precision warfare." The chapter addresses innovative technologies which the Navy can capitalize on in attempts to maintain its dominant international position.

Chapter IV ties together the discussions in Chapters II and III. It argues that the strategic changes in the wake of the collapse of the Soviet Union, when combined with impending technological changes, amount to a revolution in naval affairs. It goes on to

examine elements required to provide a link between the current Navy and the Navy intended for the 21st century.

Chapter V discusses the concept of the Arsenal Ship, including principal features such as a planned 500-cell Vertical Launch System, substantial automation, greatly reduced crew requirements, and the incorporation of the Cooperative Engagement Capability. This chapter also addresses costs, survivability concerns and options proposed in lieu of the Arsenal Ship.

Chapter VI discusses some of the operational applications and deployment concepts of the Arsenal Ship. It is concerned in particular with how this capability may be fully integrated into a new Navy capability to directly and operationally affect the conduct of war on land.

The Arsenal Ship has its share of proponents and detractors. Supporters believe that the ship is critical to the Navy's requirement to meet the demands of both a littoral strategy and the current rate of technological progress. Opponents argue that it is imprudent to invest time and money in a new platform during an era of reduced global threat and while existing platforms are capable of meeting current and anticipated security requirements. This thesis concludes that, on balance, the Arsenal Ship meets the Navy's requirement for a platform capable of executing a naval power projection strategy in the 21st century. The Arsenal Ship may not be the perfect ship - important questions still remain. However, given the lengthy period of time associated with the development of new weapons systems, timely alternatives appear unlikely.

I. INTRODUCTION

The variety and design of ships in the Navy have been subject to very few large scale changes during the past 45 years. When they have occurred, they were typically the result of technological developments, new operational concepts or a combination of both. The result was commonly an incremental improvement upon existing ship designs. As the 21st century looms on the horizon, U.S. strategy is changing while technological innovation accelerates. The combination of these events raises the question whether or not improvements to existing ships will suffice for the future Navy or if there is a need for an entirely new type of platform.

The Navy has evidently decided upon the latter. On 18 March, 1995 the Navy signed an agreement with the Defense Advanced Research Projects Agency (DARPA) which formalized a cooperative effort toward the research and development of a radically different seagoing platform termed the "Arsenal Ship." The platform, when completed, will be vastly different from anything the Navy has in its inventory.

The Arsenal Ship is conceptually designed to carry a substantially higher ordnance payload than any current ship in the fleet. It is intended to provide massive firepower in the initial stages of a conflict while operating under an integrated C4I (command, control, communications, computers and intelligence) system consistent with the joint focus of the 21st century U.S. military.

This thesis addresses the strategic and technological changes that will have an impact on the future of the Navy. Initially, the work addresses the fundamental changes which have occurred in U.S. strategic thinking following the end of the Cold War. Chapter II analyzes those changes and the factors which have influenced them. Additionally, it examines the increasing emphasis placed on joint strategy in order to assess recent changes and determine whether or not those changes provide a catalyst for revolutionary measures associated with new platform designs.

Chapter III addresses the so-called Revolution in Military Affairs (RMA.) It reviews emerging innovative technologies and their potential impact on the way U.S. forces will operate in peacetime and, when required, during combat.

Chapter IV addresses the combined impact of strategic and technological change which, this thesis proposes, has set the stage for a naval revolution. The chapter focuses on one dimension of this revolution in particular, i.e. the concept of "precision strike." This concept is central to the Arsenal Ship. The Arsenal Ship, when mated with precision strike capabilities and innovative operational strategies, has the potential of changing the Navy's institutional make-up in a manner as dramatic and far-reaching as occurred with the creation of nuclear-powered submarines, the emergence of the aircraft carrier as the capital ship, and the development of amphibious warfare techniques during in World War II.

Chapter V considers the Arsenal Ship's principal features. It also addresses the main

concerns that have been raised as well as some of the alternatives which have been proposed.

In previous eras revolutions have resulted in institutional changes for the Navy. The transition of the Navy from a service identified with the battleship to one identified with the aircraft carrier was significant and had a far-reaching organizational and professional impact throughout the service.[1] Fifty years later the possibility of such a change occurring again has arisen with the concept of the Arsenal Ship. Chapter VI analyzes the operational potential of the Arsenal Ship in the current geopolitical and security environment. It assesses whether or not the Arsenal Ship might be an appropriate choice for the Navy for the next 25 years.

In summary, this thesis assesses strategic and technical issues which will potentially effect the future security environment in which the Navy will be operating. The primary question of this thesis is whether or not changes associated with the shift in the Navy's strategic focus have created a gap in current U.S. naval ship capabilities. If so, the next question is whether there is a need for a new ship within the Navy and whether the proposed Arsenal ship is the appropriate solution.

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[1] References include: Richard Hough, *Death of the Battleship*, (New York: The MacMillan Company, 1963) and Clark G. Reynolds, *The Fast Carriers: The Forging of An Air Navy*, (New York: McGraw-Hill, 1968).

II. THE STRATEGIC REVOLUTION

A. LITTORAL FOCUS

Recent changes in strategic direction and doctrine of U.S. naval forces have shifted the focus of naval roles and missions in such a dramatic fashion that some might view them as revolutionary. One of the questions this thesis attempts to answer is whether, as a result of revolutionary changes in U.S. naval strategy, an innovative new ship concept is necessary or appropriate for the strategic environment facing the U.S. military in the 21st century.

During the five years or so preceding the collapse of the Berlin Wall, Department of the Navy strategic thinking was exemplified by the Maritime Strategy.[2] This strategic concept focused on the use of Navy and Marine Corps forces in a global war with the Soviet Union. Specifically, the Maritime Strategy was centered around the concept of "blue water" or open-ocean naval warfare against a powerful Soviet surface, submarine

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[2] Admiral James D. Watkins and General P.X. Kelley, "The Maritime Strategy" and "Amphibious Warfare Strategy", as published in U.S. Naval Institute Proceedings, 112, no. 1 (January, 1986): 2-29. This was the official statement of policy during the 1980's for U.S. naval forces, combined with other U.S. services and allied forces, on how preparations would be made for fighting and terminating war on favorable terms. (henceforth cited as the Maritime Strategy.)

and air fleet.[3]

The end of the Cold War and collapse of the Soviet Union, spelled the demise of the Maritime Strategy. As a result, the Navy announced a "fundamental shift away from open-ocean warfighting on the sea toward joint operations conducted from the sea."[4] This shift served to re-focus U.S. naval capabilities on the need for joint and combined operations, forward presence and power projection, strategic deterrence, on-scene crisis response; and sea-lift.[5] Collectively, these and related missions are expected to be carried out primarily in littoral waters adjacent to the land mass.

From the Sea and Forward...From the Sea are not the sole sources for this "fundamental shift." The need for U.S. naval forces to be able to influence events on land was highlighted in the results of the Department of Defense Bottom-Up Review (BUR).[6] This document, signed by then - Defense Secretary Les Aspin and published in 1993, announced the restructuring of U.S. military forces to cope with the new dangers of the post-Cold War era, specifically aggression by regional powers requiring that U.S. forces

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[3] Ibid.

[4] Department of the Navy, From the Sea: Preparing the Naval Service for the 21st Century, (henceforth noted as ...From the Sea), (Washington, D.C.: September 1992), 3. This document is the foundation for the U.S. Navy's strategy and doctrinal shift from planning associated with war at sea toward joint operations on land supported by naval forces "from the sea". The strategic concept was expanded in the 1994 publication of Forward... From the Sea, (Washington, D.C.: Undated).

[5] Ibid, 2.

[6] Secretary of Defense Les Aspin, Report on the Bottom-Up Review, (henceforth cited as BUR), (Washington, D.C.: October 1993).

henceforth be designed to fight and win two nearly simultaneous major regional conflicts (MRCs).[7]

The BUR's two-MRC scenario posed a formidable doctrinal challenge for the Navy. The BUR made clear that the principal adversaries likely to be encountered would be land-based, and their forces would be predominantly comprised of tanks, armored personnel carriers, land-based aircraft and ballistic missiles, etc.[8] The question before Navy strategists was how the service, whose capabilities and operational concepts had historically been focused on engagement on the high seas, could best ensure its operational relevance against a land-based adversary.

According to the BUR, the U.S. response to a major regional conflict would entail four main phases: (1) halt the enemy invasion, (2) build up U.S. combat power, (3) decisively defeat the enemy, and (4) provide for post-war stability.[9] The ability of U.S. forces to halt an enemy assault quickly and before the opponent reached key strategic objectives was believed central to U.S. success. Concentrated firepower early in the conflict was believed to hold the key to this success.[10] The Arsenal Ship appears to be the Navy's solution.

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[7] Ibid.

[8] Ibid, 13.

[9] Ibid, 15 - 16.

[10] Ibid, 15.

B. JOINT WARFARE

The strategic necessity for naval forces to re-direct their capabilities and operational concepts away from open-ocean warfighting toward operations on and over land, has re-enforced the necessity for joint operations with land-based Army and Air Forces. The Chairman of the Joint Chiefs of Staff's vision of how American military forces are to fight and win their next "joint" war, was articulated in a document entitled Joint Vision 2010.

1. Joint Focus on Strategy

Joint Vision 2010 provides a template for the evolution of the U.S. Armed Forces into the next century.[11] Four broad operational concepts are highlighted in Joint Vision 2010: (1) dominant maneuver, (2) precision engagement, (3) focused logistics, and (4) full-dimensional protection. Collectively, they define "full-spectrum dominance." Its spearhead in a MRC will be the Navy. Joint Vision 2010 indicates naval forces will substantially contribute to the initial means by which joint operations will commence in the event of a crisis. Forward deployed naval expeditionary forces are extremely mobile

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[11] General John M. Shalikashvili, Chairman, Joint Chiefs of Staff, Joint Vision 2010, (Washington, D.C.: Government Printing Office, as published in *Joint Force Quarterly*, Summer 1996), 38. References for policy on joint activities include: Joint Warfare of the U.S. Armed Forces, Joint Pub 1, (11 November 1991), and Unified Action Armed Forces, Joint Pub 0-2, (24 February 1995).

on global sea lanes. They are largely free from foreign basing and overflight constraints that can hinder land-based forces. Additionally, they can be assembled out of range of enemy forces, yet ready for action in the event a decision is made to commit forces. If the political-military situation changes, they can be withdrawn without entanglement ashore.[12]

It appears that the Navy is striving to re-invent itself in concert with the changing international security environment so as to ensure its decisive contribution to future operations. The change from the Maritime Strategy to littoral warfare necessitates a reassessment of the structure of the fleet. Changes are discussed further in Chapter IV.

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[12] Office of the Chief of Naval Operations, Naval Operational Concept, (draft copy dated 14 June 1996), 4.

III. REVOLUTION IN MILITARY AFFAIRS

As described in the document Joint Vision 2010, "full-spectrum dominance" is essentially the concept of dominating the full range of military operations from humanitarian assistance to full-fledged combat through a synergistic utilization of dominant maneuver, precision engagement, full dimensional protection, and focused logistics. In order for U.S. forces to ensure the capability to achieve this goal, they must modernize. According to Andrew Krepinevich, "a military whose modernization can be sustained over the long term is in the best position to contribute to an overall national security strategy designed to dissuade would-be proliferators and great power challengers, while maintaining sufficient capability for the regional rogue states and peace operations that confront it in the near term."[13]

Modernization of the U.S. military will most likely take advantage of what many commentators believe is an impending RMA. The latter has been variously defined, but a most useful description has been offered by Dan Goure'. He explained the RMA as "complex changes in military organization, operations, and capabilities that are linked to

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[13] "The Coming Defense Train Wreck and What to Do About It," *The Washington Quarterly*, (Winter 1996), 107. Comments made by Andrew F. Krepinevich who is the Director of the Center for Strategic and Budgetary Assessment, formerly known as the Defense Budget Project.

new technologies with greatly advanced capabilities."[14]

A. CONCEPTS OF THE RMA

As the idea of an RMA has gained increased acceptance, it is essential to understand the concept. An RMA is commonly triggered by new technologies which lead to new military equipment that, in turn, prompt changes in operational concepts, as well as doctrine and organization.[15] As a result, the conduct of war is fundamentally altered. Two leading interpreters of the contemporary RMA, Andrew Krepinevich and Andrew Marshall, have explained the process as follows: RMAs, claims Krepinevich,

> ... often are stimulated by significant changes in technology that facilitate a discontinuous leap in military effectiveness over a relatively short period of time, as occurred, for example, between the world wars. They are typically characterized by the rise of new military organizations which are created to fill new roles and to execute new missions.[16]

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[14] Dan Goure, "Is There a Military-Technical Revolution in America's Future?," *The Washington Quarterly*, (Autumn 1993), 16, no. 4, 179.

[15] James R. Fitzsimonds and Jan M. Van Tol, "Revolutions in Military Affairs", *Joint Forces Quarterly*, (Spring 1994), 25 - 26.

[16] Andrew F. Krepinevich Jr., The Military Revolution: Restructuring Defense for the 21st Century, Testimony Presented to The Senate Armed Services Subcommittee on Acquisition and Technology, (5 May 1995), 2.

Marshall has offered this clarification:

> ...innovations in technology make a military revolution possible, but the revolution itself takes place only when new concepts of operation develop and, in many cases, new military organizations are created.[17]

1. Components of the RMA

The currently proposed RMA is characterized by stealth, global mobility, long-range precision strike, information warfare, and the effective use of space.[18] It embodies the idea of a change in warfare that is so drastic, the results completely alter the way future wars will be fought. Historical examples include the aircraft which gave commanders a view of the entire battlefield and spawned aerial bombing; the submarine which presented a hidden and deadly threat to surface ships; and nuclear weapons which brought massive indiscriminate destructive capability to warfare. Each changed the way in which war was to be prepared for and fought.

What are the components of a new RMA in the next century? According to Martin Libicki, "the twin roots of the RMA emerged in the late 1970's. First came the

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[17]Andrew W. Marshall, Testimony Before the Senate Armed Services Committee, Subcommittee on Acquisition and Technology, (5 May 1995), 1.

[18] Andrew F. Krepinevich, Jr., "Keeping Pace with the Military-Technological Revolution," *Issues in Science and Technology*, (Summer 1994), 24.

development and proliferation of short-range precision-guided munitions (PGMs)."[19] The second root of the RMA, writes Libicki, is the "rapid and sustained improvements in information technology."[20]

With improvements in weapons technology long-range PGMs increasingly appear to be the weapon of choice for future strike operations.[21] The development of computers, satellites, and imagery has been occurring at an astounding rate, and there is no indication this will slow down in the foreseeable future. The inference is that the U.S. military will expand the ability to collect, evaluate and disseminate information relevant to the battlefield at a rate far greater than most current military opponents are capable of countering.

The key to the RMA then appears to be precision warfare. Precision warfare is the utilization of information technology in determining essential targets, combined with PGMs tasked to strike those targets. Precision warfare should increase the target kill rate while reducing the number of munitions and platforms necessary to achieve an

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[19] "The Coming Defense Train Wreck and What to Do About It," 110. Comments by Martin Libicki.

[20] Libicki, "The Coming Defense Train Wreck...," 110.

[21] Andrew F. Krepinevich, Jr., "A New Navy for a New Era," (Washington D.C.: Center For Strategic and Budgetary Assessments, May 1996), i.

operation's goal.[22] According to Libicki, future precision strike capabilities will mean that, "to be seen on the battlefield is to be killed."[23] The life span of equipment currently in inventory is rapidly decreasing. It therefore seems that many of the principal weapons systems of the next quarter century will likely be designed and built around the turn of the century.[24]

Acknowledging the rapid change in military affairs is crucial in order to assimilate the capabilities required of weapons or platforms that will contribute to winning a war in twenty-five years. Coupled with this is the critical need for ensuring the development of concepts of operations that incorporate the new technologies, and of organizations to permit effective exploitation of the new capabilities.[25]

B. TECHNICAL REVOLUTION

1. Information and Communications Warfare

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[22] Captain Edward A. Smith, Jr., a senior member of the CNO's Executive Panel, this information was gathered during an interview conducted 20 May 1996.

[23] Libicki, "The Coming Defense Train Wreck...," 110.

[24] Fitzsimonds, "Revolutions in Military Affairs", 28.

[25] Ibid, 29.

A most prominent aspect of the RMA is the revolution in information technology. Increasing focus is being paid to the development of technologies which enhance the ability to locate, identify, and track targets in greater numbers as well as over an extended period of time. Innovation associated with satellites and fixed platforms is rapidly improving these efforts. Future advances in sensor technology may open up unused portions of the electromagnetic spectrum that, when matched with improved computational capabilities and deployment in space, offer the prospect for a truly transparent battlefield. Meanwhile, improvements in the area of electronic systems and propulsion systems may be redesigned in a manner which will make platforms virtually undetectable.[26]

Future battlefields may be dominated by a struggle for "information superiority." Much, if not most, information gathering, transmission and dissemination will be done automatically, without human interference.

Such automation, though necessary, also creates new vulnerabilities. The most obvious is that associated with effective electronic countermeasures. It has been and will remain a primary military goal to render the opponent deaf, dumb and blind. Therefore, while the U.S. strives to improve its information and communication components, it must remain alert to associated vulnerabilities and strive to overcome them.

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[26] Goure', "Is There as Military-Technical Revolution in America's Future?," 180.

2. Weapons Systems and Platforms

Information warfare will probably be a central focus of future wars. But it alone cannot deter or win wars. Essential elements which must be present to exploit the benefits of information warfare are appropriate and sufficient weapons and platforms, i.e. precision strike weapons and launch platforms. Long-range precision strike weapons mated with stealthy platforms will allow mission accomplishment while minimizing platform vulnerability to enemy countermeasures. The best known examples are the U.S. Air Force's F-117A and B-2.

3. Cooperative Engagement Capability

Another component of the RMA is the Navy's concept known as the Cooperative Engagement Capability (CEC). It entails a concept for the control of naval combat forces that "fuzes sensor data from multiple platforms into coherent, so-called composite tracks of fire control quality, effectively transforming a naval battle group into a single distributed weapons system."[27] If the CEC proves effective it will improve the timeline

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[27] Joris Janssen Lok, "Three Thrusts for Naval Air Defense," *Janes Defence Weekly,* (3 April 1996), 25.

of target data collection, analysis, dissemination, and weapon assignment while enhancing redundancy against jamming or environmentally-caused interference of targeted weapons.[28] More interesting, CEC will allow a ground force commander to task a Tomahawk cruise missile aboard a destroyer to strike a target using targeting data gathered from an Air Force surveillance aircraft. The potential of this integration is encouraging, however, caution is necessary pending resolution of certain critical command and control issues discussed in Chapter VI.

[28] Ibid.

IV. REVOLUTION AT SEA

Rapid change in both U.S. military technologies and strategies has compelled the Navy to radically revise some of its operational concepts. This chapter considers the shift in the Navy's operational focus as reflected in recent key documents.

A. CHANGE IN OPERATIONAL FOCUS

In response to the demise of the Soviet threat, then Chief of Naval Operations, Carlisle Trost, modified the Maritime Strategy with the issuance of an article entitled "Maritime Strategy for the 1990's."[29] After noting the end of the Cold War, the document expressed concern for the dangers posed by military applications of rapid technological advancements throughout the world. It noted that the "most worrisome aspect of the increasing diffusion of global political and military power is the accompanying spread of high-technology weaponry."[30]

The trend suggested in "Maritime Strategy for the 1990's" was supported by the Navy's 1991 document "The Way Ahead."[31] The dissipation of a bipolar world was

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[29] Admiral Carlisle A. H. Trost, Chief of Naval Operations, "Maritime Strategy for the 1990's", (as published in the Naval Institute Proceeding/Naval Review, 1990.)

[30] "Maritime Strategy for the 1990's", 94.

[31] "The Way Ahead" was written by Secretary of the Navy H. Lawrence Garrett III with Chief of Naval Operations, Admiral Frank B. Kelso II and Commandant of the Marine Corps, General A. M. Gray. Citations are from this document as published in The Naval

acknowledged as well as the increasing regional threat which accompanied it. This prompted the Navy to declare a change in ground rules and assumptions, leading to a restructured naval force with revisions in strategy, tactics and operating patterns.[32] Additionally, political and fiscal pressures associated with reducing the national debt were recognized as a concern which would unquestionably affect the level of resources available for defense.

...From the Sea and its successor, Forward...From the Sea, established the basic direction for the Navy today. The Navy's most recent attempt at spelling out the operational implications of ...From the Sea and Forward...From the Sea, is a document known until the fall of 1996 as 2020 Vision.[33] Though unpublished as of this writing, the ideas expressed in that document are suggestive of how Navy planners envision the exploitation of long-range precision strike capabilities. The ideas are formulated in a three-tier structure consisting of: (1) strategic options to break the enemy's will using precision operations to exploit critical enemy vulnerabilities; (2) operational options to attack the enemy's infrastructure which will require joint forces to identify specific key nodes in order to abort the enemy's means of fighting effectively; and (3) tactical options requiring direct combat with the support of information dominance.[34]

Institute Proceedings, (April 1991).

[32] ...From the Sea, 2.

[33] 2020 Vision: A Navy for the 21st Century, (Office of the Chief of Naval Operations, Washington, D.C.: draft copy 15 August 1996.) Cited with permission of Captain Smith of the CNO's Executive Panel, (henceforth noted as 2020 Vision.)

[34] Ibid, 6-7.

B. NAVAL EXPEDITIONARY WARFARE

With the Navy's principal Cold War mission - to secure command of the sea against the Soviet threat - having effectively been obviated, the Navy reoriented its strategy toward influencing events on land. This entails a significant change in focus for the Navy, but adoption of a policy which concentrates on operations associated with the littoral is a logical and necessary strategic development.

The use of naval forces in littoral waters against the land mass is not a new concept per se'. According to then Admiral William Owens:

> ...Affecting events on land is not a new concern of naval forces. But in concert with the Marines (or mobile Army units) the navy's new operational concept goes far beyond the traditional notion of power projection to a broader concept, better understood as battlefield dominance.[35]

Naval expeditionary war, i.e. amphibious warfare, is one "traditional" way for naval forces to project power ashore. Carrier-based air strikes are another. Yet, neither are sufficient if the Navy is to make a decisive impact on the "halt-the-invasion" phase of a future MRC. The early drafts of 2020 Vision proposed the Navy place reliance on precision operations, smart targeting, and massed fires from the sea.[36] One new naval platform, the Arsenal Ship, is being advocated as the means to bring early, massive, and

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[35] William A. Owens, High Seas: The Naval Passage to an Uncharted World. (Annapolis, MD: Naval Institute Press, 1995), 78-79.

[36] 2020 Vision, 9.

sustained firepower to bear against an aggressor. This ship is emerging as the Navy's answer to the question of how sea-based forces might have a decisive impact in a future MRC.

V. THE ARSENAL SHIP: A SYNTHESIS OF REVOLUTIONS

In order to operationalize the strategic concepts laid out in the draft 2020 Vision paper, and specifically, make a decisive difference in the early phases of an MRC, the Navy must acquire the capability to bring large volumes of combat power to bear. Moreover, it must do so discriminately, that is to say, against targets that count and with little collateral damage. Air Force bombers can deliver large amounts of ordnance with relatively high precision. However, forward operating bases necessary for a high tempo of strike operations may not be available. Forward deployed Arsenal Ships are the Navy's solution.

According to Rear Admiral Daniel J. Murphy, Director of the Surface Warfare Division, Office of the Chief of Naval Operations (N86), the Arsenal Ship is "best defined as providing multifunctional support to the land battle in its role as the 'battleship of the 21st century'."[37] Norman Polmar, a leading naval strategist, noted that "this is the first completely new warship concept by the Navy since the 1950s when it developed the fleet ballistic missile submarine...it's an opportunity for Navy admirals to show they're not fighting the battle of Midway, but taking advantage of the newest technologies."[38]

Naval planners have proposed that the Arsenal Ship can provide massive

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[37] Scott C. Truver, "Floating Arsenal to be 21st Century Battleship," International Defense Review, 29, no. 7, (1 July 1996), 44.

[38] Norman Polmar, as cited by John Mintz in "Navy Developing Remote-Control Ship," Washington Post, (23 June 1996), 1. Mr. Polmar is a naval analyst, historian and former advisor to three secretaries of the Navy.

firepower in the initial stages of a conflict to halt an aggressor's advancement.[39] The ship is envisioned to be a highly automated, missile-laden forward-deployed platform which will be capable of providing not only fire support for ground forces ashore, but also theater air defense, and theater ballistic missile defense.[40] Although it is a naval platform, as such, the Arsenal Ship advocates insist it will be a de facto joint system due to the variety of capabilities it is intended to have.[41]

A. CONCEPT OF OPERATIONS

On 11 April 1996 the Navy promulgated The Arsenal Ship Concept of Operations.[42] It contends that the Arsenal Ship is compatible with ...From the Sea and Forward...From the Sea, and that it is designed to meet the challenges of current and anticipated future naval requirements in support of land battles. Given budget constraints, the ship is to be designed, built, and manned in an affordable manner, while providing a much needed enhancement to the existing force of carriers and land attack-

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[39] Captain Smith, interview conducted 20 May 1996. Commander R. Cameron Ingram, Surface Warfare Division, Plans Office, Office of the Chief of Naval Operations (N863). Information from Commander Ingram was gathered during an interview conducted 23 May 1996.

[40] Ibid.

[41] Captain Smith, interview conducted 20 May 1996.

[42] Rear Admiral Daniel J. Murphy, Memorandum for Distribution, Promulgation of The Arsenal Ship Concept of Operation, (11 April 1996).

combatants and submarines.[43]

1. Weapons Capability

The Arsenal Ship is being designed with approximately 500 Vertical Launch System (VLS) cells and is intended to have space for future extended range gun systems.[44] This is done so that the ship will be able to launch a diverse array of both current and future weapons. According to Captain Smith weapons under consideration for the Arsenal Ship program include:

- a 155mm gun firing extended-range guided munitions out to 100nm (185km)
- Tomahawk Land Attack Missile (TLAM) with a range of approximately 1,500 miles and a speed of 548mi/hr (885km/hr)
- Fast Hawk, a variant of the Hawk surface-to-air missile system in development, with an anticipated range of approximately 1,000 miles and a terminal velocity of Mach 3.5 to Mach 5
- a land attack variant of the Navy's Standard Missile, known as the "Strike Standard"
- SM-2 Block IV/IVA Standard Missile with extended range and a speed of over Mach 2.5 for theater air-defense

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[43] Ibid, 1.

[44] Commander Jan Van Tol, Office of Net Assessment, Office of the Secretary of Defense. This information was gathered during an interview conducted on 20 May 1996.

- a naval variant of the current 24-inch diameter battlefield missile Army Tactical Missile System (ATACMS) with a range of 60-160nm (110-295km)[45]

- Sea SLAM, a variant of the air-launched Standoff Land-Attack Missile (SLAM) which is a modification of the Harpoon and can deliver a 500lb warhead over 50 miles (80km)

- Evolved Sea Sparrow Missile (ESSM) for self-defense.[46]

The Arsenal Ship will not necessarily be deployed with all of these weapons, nor is it intended to be limited to them. They simply illustrate the range of weapons capabilities the Navy has in mind.

2. Interoperability

The Arsenal Ship Concept of Operations states that the ship will employ the CEC discussed in Chapter III. According to Captain Smith, Navy planners view the ship as a "remote magazine" with remote missile selection, onboard missile initialization and remote launch capabilities. Initially the concept intends the "remote magazine" to be controlled by an accompanying Aegis weapons system; however, future plans are for this

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[45] Test firing from a surface ship was conducted in February according to "The American Scud," *Navy News & Undersea Technology*, 12, No. 41, (23 October 1995).

[46] This list of weapons was compiled from interviews conducted with Captain Smith, 20 May 1996, Commander Ingram, 23 May 1996, Commander Joseph Bouchard, Strategy and Concepts Division, Office of the Chief of Naval Operations (N513), 21 May 1996 and from "Arsenal Ship...21st Century Battleship," a brief prepared for Admiral Hogg, USN (Retired) by OPNAV (N86), (23 May 1996), 3.

control to be extended across the joint spectrum, including the Air Force AWACS and JSTARS aircraft. There is even an employment concept that may eventually permit weapons' designation and launch by an individual ground force unit.[47]

To illustrate how this might work the following example is provided: (1) a satellite, reconnaissance plane, shipboard radar or ground based unit detects a battery of SCUD missiles; (2) networking capabilities of the CEC allows all U.S. units in the area of responsibility (AOR) to instantly share the data; (3) a command to launch weapons from the Arsenal Ship deployed in the AOR is given by a remotely located commander (possibly on another ship, with ground forces, or on an AWACS aircraft); (4) resulting in weapons from the Arsenal Ship being remotely controlled to strike a designated target. Naval officials are quoted as saying, "the stockpile of missiles deployed aboard the Navy's future Arsenal Ship could be controlled by Army or Air Force officers depending on the mission."[48]

If this capability is realized it would potentially provide the Joint Task Force (JTF) commander with increased flexibility in determining the most appropriately suited weapon and platform for utilization in a strike. If this proves successful, then the Arsenal Ship would be one of the first truly joint platforms in the U.S. military inventory.

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[47] Captain Smith, interview conducted 20 May 1996.

[48] Robert Holzer, "Commanders May Share Arsenal Ship Assets," Defense News, (17 June 1996 - 23 June 1996), 10.

3. Manning

The Arsenal Ship Concept of Operations says little about manning other than that the crew will be limited to no more than 50 personnel. It does, however, allow for some additional berthing space to accommodate special evolution detachments. Further review of this program indicates that advances in information technologies, stealth and weapons guidance should allow the Navy to operate the ship with a greatly reduced crew.[49] Automation in engineering, as well as weapons and damage control systems could reduce the need for large crews. This, in turn, could contribute to an increase in space available for VLS cells. In addition, a reduction in crew size could allow the ship to remain at sea for extended periods of time. This would be made possible by the rotation of crews via helicopters or ferrying them by transport boats. Merchant tankers have been crewed in this fashion for years. However, the concern has been expressed that small crews could seriously degrade damage control capabilities. Immediate damage control measures are often essential to the survival of a combat vessel in the event it sustains damage during combat. With a minimal crew on board the Arsenal Ship, questions remain unanswered as to its capability to effectively control combat damage or fire and flooding.

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[49] Robert Holzer with Pat Cooper, "Warships May Use Leaner Crews; Report Recommends Additional Firepower for U.S. Navy Vessels," Defense News, (29 January - 4 February 1996), 4.

4. Ship Design

The Arsenal Ship Concept of Operations states the design is to be based on commercial practices and incorporate previously mentioned automation. It is expected to have: (1) a double hull, which has not been used on a U.S. warship before; (2) a hull which will ride low in the water and incorporate additional stealthy features to degrade detection by enemy radar and sonar, such as those which have been tested on the Sea Shadow experimental ship or developed in the B-2 and F-117A programs; and (3) have minimum structural features exposed on the deck and above with navigation being directed from a small deck-level conning station.[50] A possible submersion capability has also been discussed.[51]

Prior to selection of the Arsenal Ship, there were four alternatives the Navy considered. The first would have been a modification of Ohio-class SSBNs which the Navy is removing from strategic service. The second was a modified Arleigh Burke-class destroyer (DDG-51.) A third possibility considered the use of a modified commercial oiler. And the last was a new hull designed from the keel up, i.e. the Arsenal Ship itself.[52]

According to Captain Smith studies were conducted to assess the feasibility of

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[50] Robert Holzer, "U.S. Navy Eyes Options as Arsenal Ship Takes Shape," Defense News, (5 February - 11 February 1996). 20, and Holzer, " U.S. Navy's New Arsenal Ship Takes Shape," Defense News, (8 April - 14 April 1996), 4.

[51] Commander Van Tol, interview conducted on 20 May 1996.

[52] Ibid.

each option and the first three options were losing support for the following reasons.[53] A modified SSBN, though very stealthy and able to accommodate a reasonably large number of VLS tubes, would be far too expensive to justify. The modified DDG-51 concept would limit space available for VLS cells to approximately 150; therefore, the associated cost per launcher would have been steep, thus making it infeasible. The third option, the modified oiler, seemed to be fairly reasonable considering survivability of oilers struck by Iraqi and Iranian missiles during the "Tanker War" in the early 1980s. Obstacles presented with this option were the limited availability of U.S. oilers, limited lifetime coinciding with those that might be available, slow speeds and overall reduced capabilities.

The fourth option of an entirely new hull has gained acceptance. The Navy, in an agreement with the Defense Advanced Research Project Agency (DARPA), has awarded contracts to five shipbuilding/systems integration consortia "to develop a new low-observable surface ship to provide firepower for long-range strike, naval surface fire support and theater air defense."[54] According to the agreement the five consortia will have six months to conduct studies and develop designs leading to the selection of two teams for a 12 month period of refining concepts and performance specifications into a functional design. Ultimately, one team will be selected to produce a detailed design, build a demonstrator, and submit an irrevocable offer for construction of five additional

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[53] Captain Smith, interview conducted on 20 May 1996.

[54] "Arsenal Ship Programme Launched," *Jane's Navy International*, 101, No. 7, Richard Scott, Editor (1 September 1996), 5.

vessels as well as the conversion of the demonstrator into an operational unit.[55] The goal for the demonstrator to go to sea for trials is fiscal year 2000.

B. COSTS

With budgetary restrictions playing such an important role in the post Cold War era, the Arsenal Ship may be well suited to filling the littoral gap in a cost efficient manner. The following three areas are viewed as primary cost saving segments of the Arsenal Ship program: (1) research, development, test and evaluation (RDT&E), (2) weapons capacity, and (3) personnel costs.

1. Research, Development, Test and Evaluation

On 18 March 1996, the Navy and DARPA signed an agreement to jointly develop the Arsenal Ship. The cost of development, production of the demonstrator and performance testing and fleet evaluation was agreed not to exceed $520 million with the Navy and DARPA funding $350 million and $170 million respectively.[56] Compared to

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[55] Ibid.

[56] Larry Lynn, John W. Douglass and J. M. Boorda, "Arsenal Ship Program," Joint Memorandum from the office of the Chief of Naval Operations, Assistant Secretary of the Navy (Research, Development, and Acquisition), for Commander, Naval Sea Systems Command, Chief of Naval Research, (18 March 1996.) Mr. Lynn is Director, Defense Advanced Research Project Agency, and Mr. Douglass is Assistant Secretary of the Navy (Research, Development and Acquisition). Admiral Boorda was Chief of Naval

an estimated building cost of $4.5 billion for a new Nimitz-class aircraft carrier, $1.9 billion for a new Ohio-class submarine, or $800 million for a new Arleigh Burke-class destroyer, the project funding goal appeared modest and considerate of the constraints of current budgeting issues. The Navy and DARPA also agreed that only off-the-shelf systems were to be used. Any new systems proposed for development would require the specific approval of the Assistant Secretary of the Navy (Research, Development, and Acquisition.)

Extended deployment cycles are planned for this platform. The automation of shipboard systems is expected to permit a substantial reduction in crew. With an anticipated crew of 50 or less, rotations will not require the Arsenal Ship to pull into port. Meanwhile, the capability of housing a large number of weapons potentially allows the Arsenal Ship to remain at sea for extended periods of time during combat.

2. Weapons Capacity

The cost of weapons intended for the Arsenal Ship poses a concern. With a capability of housing 500 PGMs, the Arsenal Ship will potentially carry approximately $500 million worth of munitions.

The trade off for the benefit of advanced technology incorporated in PGMs is the more expensive cost per round than that associated with conventional munitions. At

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Operations.

$800,000 each, the Tomahawk cruise missile is the most expensive missile expected to be placed on the ship.[57]

Nevertheless the technology provided by precision strike might also contribute to an overall reduction in cost. If the Arsenal Ship's stealth features, coupled with the defenses of the Aegis system, are as effective as Navy planners anticipate, then this platform would seem to have an increased chance of delivering its weapons without significant interference from enemy defenses. Therefore, the PGMs potentially will have an increased rate of direct hits on their designated targets. This combination could reduce the number of weapons required to be employed to destroy a target. Meanwhile, logistical requirements for an operation could be substantially reduced.

Additionally, the precise load-out of an Arsenal Ship may vary based on predetermined threats and objectives. Accordingly, the numbers of any given weapons system would likely vary for each deployment.[58] Therefore, the exact cost associated with weapons housed on board an Arsenal Ship seems difficult to determine in advance. It is prudent to say, however, that the cost associated with the weapons on an Arsenal Ship, in both the type of weapons and the numbers which it can carry, will be substantial.

3. Personnel

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[57] Andrew F. Krepinevich, "Letters To The Editor," *Washington Post*, (27 July 1996).

[58] Captain Smith, interview conducted 20 May 1996.

Emerging RMAs and their products are typically underwritten by advances in technology. In today's environment such advances are predominantly associated with computers and related information technologies. With the improvements in computer technology made during the past several decades, far more can be accomplished with fewer people and in much less time, speaking in general terms. From this arises the question to what extent would the technologies incorporated into the Arsenal Ship impact manpower requirements? Little information is currently available on this issue, but it appears as though Navy officials are assuming increased automation will equate to decreased personnel.

Recalling that the Navy intends to incorporate innovative stealthy features on the Arsenal Ship, stealth itself might assist the Navy in its efforts to reduce personnel requirements. If, in fact, stealth platforms do have greatly increased survivability due to their ability to evade detection, it seems to logically follow that fewer platforms will be required. Having only a few platforms, coupled with extensive automation, would concurrently reduce the number of operators.

Staging requirements could potentially be reduced as well. With limited numbers of Arsenal Ships having extended deployment periods - currently no more than six are planned - there would not be an extensive need for shipyard support. However, since maintenance personnel might require additional training to support the needs of advanced systems associated with this ship, the initial indication is that these manpower numbers might be increased. However, considering that fewer platforms will be required, these manpower needs could possibly be reduced as well. As a result it appears as though the

cost savings, associated with a limited number of personnel required to support the Arsenal Ship, could be substantial.[59] Should all the pieces of the Arsenal Ship fall into place, the Navy may very well reap benefits from the platform's reduced personnel requirements and their associated costs. However, questions still exist regarding the previously mentioned damage control issue and until those are satisfactorily answered, as well as questions which follow in the next section, more investigation into actual costs and benefits from drastically reduced manning will be needed.

C. QUESTIONS AND CONCERNS

Like any new program the Arsenal Ship has its share of critics. There are those who believe the Navy does not need any additional ships in light of the lack of a dominant threat to U.S. national security. Others acknowledge the threats posed by regional conflicts, but do not feel that the Arsenal Ship presents a substantial improvement to current capabilities.[60]

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[59] Ibid.

[60] Critical assessments include Greg Pickell's article"Arsenal Ship Fails to Hit the Mark", Defense News, (16 October 1995 - 22 October 1995), 55; William Lloyd Stearman's article "A Misguided Missile Ship; Old Battleships Would Do a Better Job Than a Pricey New Boat" *Washington Post*, (7 July 1996), C03; and Robert C. Penison's article "Gunfire to Get Them Off the Beach", *Washington Post*, (14 August 1996), A20.

1. Weapons Cost

The cost of weapons seems to be one of the largest points of contention between the program's supporters and its antagonists. With the large volume of weapons intended to be housed on an Arsenal Ship and the intention of those weapons to be mostly technically advanced systems, adversaries of the program contend that the ship itself may not have a high price tag, but the associated costs of its weapons will be excessive.

The array of missiles being considered for the Arsenal Ship will cost $500,000 to $1.5 million per missile, according to the Navy Times (July 29, 1996.) If these costs are accurate then an Arsenal Ship could potentially carry an estimated $2 billion worth of weapons. Although these estimates seem excessive, with the cost of a Tomahawk being the most expensive of the intended weapons at $800,000, a completely loaded ship would still have a very high weapons cost. Skeptics of the program cite Admiral Boorda's own concern that "it is nice occasionally if the target costs more than the bullet you shoot," as a summation of their argument.[61]

An opposing view to this concern is that the U.S. military will have a vast inventory of weapons anyway, so why not have them forward deployed and immediately available to a theater Commander-in-Chief (CINC) instead of stockpiled in the United States? The capability of the Arsenal Ship to help alleviate the stockpiling problem, while housing the weapons in a manner which makes them ready for immediate use, is

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[61] David Evans, "The Navy's Blues," *New York Times*, (8 June 1996,) 15.

one of the goals presented in a brief on 29 August by the Navy's Surface Warfare Division.[62]

2. Survivability

Loading up one ship with such an expensive cache of weapons raises the issue of platform survivability. If a CINC concentrates a majority of theater assets in one platform, as opposed to the Cold War strategy of dispersion, that platform would logically become the primary target of adversaries in the region. Therefore, the protection of an Arsenal Ship would be essential.

Current designs for the Arsenal Ship incorporate few self-defense measures. The most touted measure is that of a double hull, yet, it does not in itself seem sufficient. Additionally, there have been discussions of a small complement of last ditch self-defense systems such as the Phalanx Close-in-Weapons-System but a final decision is yet to be made.[63] The vulnerability of the platform has been acknowledged by naval planners, however, they never intended to jeopardize this platform by deploying it without an escort.[64] The Arsenal Ship is being designed in affiliation with the Aegis system as noted in the operational concept specifying, "the Arsenal Ship will operate in

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[62] "The Arsenal Ship," brief prepared by OPNAV (N86), (29 August 1995), 3.

[63] Commander Van Tol, interview conducted 20 May 1996.

[64] Captain Smith , interview conducted 20 May 1996.

any threat environment under the protective umbrella of battle force combatants, however, it must have self-defense measures which reinforce its survivability against 21st century anti-ship missiles, torpedoes and mines."[65]

Passive defense is the predominant self-defense measure that the ship will rely on. "Passive defense will allow the Arsenal Ship to capitalize on the benefits of mass tonnage, innovative applications of multiple hull integrity, and signature reduction."[66] Stealth technology is intended to be utilized in the design of a hull with a low radar cross section in order to evade enemy radar. Navy planners intend for the Arsenal Ship to ride very low in the water and have radar-suppressing surfaces and shapes to assist in reducing its radar cross section.[67] Another stealth feature to be incorporated is that of technology associated with wake reduction and acoustic propagation.[68] A number of stealth related technologies such as these have been successfully tested on the Navy prototype ship know as the "Sea Shadow".

The second major selling point for survivability is that of a double hull. This is a design which would enhance the hull integrity against mines, missiles and torpedoes. Never before has a U.S. warship used such a design; yet, the additional protection provided by this structure will increase the probability of survival. Strikes against current ships in the U.S. fleet with single hulls have demonstrated respectable survivability as

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[65] Rear Admiral Murphy, "Promulgation of the Arsenal Ship Concept of Operations," 4.

[66] Ibid.

[67] John Mintz, "Navy Developing Remote-Control Ship," A22.

[68] Commander Ingram, interview conducted 23 May 1996.

recently as the Persian Gulf War, therefore, doubling the hull on the Arsenal Ship is a strong selling point for the Navy.[69] The problem with this approach is that most mines which have been struck have been very small and of old design.

Skeptics do not seem to believe these measures will be sufficient. In a recent article, William Stearman questions "how can it be a 'stealth ship' when it requires an easily located escort fleet for protection?"[70] Logic implies that if the Arsenal Ship is deployed without an escort fleet, its stealth features, while likely to reduce its possibility of detection, would not be able to guarantee it remained undetected. In the event the ship were to be detected, by perhaps a diesel submarine, a double hull could prove insufficient to guarantee survivability of the platform.

If this program cannot provide more assurances for the survival of an Arsenal Ship, then some skeptics of the program seem justified with their concerns. The apparent vulnerability of an Arsenal Ship may present difficulties for JTF commanders who may be risking a substantial amount of their theater assets if Arsenal Ships are fully loaded yet haven't been able to ensure enhanced survivability.

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[69] Captain Smith, interview conducted 20 May 1996.

[70] William L. Stearman, "The Navy's Proposed Arsenal Ship," *The Retired Officer Magazine,* 102, No. 11, (November 1996), 39. Mr. Stearman is a former Navy officer and member of the White House National Security Council staff.

3. Battleships

Besides his concerns over survivability, Stearman claims that the Iowa-class battleships could provide substantial firepower more cost-effectively. He insisted that, missiles are "fine for distant, high-value, fixed-targets, but for supporting troops locked in combat, 16-inch rounds are not only infinitely cheaper, but have substantially greater penetration and blast effects and disperse submunitions as well, if not better."[71] He claimed that with current technology the range of these rounds can be extended from 30 to 100 miles.

Although there are valid points in arguments such as these, other issues seem to be either ignored or misinterpreted. An example is the vulnerability of 50 year old battleships. According to Andrew Krepinevich we need only to be reminded that "a single shell from the German warship Bismarck sunk the British battleship HMS Hood, ... or of the Japanese torpedo attack on Pearl Harbor's 'Battleship Row.'"[72] In light of weapons advancements in the past 50 years, the vulnerability of these ships appears to be substantially increased.[73]

Additionally, the spectrum of capabilities planned for the Arsenal Ship is far

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[71] Stearman, "A Misguided Missile Ship...".

[72] Krepinevich, *Washington Post.*

[73] Ibid.

greater than that of a battleship.[74] Arsenal Ships are intended to carry anti-ballistic and anti-tactical missiles while also having a 155mm gun that will provide ground support firepower. Unmanned aerial vehicles may also be carried. "The Arsenal Ship's flexibility is as varied as the weapons we choose to put aboard," says Captain Smith.[75] Meanwhile, many more personnel are required to operate a battleship than an Arsenal Ship and the need for logistical support for a battleship is substantially greater.

D. EARLY SUPPORT

In January 1988 then Vice Admiral Joseph Metcalf III published thoughts on a "Revolution at Sea."[76] He took note of the enormous expansion over the past decade in the warship's battlespace especially as the result of the 1,200-mile Tomahawk missile."[77]

Metcalf's article discussed issues such as redesigning ship superstructures for a modern era with little more than a conning station visible on the deck. He also proposed that the warfighting policy of a revolutionary Navy would be to maximize a warship's ability to deliver ordnance on target. With this tasking, he conceptualized a ship designed

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[74] Edward A. Smith, "Naval Firepower for the 21st Century," *Washington Post*, Op-Ed Section, (27 July 1996).

[75] Ibid.

[76] Joseph Metcalf III, Vice Admiral, USN (Ret), "Revolutions at Sea," U.S. Naval Institute Proceedings, 114, no. 1019, (January 1988), 34-39.

[77] Ibid, 36.

with an extensive volume of weapons, most likely VLS cells for cruise missiles.[78]

An emerging concern of the RMA is a need to increase the number of individually targetable missiles in theater to counter future threats. The Arsenal Ship conceptually provides up to 500 VLS cells which could substantially improve capabilities to counter these threats.

Issues such as increased missile capacity, automation, reduced manpower requirements, and a stealthy ship design espoused by Metcalf are being incorporated into the Arsenal Ship.[79] Additionally, efforts by the Navy to examine potential RMA issues have resulted in the utilization of the Arsenal Ship in a number of recent wargames.

Metcalf concluded that technology alone could not lead the way of the future Navy. He stressed the need for the Navy and its leadership to "step up to the mark," as revolutions occurring across the spectrum require innovation within the naval ranks. Supporters of the Arsenal Ship assert the Navy has acknowledged this necessity and through the Arsenal Ship program the Navy is pursuing innovative methods to ensure its viability in the next century.

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[78] Ibid, 38.

[79] Captain Smith, interview conducted 20 May 1996.

VI. OPERATIONAL USE OF THE ARSENAL SHIP

Having reviewed the strategic and technological changes currently impacting the U.S. military and examining the physical attributes of the Arsenal Ship and its associated systems, the next step is to address the actual employment of the ship. In doing so the ship needs to be assessed as to whether it will provide the United States with a joint capability that fills the strategic gaps of the post Cold War and presents innovative ways, consistent with the RMA, of dealing with the future. This includes a review of its anticipated effectiveness in carrying out its military missions, discussions regarding command and control issues, and its potential for joint interoperability.

A. MISSION

The missions of the battleship, aircraft carrier and Arsenal Ship share a number of similarities as well as differences. The similarities revolve around their primary goal of power projection, while their differences are defined by the technology associated with their respective eras of development. With respect to the battleship, Richard Hough has written how, "like most weapons of destruction created in times of peace, the first function of the battleship was to instill fear in the hearts of men. For almost a century the threat of the armored battleship fleet was the first instrument of power diplomacy.[80] It

[80] Richard Hough, *Death of the Battleship*, 4.

was specifically designed for destroying similar targets, i.e. other battleships.

With the modernization of the U.S. fleet, through the incorporation of aircraft carriers during World War II, continuity of the battleship mission of power projection and forward presence was maintained. However, the carrier redefined this mission through the use of sustained long-range strike. With further modernization in strategy and technology it appears as though Navy planners intend for the Arsenal Ship to play a similar role in redefining the Navy's mission through massive firepower and precision warfare.

The Air Force has long had the ability to extend its range of strike through the use of intercontinental bombers and intercontinental ballistic missiles. These options have arguably been favorable to carrier based aircraft due to a reduced risk of collateral damage. According to Commander Ingram, the Arsenal Ship would risk relatively little collateral damage; yet it could provide a JTF with a substantial strike capability that is more timely than the Air Force alternatives.

Technology has added PGMs to the equation. Cruise missiles, such as the TLAM, have gained utility as a primary means of conducting strikes. The combination of extended range and precision guidance system enhances the chances of commanders reducing the risk to their platforms and personnel. This is accomplished by launching weapons from far greater distances than was possible in previous eras. At the same time PGMs provide theater platforms with an immediate response capability due to their increased delivery speeds over more conventional weapons.

As Krepinevich stated in his recent publication "*A New Navy for a New Era*,"

these systems and munitions have increasingly been encroaching on operations "turf" that was once the sole preserve of the carriers.[81] If such changes continue to occur, might it be possible that the role of the aircraft carrier could decrease while other platforms such as the Arsenal Ship take on a greater naval role? This is not to say the aircraft carrier will no longer be needed. In the foreseeable future there remain a number of missions which will still be more aptly suited to the abilities of the carrier than a platform such as the Arsenal Ship, specifically that of sustained strike operations.[82]

A closer look at the potential effects of the Arsenal Ship shows a variety of operational capabilities. Some are redundant, yet this platform is intended to provide an enhanced capability tailored toward massive strike during the initial stages of a conflict to meet the demands of... From the Sea and Forward...From the Sea. Currently, there is no U.S. national asset which can accomplish this task as rapidly and decisively as a permanently deployed ship containing 500 VLS cells.

1. Forward Operations

The Bottom-Up Review focused attention on the U.S. military's need to prepare for two MRCs. Accordingly, Forward ... From the Sea states the Navy shall maintain a

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[81] Andrew Krepinevich, Jr., "A New Navy for A New Era," 6.

[82] Richard Hough, *Death of the Battleship*, 13.

posture of forward operations.[83] This is visualized as a means to provide peacetime presence and crisis response in the event of a regional conflict. The current means by which the Navy accomplishes this mission is through the deployment of carrier battlegroups (CVBGs) and Amphibious Ready Groups (ARGs). However, budgetary reductions in the 1990's make continual overseas presence of CVBGs increasingly difficult to sustain.

A number of options for sustaining the Navy's forward presence have been proposed. Among those proposals, the Arsenal Ship is relatively cheap to build, much less expensive to operate than a carrier and could provide a theater CINC with capabilities currently unavailable.

One of the primary requirements for the Navy's forward deployed forces is to "satisfy joint naval expeditionary force warfighting requirements early in regional conflicts."[84] The Arsenal Ship is designed to accomplish this via three avenues: "(1) massive firepower, (2) exploiting technology, and (3) providing resources to meet the tasks."[85] According to Captain Smith and Commander Ingram, the first could be provided by the overwhelming firepower of the Arsenal Ship. The littoral focus of this ship is a shift from traditional naval concerns of fighting open-ocean battles. Instead, this

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[83] Forward...From the Sea, 2.

[84] "The Arsenal Ship", N86 brief of 29 Aug 95, 4.

[85] Ibid, 5.

ship is intended to provide massive firepower in the initial stages of a conflict effectively halting an adversary's aggression.[86]

The second is proposed to be accomplished through an array of technical advancements associated with the Arsenal Ship, such as the integration of PGMs and the Cooperative Engagement Capability. Effective utilization of the CEC would conceivably allow enhanced distribution of targeting data among theater assets. This, in turn, should provide a CINC with the capability of selectively targeting vital enemy assets. The combination of such targeting and the use of PGMs in attacking those targets is intended to enhance the probability of hitting vital targets with fewer rounds.[87]

The third avenue is intended to be accomplished through the diversity of weapons available in an Arsenal Ship. Navy planners insist that when a CINC determines he needs ground fire support, the Arsenal Ship will have the capability to deliver it. If the CINC determines theater ballistic missile defense (TBMD) is the primary threat, the ship will be able to deploy weapons in support of this. The Arsenal Ship is also intended to provide theater air defense (TAD). In theory, the ship should contribute to the joint concept of "full-spectrum dominance" through its ability to provide support to allied assets throughout the theater and in numerous missions. The Arsenal Ship's weapons capability and mission requirements are not to be limited to traditional naval operations. Instead it is proposed to combine the strategic requirements of ...From the Sea with those of the

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[86] Commander Ingram, interview conducted 23 May 1996.

[87] Captain Smith, interview conducted 20 May 1996.

National Military Strategy and Joint Vision 2010 resulting in a platform that can potentially fill very diverse mission requirements across the joint spectrum.

It has also been proposed that the Arsenal Ship can provide a solution to the problem of vulnerable ammunition stockpiles. During Desert Storm, if the SCUD missile that struck near a pier stockpiled with U.S. ammunition at Jubayl, Saudi Arabia on 16 February 1991, had done so closer-in, vast amounts of ordnance could have been lost. In order to alleviate vulnerabilities such as this in the future, the Arsenal Ship is envisioned as having the means to house a vast amount of ammunition while also maintaining it in such a manner that it is combat ready.

Another concern of Navy planners is the "force architecture which identified vertical launch system shortfalls early in a major regional conflict."[88] This architecture identifies less than 1000 VLS cells available during the first eight days of a conflict under current surface combatant capabilities.[89] With a regional presence of two Arsenal Ships, which is the intention of Navy planners, the number of VLS cells available during these first eight days would be more than doubled. Such a presence indicates a vast increase in naval firepower support in the early stages of an MRC.[90] With the complement of weapons projected for an Arsenal Ship, its diversity should allow the ship to provide

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[88] "Arsenal Ship...21st Century Battleship", 3.

[89] Ibid.

[90] Ibid.

massive firepower ranging from strike to surface fire support to theater air defense.

2. Strike

The actual strike role of the Arsenal Ship seems to have a number of possibilities. The weapons and the design of the ship are proposed to afford the Navy, as well as the other branches of the armed forces, an opportunity to create innovative strike packages. According to Commander Bouchard, this is not to say that current strike packages are obsolete. On the contrary in many cases they may prove to be more than adequate, but if innovative packaging can provide more effective results with less risk to U.S. personnel then the Arsenal Ship may put a new face on the way strike packages are viewed.[91]

The DOD specifically required the incorporation of long-range strike capabilities in addition to expeditionary ground support and fleet support capabilities into the Arsenal Ship. The increasing technological development in the area of PGMs should enhance the Arsenal Ship's capability of destroying strategic targets. It should also provide increased means of suppressing enemy air defenses as well as demolishing enemy military infrastructures.[92] These long-range strike measures could be coupled with the ability to provide early intervention against hundreds of targets.

According to Captain Smith the benefits of successful effects from early

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[91] Commander Bouchard, interview conducted on 21 May 1996.

[92] Commander Ingram, interview conducted 23 May 1996.

firepower provided by the Arsenal Ship can be substantial. First it could ensure the continued exploitation of freedom of the seas by the deterrence and power projection role it is envisioned to have. This could be accomplished by respecting the sovereignty of partners due to the range and maneuverability of the Arsenal Ship. This exploitation could allow minimizing the use of early land-based units, that have recently lost access to a number of overseas staging facilities through base closures. Secondly, massive firepower is intended to punish the enemy from the initial stages of combat operations. According to the recent OPNAV brief "Arsenal Ship...21st Century Battleship," the intent is to have 1,000 VLS cells available in less than a week. This capability is intended to enhance the credibility of those forces that are forward deployed. Next, the Arsenal Ship could free-up early airlift tasked with transporting munitions into the theater. This capability will potentially make airlift available to provide support across a much larger spectrum. Finally, it will increase the time tactical air components have for preparations of traditional roles such as combat air support, combat air patrol, and strategic strike.

3. Interoperability

Perhaps the most dramatic change from traditional strike operations that the Arsenal Ship would incorporate is its operation under the CEC. As previously indicated the Arsenal Ship "allows for remote missile selection, on-board missile initialization and remote launch orders, and provides remote 'missile away' messages to the control

platform."[93] This "program seeks to combine all the combat systems and major sensors on ships into a single, integrated architecture for intelligence, surveillance, reconnaissance, and C4I."[94] The CEC has the potential to provide commanders with "a dramatically improved picture of the extended battle area and greatly improve their ability to engage targets successfully at extended ranges employing long-range precision strikes."[95] As a fully integrated component of the Arsenal Ship, CEC could potentially utilize the weapons capability of this ship to enhance the Navy's long-range strike assets in a way never before attainable.

The benefits the Navy could reap from such an asset seem worth the investment. "The Navy's strike capabilities are not likely to be sustained at today's level of effectiveness unless the Navy can meet the challenge of increasingly capable Third World military systems."[96] To do this the Navy will have to "increase its emphasis on conducting long-range precision strikes, and on defending the fleet from the threat of submarines, mines, and anti-ship missiles."[97] According to Krepinevich's "*A New Navy For A New Era*", the Arsenal Ship will be able to outrange carriers by virtue of its

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[93] "Promulgation of the Arsenal Ship Concept of Operations," 2.

[94] Andrew F. Krepinevich, Jr., "A New Navy For A New Era," 40-41.

[95] Ibid, 41.

[96] Ibid.

[97] Ibid.

missiles and the missiles' reduced vulnerability. The latter, claims Krepinevich, will allow Arsenal Ships to operate more closely to shore than carriers. The Arsenal Ship is touted as having the ability to undertake offensive mining and countermine operations, and still operate with less detection - and less protection - in the littoral areas than carriers, however, the skepticism presented in the previous chapter regarding vulnerability raises questions as to the accuracy of these points. Meanwhile, Krepinevich's point that "an emphasis on a more balanced, more distributed fleet that exploits advancing technologies under the CEC, could provide future fleet commanders as well as CINCs with a variety of options for conducting strike and presence operations," seems well founded.[98]

B. COMMAND AND CONTROL

The implementation of CEC, though promising in many respects, raises fundamental questions about command and control. With the control of Arsenal Ship weapons being located elsewhere in the theater, the Arsenal Ship's commanding officer will have relatively little responsibility for actually fighting the ship. This would present a major paradigm shift from the historical role of a ship's commanding officer and would represent a major institutional change for the Navy.

Aside from institutional concerns, who decides what goes into the tubes and who will actually control the launching are two primary command and control questions.

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[98] Ibid.

According to Captain Smith, the theater CINC would determine the load-out of an Arsenal Ship prior to deployment based on the theater threat assessment. The decision for control of targeting and shooting is still being refined; however, the best estimate is that control would be handled in a manner similar to that currently associated with the Tomahawk cruise missile.

Questions regarding who decides the actual location of the Arsenal Ship, control of the multipurpose radars, and which mission will be assigned for multiple-mission weapons are also yet to be resolved, though discussions seem to be leaning toward the JTF commander.[99] Whether or not the JTF commander will delegate any or all of these roles, or will have the legal option to do so, remains unclear.

One additional concern is that of too much access leading to confusion. This concern is meant to address the issue surrounding future projections for the CEC. If the CEC ultimately includes a ground force unit with the capability of launching a weapon from the Arsenal Ship, while additional units such as AWACS, JSTARS, Aegis system and F/A-18 simultaneously have that same capability, command and control issues could become tangled. There would have to be a control point to ensure different units were not tasking the same weapon and that conflicting use of weapons does not occur.

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[99] Commander Bouchard, interview conducted 21 May 1996.

C. JOINT WARFIGHTING CAPABILITIES

The Arsenal Ship has been conceived and espoused as a fully integrated joint platform.[100] First, it is intended to have strategic mobility and protection capabilities with the ability to operate in forward positions. With fewer personnel on board and the protective umbrella of the Aegis system, the Arsenal Ship should be able to remain forward deployed for extended periods of time. Therefore, it should be able to provide continuous force presence and a forward magazine capacity.[101]

Secondly, as previously mentioned, it is intended to have an excellent strike capability. With the massive volume of weapons an Arsenal Ship is anticipated to have, the Navy proposes the Arsenal Ship will be able to provide sustained and coordinated long-range strikes.[102]

The third capability intended to support joint warfighting is direct support to the land campaign. The Arsenal Ship is perceived to have the flexibility of positioning in such a manner as to effectively interdict advancing armor and to deliver battlefield operational fires in support of U.S. ground forces in the region.[103]

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[100] Captain Smith, interview 20 May 1996.

[101] "The Arsenal Ship," 7.

[102] Commander Ingram, interview conducted 23 May 1996.

[103] Ibid.

A fourth joint capability would seem to be that of contributing to air superiority and countering Weapons of Mass Destruction (WMD). This is envisioned through the combination of theater air defense and theater ballistic missile defense weapons planned for the Arsenal Ship. Having a permanent availability of these weapons coupled with the remote magazine concept would considerably enhance air superiority and efforts to counter WMD.

Finally, there is the area of command and control. The Arsenal Ship is intended to be fully joint interoperable and capable of remotely firing weapons.[104] The combination of these capabilities appears to be the Navy's proposal for its contribution to affecting events on or over land in the event of an MRC.

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[104] Ibid.

VII. CONCLUSION

This thesis asked the question whether changes that brought about the shift in the Navy's strategic focus from open-ocean to littoral warfare have created a shortfall in U.S. naval land attack capabilities; and if so, whether the Navy's proposed Arsenal Ship is the right choice for rectifying the situation? To analyze these questions, four areas were examined: the strategic revolution (Chapter II), the Revolution in Military Affairs (Chapter III), the resultant naval revolution (Chapter IV), the Arsenal Ship as a synthesis of revolutions (Chapter V), and the operational concepts of the Arsenal Ship (Chapter VI).

Neither the strategic revolution in the wake of the end of the Cold War, nor the Revolution in Military Affairs alone appear to be sufficient justifications for a new ship capability. However, when the two are combined, implications for future warfare indicate a need for a new ship capability. The combination of a new strategy which focuses on operating in the littoral regions of the world so as to affect events on land, plus an evolving era of technological advancements, suggests that current Navy ships would lack the capabilities necessary to ensure the Navy's ability to support dominant battlespace superiority.

A. STRATEGIC CHANGES DRIVING THE 21ST CENTURY NAVY

The Navy no longer bases its strategic thinking on the concept of open-ocean

naval warfare. This strategy was the focal point of the Cold War; however, in the post Cold War era and for the foreseeable future this strategic approach is no longer warranted. With the publication of ...From the Sea, the Navy made a fundamental shift away from open-ocean warfighting on the sea toward a strategy of joint operations conducted from the sea. How and against what "kinds" of opponents the Navy should prepare to fight was spelled out in the Bottom-Up Review.

The question Navy planners have found themselves confronted with is how their service can effectively contribute to operations during a regional conflict that will predominantly occur on or over land. This must be done in a manner which enables the Navy to retain enough warfighting capabilities in reserve to thwart a second regional conflict should one arise. In order to support joint operations required to accomplish these goals, the Navy is focusing on increasing its naval expeditionary warfare capabilities. Naval planners will have to concentrate efforts on training in the littoral; however, current ship capabilities limit the extent to which this can be done. A new ship designed to operate in the littoral might provide the Navy with an effective means to accomplish these goals.

B. RMA IMPLICATIONS

The extensive advancements in technology in today's military environment indicate the necessity for modernization of U.S. capabilities if the United States is to maintain its dominant role in international security and protect U.S. interests overseas.

Stealth, global technology, long-range precision strike, information warfare, and the effective use of space characterize the current technological movement. The rate at which battlefield information can be collected, analyzed and disseminated is rapidly approaching a rate far greater than most current capabilities can counter. The key to the RMA appears to be precision warfare. The utilization of precision guided munitions tasked to strike targets which are determined essential, through the use of information warfare technology, will alleviate unnecessary expenditure of weapons and should vastly increase the target-kill ratio. In addition to the increasing emphasis on PGMs, the concept of a Cooperative Engagement Capability which fuzes sensor data from multiple platforms into composite tracks of fire control quality could effectively transform a naval battlegroup into a distributed weapons system. Innovative technologies and capabilities such as these will most likely be the norm in the 21st century; therefore, the Navy must continue to modernize in concert with advancements in technology and in military strategy.

C. THE ARSENAL SHIP

Under the Arsenal Ship's operational concept, each ship will have 500 VLS cells capable of carrying an array of current and future weapons. These weapons will range in mission capability from land attack to TAD and TBMD. The Arsenal Ship is to be highly automated, requiring a crew of no more than 50 personnel, and it is to be operated in conjunction with the CEC for remote targeting.

1. Design

The actual design of the Arsenal Ship is still in development; however, Navy planners expect it will have a double hull which will ride low in the water, have stealthy features so as to minimize the probability of detection by enemy radar and sonar, and have minimal structural features above the water line. After reviewing a number of platform options, the Navy, working with DARPA, has decided to design an entirely new ship. A demonstrator ship is scheduled for sea trials in fiscal year 2000.

2. Cost

An obvious concern is cost. The RDT&E cost of the Arsenal Ship was agreed by the Navy and DARPA not to exceed $520 million which is far less than the building cost of an Arleigh Burke-class destroyer. Meanwhile, the associated cost of weapons to be carried on the Arsenal Ship is estimated to be rather high. Nevertheless the configuration of weapons on the Arsenal Ship will be determined by the theater CINC based on his threat assessment. As a result, the associated cost will fluctuate. Additionally, having these weapons housed on the Arsenal Ship ready for use, rather than stockpiled in warehouses or on piers, make the ship an attractive option.

Personnel related costs have been presented with the potential of substantial savings. The incorporation of extensive automation indicates the potential for dramatic reductions in crew size. Consequently fewer lives will be put at risk. With crew changes

via helicopter or other capabilities, ship deployments can be greatly extended. Subsequently, this indicates the manpower requirements associated with the Arsenal Ship could be dramatically reduced, resulting in a potential cost benefit for the Navy.

3. Detractors

Survivability of the Arsenal Ship poses some concern. With few self-defense measures intended to be incorporated other than a double hull and some stealth features, it would seem that the Arsenal Ship could be a "sitting duck." The Navy has considered this point and intends to deploy the Arsenal Ship in conjunction with an Aegis equipped platform and perhaps additional ships from a battlegroup.

Command and control issues pose another concern. If the Arsenal Ship does incorporate the CEC which eventually expands to permit targeting by an array of forces, this structure could become disorganized. The potential for trouble associated with dual tasking is disturbing unless a specific command and control blueprint is established.

4. Mission

The Arsenal Ship is intended to operate forward in a manner which provides peacetime presence and crisis response in the event of a regional conflict. With massive firepower, Navy planners hope to create the ability to halt a regional aggressor quickly, allowing time for a counter-build up of friendly forces. The Arsenal Ship will attempt to

exploit technology through the integration of PGMs and the CEC, enhancing distribution of targeting data among theater assets. Additionally, it is intended to provide resources to meet required tasks through the diversity of weapons which it is proposed to carry.

These capabilities suggest the Arsenal Ship could provide the Navy with an effective means of affecting events on land and contributing to the joint concept of "full-spectrum dominance."

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