

NAVAL WAR COLLEGE
Newport, R.I.

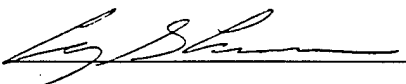
CLOSING THE BOOK:
THE ROLE OF THE AIRCRAFT CARRIER
IN THE TWENTY-FIRST CENTURY

by

Cory S. Cummins
Lieutenant Commander, U.S. Navy

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

5 February 1999

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

DTIC QUALITY INSPECTED 4

19990520 077

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: C		7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207	
8. Title (Include Security Classification): Closing the Book: The Role of the Aircraft Carrier in the Twenty-First Century. (U)			
9. Personal Authors: LCDR Cory S. Cummins, USN			
10. Type of Report: FINAL		11. Date of Report: 05 Feb 1999	
12. Page Count: 23			
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: Peacetime engagement; forward presence; deterrence; vulnerability; risk; precision guided munitions; deep strike; cost; casualties; new technologies.			
15. Abstract: The aircraft carrier and its embarked air wing have been a potent symbol of American resolve for most of the 20th century. As the Navy moved its focus toward the littoral regions, the aircraft carrier maintained a position of prominence in the roles of peacetime engagement, forward presence, and deterrence. Other naval platforms have proven just as capable, if not more so, of performing those missions. In the littoral regions, the aircraft carrier and its crew face multiple threats. Additionally, the cost of procuring and operating a carrier and its air wing are prohibitively expensive. Funding should be channeled away from carriers toward new technologies and weapons systems that are equally capable of performing to the combatant commander's expectations.			
16. Distribution / Availability of Abstract:	Unclassified X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-6461		20. Office Symbol: C	

Abstract of

CLOSING THE BOOK: THE ROLE OF THE AIRCRAFT CARRIER
IN THE TWENTY-FIRST CENTURY

The aircraft carrier and its embarked air wing have been a potent symbol of American resolve for most of the 20th century. As the Navy moved its focus toward the littoral regions, the aircraft carrier maintained a position of prominence in the roles of peacetime engagement, forward presence, and deterrence. Other naval platforms have proven just as capable, if not more so, of performing those missions.

As the aircraft carrier moves closer to the coastline of our adversaries, it and its crew are placed in a high-threat environment. Such a concentration of firepower in one platform makes the carrier a prime target for rogue states and non-state actors. With the development and improvement of long-range precision guided munitions, C4ISR systems and distributed weapons platforms, the advantages of manned aviation platforms are diminished. Yet, the aircraft carrier and its air wing remain prohibitively expensive to acquire and operate. Aircraft carriers have become a lot of buck for the bang. Funding of future carriers limits resources for developing new weapons systems. Force planners should revisit plans to move to a “next-generation” carrier, and re-direct those funds toward development of the arsenal ship, Trident submarine conversion into a “stealth battleship”, improved long-range weapons and Cooperative Engagement Capability. The carrier force can be reduced gradually as service lives expire, providing ample opportunity to test and field alternative weapons systems.

Introduction

For most of the past century, America's ability to wage war at sea has centered on the capital ship. The first capital ships took the form of massive and highly capable battleships. In World War II, however, the battleship was overshadowed by an evolving centerpiece of maritime warfare: the aircraft carrier and its organic air force. As the Cold War erupted and lingered on, the need for a capability to defeat a large Soviet battle fleet in open-ocean conflict grew. In response, U.S. aircraft carriers grew in size and function, supporting larger, longer-range aircraft that could not only engage in blue-water warfare, but carry out a nuclear strike on Soviet territory should circumstances dictate. The carriers themselves became nuclear powered, vastly increasing their flexibility and autonomy by being able to sprint at high speed, without being tied to an oiler, to quickly arrive at the scene of conflict to dart out of harm's way. Such robust capability was always at the top of the warfighting commander's list of options in contingency planning. Paradoxically, neither the aircraft carrier, nor its concomitant Carrier Battle Group has ever had the opportunity to exercise its formidable force as envisioned. It is perhaps for this reason that strategists, force planners, and operational commanders have come to equate the aircraft carrier as a monolith of deterrence.

The demise of the Soviet Union and subsequent defense budget reductions came at a time when the Navy was attempting to achieve a 600-ship force level, still centered around the aircraft carrier (although the battleship made a brief comeback to bolster the ambitious fleet size). As the services scrambled to address their roles in the new world political environment, new "visions" emerged. Planners focused more closely on the increased threat of regional instability, proliferation of modern arms to small state and non-state belligerents,

and the rise of the asymmetrical threats of weapons of mass destruction and terrorism. At the same time, the military expanded its range of involvement in world crises, frequently engaging in Military Operations Other Than War. The resulting challenge was to achieve "Full Spectrum Dominance"¹ across a wide variety of potential conflicts and non-conflicts, almost anywhere in the world, with reduced budgetary and force level resources. The Navy responded by focusing on expeditionary warfare in the littoral regions of the world, placing emphasis on forward presence in support of peacetime engagement, deterrence and conflict avoidance, battlespace dominance and power projection ashore. While naval strategy evolved through the "... From the Sea" series of white papers, new roles and missions were developed for the Navy's existing warfighting assets.² The aircraft carrier, however, remained in its position of prominence, both operationally and fiscally.

Continuing budget constraints resulting from the Bottom Up Review and Quadrennial Defense Review appear to have capped the carrier force at 12 ships. Navy planners have convinced Congress of the need to modernize its carrier force, and have secured funding for the tenth Nimitz class carrier, as well as commitment to build an innovative new carrier, the CVX.³ Designed from a "clean sheet of paper" approach, CVX is intended to incorporate technological advances that will increase survivability while reducing manpower and

¹Chairman, Joint Chiefs of Staff, Joint Vision 2010 (Washington, n.d.), 2.

²Department of the Navy, ... From the Sea: Preparing the Naval Service for the 21st Century (Washington, September 1992), 1-10; Forward ... From the Sea (Washington, September 1994), 1-10; Forward ... From the Sea: The Navy Operational Concept (Washington, March 1997), 2-5.

³Scott C. Truver, "Sunrise or Sunset? U.S. Carrier Power Launches Itself Into the Future." Jane's International Defense Review, February 1997, 26-27.

operating costs over its approximately 50-year life cycle.⁴ Allocating a large portion of the Navy budget toward procurement of aircraft carriers and tactical aircraft has the negative effect of limiting funding for development of new technologies. Ironically, those same technologies, such as mine countermeasures improvements and theater ballistic missile defense, are desperately needed to protect the carrier battle group from an increasingly prolific threat. As the carrier operates closer to shore to fulfill its deep strike role with newer, shorter-range aircraft, its vulnerability to attack increases dramatically. With alternative current and future precision strike technologies like the Tomahawk Land Attack Missile (TLAM) and Cooperative Engagement Capability, the need for an expensive, vulnerable, densely populated platform to operate in the littoral environment is questionable. While the deterrence, power projection and battlespace dominance capabilities of the aircraft carrier and its air wing has been impressive., new, more capable concepts in weapons systems are being designed to win future wars. The nature of current and future threats, and the operational advantages in terms of effectiveness, risk, and cost of those weapons systems that will defeat them make the cold-war era capital ship a warrior of the past.

Shaping through Peacetime Engagement

An essential ingredient of peacetime engagement, forward presence is the forte of the Navy. Continuous overseas deployments of large modern warships and their logistics tail shows the flag in vital strategic locations. Navy ships make port calls more frequently, for longer periods, and in a greater variety of countries than ever, partly to fulfill its forward

⁴Reuven Leopold, Sea-Based Aviation and the Next U.S. Aircraft Carrier Design: The CVX, MIT Security Studies Program Occasional Paper (Cambridge: Center for International Studies, Massachusetts Institute of Technology, 1998), 12-13.

presence role, but also due to steaming budget shortfalls and the need to make good its “see the world” promise to recruits. During and between port calls, naval units frequently participate in exercises with other nations’ armed forces, improving interoperability and strengthening alliances. The third in the series of “...From the Sea” documents describes the diplomatic aspect of forward presence: “sending Sailors and Marines ashore as representatives of the American people; bringing foreign visitors onto sovereign U.S. naval vessels; and carrying out a wide range of community relations activities.”⁵ Mainly due to its aviation capability and large compliment of crewmembers, the carrier is especially suited to carrying out the diplomatic mission. Yet not even today, when such a high premium is placed upon the importance of forward presence, would any astute strategic planner or proponent of naval aviation list community relations as justification for maintaining a large carrier force. With the exception of ballistic missile submarines (and possibly arsenal ships in the future), all other naval assets can be sufficiently effective in this role. Furthermore, a move toward distributed weapons platforms will have the side benefit of placing a larger number of vessels in greatly dispersed locations, increasing exposure of foreign nations to U.S. presence.

Shaping Through Deterrence

The attribute most commonly championed by carrier air power proponents is the other objective of American forward presence: deterrence. Praises are sung for the “sheer size and magnitude of a carrier’s power.... Because of the carrier’s versatility, responsiveness and

⁵Department of the Navy, Forward ... From the Sea: The Navy Operational Concept, 4.

innate power, positioning of a Carrier Battle Group has often been used to signal our government's interest and project influence in a distant trouble spot."⁶ The "influence" of a large-deck carrier is often touted as the panacea to world discord. Indeed, even President Clinton has sung the praises of the aircraft carrier: "When word of a crisis breaks out in Washington, it's no accident that the first question that comes to everyone's lips is: 'Where is the nearest carrier?'"⁷ The documentary evidence, however, suggests otherwise. Between 1974 and 1990, of more than 50 international crises that erupted while a carrier was in the vicinity, only the Achille Lauro incident's outcome was effected by carrier air power.⁸

It has been asserted that in the Libya strikes of April 1986, carrier aviation's contribution was pivotal.⁹ The decision was made, however, for Air Force F-111s from bases in Great Britain to attack the main target, Tripoli, while carrier aircraft struck Benghazi. Interservice rivalry may have played a role in that decision, but the outcome proved that even faced with overflight restrictions, Air Force air power could respond quickly to a crisis situation.¹⁰ Despite the continuous overseas deployment of aircraft carriers for the past half-century, the littoral regions are just too vast for a combatant commander to count upon rapid response to crisis. At the current force level of 12 carriers, unified Commanders in Chief

⁶Frank B. Kelso III, "Aircraft Carriers--Power Projection From the Sea," NATO's Sixteen Nations, 1994, 82.

⁷Ibid.

⁸The Achille Lauro crisis was resolved by fighters from USS Saratoga intercepting the commercial airliner hijacked by terrorists, and forcing it to land. For a table of Carrier Battle Group responses to crises since the Vietnam War, see Thomas W. Trotter, "The Future of Carrier Aviation," Naval War College Review, Winter 1993, 34-35.

⁹Kelso, 81.

¹⁰Andrew F. Krepinevich, Jr., A New Navy For a New Era. (Washington: Center for Strategic and Budgetary Assessments, 1996), 14.

(CINCs) must share the deployed carrier, resulting in transits of days, up to weeks to arrive on the scene of trouble. Increasingly, CINCs are relying on alternative means of deterring aggression. As the Air Force transitions to its Air Expeditionary Force, its use as a "gap-filler" for Arabian Gulf contingencies has already gained the support of the CINC.¹¹ Were the Navy to transition away from the centralized weapons platform of the aircraft carrier, to a distributed system of weapons platforms with centralized Command and Control, those platforms (Aegis cruisers and destroyers, submarines and arsenal ships for example) could be widely separated, yet provide the same deterrent firepower as a large-deck aircraft carrier. The farthest from the scene of crisis could redeploy as necessary, nearly as fast as a nuclear carrier, ready to strike with its precision-guided cruise missiles from over a thousand miles away. If the use of manned air power is desired by the combatant commander, Air Force long-range bombers and tactical aircraft, supported by tankers, could arrive within hours, far sooner than a carrier positioned out of theater. Admittedly, as in the Libya incident, land-based aviation may be restrained by basing or overflight restrictions. If the political situation reaches the unlikely point where every nation in the region of the crisis prohibits American aircraft operating from or over their territory, the prudent course of action would be for policy makers to revisit U.S. involvement in that crisis.

Power Projection

When peacetime engagement and deterrence fail to "shape" a belligerent's political will, the next step of the National Military Strategy is to "project power," using "decisive

¹¹Truver, 27.

force” to defeat enemy aggression.¹² The Navy’s move into the littorals translates into an imperative to project power far inland, moving beyond the traditional naval role of amphibious forcible entry. As precision guided munitions improve in both range and accuracy, the battlespace within reach of naval firepower has expanded. Ironically, the combat radius of naval strike aircraft has decreased. In an effort to cut costs, the Navy has elected to use a multi-role strike fighter, the F/A-18, which, like any multi-mission platform is a product of compromise. In this case, extended range was forfeited for maneuverability.¹³ Since the aircraft carrier operates increasingly in the littorals, decreased range has not yet proven to be a showstopper. As modern technology weapons proliferate, threats on or near the enemy’s coastline will increase. The carrier will be forced to seek blue water for self-protection, and deep strike will again be left to long-range bombers, land-based tactical aircraft, and cruise and ballistic missiles.

Future technological advances in enemy weapons capabilities will likely be matched with advances in Command, Control, Communications, Computers, Intelligence and Reconnaissance (C4ISR) systems. These advances will have the effect of accelerating the tempo of future conflicts. U.S. forces will have to respond rapidly to deter aggression, or, failing deterrence, to project power and achieve battlespace dominance. Rapid response is another attribute of carrier air power that proponents like to advertise.

On September 12th, 1996, USS ENTERPRISE (CVN 65) was operating in the Adriatic Sea, supporting Implementation Force ground troops. At 1800 hours, ENTERPRISE was tasked to proceed at best speed to support the units of the USS CARL VINSON (CVN 70) in the Arabian Gulf. ENTERPRISE transited

¹²Chairman, Joint Chiefs of Staff, National Military Strategy of the United States of America, (Washington, 1997), 15, 20.

¹³Congressional Budget Office, A Look at Tomorrow’s Tactical Air Forces, (Washington, January 1997), 7-8.

between two of the world's most critical regions in six and a half days covering 4300 miles at an average speed of 30 knots. (Not including of course its transit through the Suez Canal.) Within three hours of arrival, ENTERPRISE was launching aircraft over the Arabian Gulf.¹⁴

Speed, however, is relative. For ships, a nuclear carrier is fast. For airborne methods of power projection, "fast" is measured in hours or minutes to target, not days. On 27 December 1992 in Southern Watch, 17 January 1993 in Provide Comfort, and 28 February 1994 in Deny Flight, three incidents occurred where U.S. aircraft engaged enemy aircraft. In each case, although aircraft carriers were deployed in the region, they could not maneuver in time to participate.¹⁵

As the speed of C4ISR increases toward real-time, the response of warfighting assets will need to rise proportionally. A ship-based ballistic missile system like the Army Tactical Missile System (ATACMS) will be able to engage fixed enemy targets within minutes from 300 nautical miles, with precision. For mobile targets, current technology favors manned aircraft due to time delays between identifying and attacking a target. In the near future, improvements in wide-area surveillance, using either manned or unmanned aircraft, spacecraft and distributed sensors; combined with automated target identification and high-speed data transmission will greatly reduce the target identification time portion of the equation. The time factor will also be compressed with the use of precision guidance systems for weapons that receive in-flight updates or re-targeting information.¹⁶ These technologies

¹⁴Leopold, 25.

¹⁵Krepinevich, 16, citing Gary Crowder, "Forward *Naval* Presence?" U.S. Naval Institute Proceedings, April 1995, 45.

¹⁶Reuven Leopold, "The Next Naval Revolution," Jane's Navy International, January/February 1996, reprinted, Strategy and Force Planning Faculty, eds., Strategy and Force Planning, 2d ed., (Newport, RI: Naval War College Press, 1997), 602-604.

are in development now, and will certainly be operationally viable before the newest aircraft carriers are retired from service.

Vulnerability and Survivability

The littoral region is frequently characterized by confined and congested water and air space occupied by friends, adversaries, and neutrals--making identification profoundly difficult.... In an era when arms proliferation means some third world countries possess sophisticated weaponry, there is a wide range of potential challenges.... Some littoral threats--specifically mines, sea-skimming cruise missiles, and tactical ballistic missiles--tax the capabilities of our current systems and force structure. Mastery of the littoral should not be presumed. It does not derive directly from command of the high seas.¹⁷

When the concept of placing aircraft on ships to extend the reach of American power projection was developed, the main threats to the ship--enemy aircraft and submarines--were recognized and defensive measures put in place. Today and well into the future, the threats are many, varied, and pandemic. They range from World War I era mines to state-of-the-art surveillance and communications satellites. As "...From the Sea" insinuates, surface ships--particularly aircraft carriers--are vulnerable while in the littoral regions. Successfully exploiting that vulnerability could have strategic implications in a conflict, for two reasons:

First, an aircraft carrier is above all a high-value target. A 100,000-ton mobile airfield, loaded with 80 combat and combat support aircraft, hundreds of tons of munitions and thousands of gallons of aviation fuel is a critical strength as a CINC's operational asset. To a rogue state or non-state belligerent, however, it becomes an operational, even strategic center of gravity. A successful attack on an American carrier would profoundly alter the

¹⁷Department of the Navy, ... From the Sea, 5.

strategic makeup of the battlespace. Granted, a rogue actor would be making a desperate choice to attack a carrier, but the political gains to be had may be well worth the risk. This is certainly true of a non-state belligerent, such as a terrorist organization. To terrorists, being able to sink, disable or even damage a "sovereign" U.S. platform would serve their political purposes well.

Second, greater than the psychological effect the damaging or disabling of an U.S. warship would have on warfighters and the American public, is the public's growing aversion to personnel casualties. The possibility of U.S. casualties has already altered decisions made by combatant commanders in recent conflicts. In Bosnia, in August 1995, "concern over casualties resulted in NATO committing the entire initial air effort of [a] 129 aircraft force (79 strike, 50 defense suppression) into strikes against Serb air defenses.... No attacks were made against the targets of primary interest--the Serb heavy weapons--because of concern over aircraft losses. In essence, commanders concern over casualties resulted in 100% virtual attrition of the attacking force...."¹⁸ If concern over the lives of a hundred or so aviators is sufficient to influence operational and strategic objectives, then placing 5000-6000 sailors at risk is a decision a combatant commander cannot make without reservation. When other methods of power projection exist with lower risk and lower cost, the aircraft carrier appears less appealing to the commander as a warfighting asset.

One can argue that land-based aircraft located on a base in the area of operations are even more vulnerable than an aircraft carrier off the coast. True, the airfield is more easily

¹⁸Roger W. Barnett, Surface Ship Survivability: Risk Management and Network Centric Warfare, Strategic Research Department Research Report 12-98, (Newport, RI: Naval War College. Center For Naval Warfare Studies, 1998), 11; citing Christopher J. Bowie, Untying the Bloody Scarf: Casualties, Stealth, and the Revolution in Aerial Combat, (Arlington, VA: IRIS Independent Research, 1998), 10.

targeted, cannot maneuver out of harm's way, and may be less well defended than a carrier. However, an airfield covers a much greater surface area, allowing aircraft and personnel to be more dispersed, or placed in hardened bunkers. All of a carrier's crew, aircraft, propulsion, weapons, ammunition and fuel are contained in a comparatively compact space. One well-placed explosion could disable the propulsion system, render flight operations impossible, cause multiple casualties, or set off a devastating conflagration that would take the carrier out of action indefinitely. In addition, an airfield is not vulnerable to subsurface threats, an increasing concern for ships in the littorals.

Given a carrier's size, the damage inflicted by most naval mines may not be enough to cause serious harm. Moreover, a carrier that remains 50 to 60 miles out to sea is largely out of the current mine-threat area. Unfortunately, that option is disappearing. Potential adversaries, Iran for example, are augmenting their inventories of Russian and Yugoslav antiship mines with Chinese EM52 rising mines, which are propelled upward by rockets as the ship passes. What makes the mine threat more difficult to control is that mines are a relatively low cost option for an adversary to employ. The mines that damaged USS Princeton and USS Tripoli during the Gulf War cost less than \$1,500 each.¹⁹

The other undersea threat--the submarine--is also growing in capability and availability. Conventional submarine sales will likely double by 2006, and both Russia and China will maintain robust submarine forces. In the littorals, submarines are more difficult to find, but aircraft carriers are not. Ironically the Navy's emphasis on antisubmarine warfare (ASW), particularly carrier-based ASW, has largely decreased. Submarines are capable of

¹⁹Krepinevich, 10-12.

laying minefields, as well as firing torpedoes at unsuspecting ships. Unlike the damage potential of a mine, a torpedo hit may very well be able to sink a carrier.²⁰ Again, not a comforting prospect for a commander concerned about the strategic implications of a tactical action.

In addition to subsurface threats, ballistic and antiship cruise missiles with improved range and lethality are becoming a major part of a growing number of arsenals around the world. Ballistic missiles have much improved range and precision over the Scuds used by Iraq in the Gulf War. North Korea has a large ballistic missile program, partly funded by Iran. At least 15 nations have ballistic missile systems. Even more disturbing, over 40 countries possess antiship cruise missiles capable of being launched from a variety of ground-, air-, or sea-based platforms, to ranges of 60 miles or more.²¹

As ships remain farther out to sea to avoid enemy mines and missiles, that solution is losing its margin of security. Several nations, even allies, are showing a willingness to offer high-resolution satellite surveillance imagery commercially. While locating a ship at sea from space remains difficult, the job gets easier as the probable area of detection gets smaller; a country's littoral regions for example.²²

How then can this wide array of threats be mitigated? One solution, borrowed from aircraft designers, is stealth. A ship that is harder to find is harder to hit. Designers of CVX desire to incorporate stealthy, or low-observable technologies into the design. Just how effective stealth technology will be when applied to a 100,000 ton ship remains to be seen.

²⁰Ibid., 13.

²¹Ibid., 8,9.

²²Ibid., 7-8.

The one demonstrated method of making a ship stealthy is to make it submersible or semi-submersible. This concept is envisioned for the arsenal ship. Another proposal has been made to convert Trident ballistic missile submarines into "stealth battleships."²³ For the aircraft carrier to reduce its vulnerability to missiles, mines and torpedoes, the best solution is for the carrier to remain out in the open ocean "unfound." Trends in naval doctrine, however, combined with the decreased range of sea-based tactical aviation are forcing the carriers closer to the littorals. It seems only a matter of time before a rogue organization sees the political value of striking a multi-billion dollar American capital ship.

Cost Issues

If vulnerability were the sole determinant of whether to continue procurement of aircraft carriers, defense planners would counter that all forms of warfare entail risk; that risk must be weighed against capability. Vulnerability is only one of the detractors of continued investment in carrier air power. Another is cost. At over \$5 billion to procure, plus \$56 million for each of its 55 strike fighters (\$81 million for the Navy Joint Strike Fighter (JSF)), and around \$1.8 billion a year to operate its battle group, the aircraft carrier has consumed the lion's share of the Navy budget.²⁴ Estimates for the life cycle cost of the latest Nimitz class carriers run from \$16 billion to \$20 billion.²⁵ That figure pertains to the carrier platform

²³Ibid., 40. The "Stealth Battleship" would be capable of launching hundreds of cruise and tactical ballistic missiles, unmanned aerial and underwater vehicles and possibly providing facilities for a small number of troops or special operations forces.

²⁴Truver, 26; Congressional Budget Office, 37; Krepinevich, 20.

²⁵Sandra I. Erwin, "Design of Next Generation Navy Carriers Driven by Need to Cut Crew, Curb Costs," National Defense, March 1998, <<http://www.adpansia.org/magazine/98mar/navycar.htm>> (6 January 1999), 2.

alone. The life cycle cost of the carrier air wing is typically two to three times that much. An aircraft carrier has roughly a 50-year life cycle, while an air wing's aircraft last an average of 20 years. The grand total for an aircraft carrier and 2.5 air wings comes to between \$50 billion and \$60 billion on the low side.²⁶ For obvious reasons, planners of CVX are looking closely at ways to reduce those costs.

One of the largest components of an aircraft carrier's life cycle cost is the cost of the crew; approximately 30 percent. That equals the acquisition cost of the carrier itself. Again, CVX designers desire to reduce crew--and crew costs--by incorporating technological improvements in computerization and automation.²⁷ Given the manpower-intensive nature of both aircraft and ship operation and maintenance, a 15 percent cost reduction is about as much as can be hoped for. Other costs that will remain high for both Nimitz and CVX carriers (assuming CVX will be nuclear powered, as appears to be the case) involve the complex mid-life overhaul and refueling, and the nuclear disposal costs upon decommissioning. Since no nuclear carrier has yet been decommissioned, current estimates of two to three percent of life cycle costs may grow towards 10 percent.²⁸

The United States is not alone in its desires to build its carrier force. The United Kingdom, France, Italy, Spain, India and Russia are all current owners of aircraft carriers, and all but Russia and Spain are looking to add to their fleets. Like the U.S., these carrier powers are facing difficulties justifying the high acquisition costs of these capital ships. All have opted for smaller, mostly Short Take-Off, Vertical Landing type platforms. Russia's

²⁶Leopold, Sea-Based Aviation, 30,32.

²⁷Erwin, 1.

²⁸Leopold, Sea-Based Aviation, 30.

carrier program is all but defunct, and the Russians are looking for a buyer for its Admiral Gorshkov. China desires to enter the aircraft carrier fraternity, but has focused its resources on nuclear and conventional submarines.²⁹

As fiscal restraints continue to affect these military powers, including the United States, defense planners are seriously considering alternatives. Technological advances in land-attack cruise missiles; providing advanced terminal guidance and in-flight target updates will increase their already favorable reputation as a potent deep-strike weapon. At around \$1 million per missile, a large arsenal could be maintained for the cost of an air wing.³⁰ For transporting that large arsenal to the theater of operations, the arsenal ship offers lower acquisition costs (estimated to be \$500 million), and with a crew of about 50, lower manpower and operating costs than an aircraft carrier. For battlespace C4ISR, next generation UAVs will be available at about \$15 million apiece.³¹ They are not cheap, and not really expendable, but certainly less risky than manned reconnaissance aircraft. These and other "next generation" weapons systems will offer the CINCs some potent alternatives to traditional sea-based air power. The challenge will be to get them to break out of the habit of summoning the carrier at every political hiccup.

The [CINCs] of the various world areas of responsibility have operated for years without fiscal accountability by placing financially unwieldy demands on the Navy's carrier forces. The CINC's job is to be prepared for any contingency in his area, and continual carrier coverage, whether actual

²⁹David Foxwell, "New Waves of Sea Power: Carriers Epitomize Modern, Mobile Forces--At a Cost," Jane's International Defense Review, February 1997, 31-36.

³⁰Leopold, Sea-Based Aviation, 30.

³¹"Military Affairs--The New Way of War," The Economist, May 1997, Lkd. Global NewsBank. <<http://infoweb3.newsbank.com/bin/gate.exe?f=doc&state=8ddiv0.3.77>> (7 January 1999).

employment is specifically envisioned or not, has traditionally been a convenient method of doing so.³²

The Future of Warfare

It is impossible to predict when the next war will occur or the level of intensity it will attain. As the sole remaining superpower, the United States should consider the entire spectrum of conflict and structure our military forces accordingly. Looking ahead to 2010 and beyond requires judging the nature of the current world political-economic environment, then applying history, experience, modeling and guesswork to come up with practical solutions to force structure.

With current world indicators being the easiest and most concrete portion of the formula, one could suggest some likely scenarios. For instance, the absence of a rival superpower for the foreseeable future makes high intensity conflict and war at sea highly unlikely in the next several decades. Continuing religious, ethnic, and nationalistic strife, however, combined with rampant proliferation of modern arms, make low intensity conflict, up to and including limited war a distinct possibility. Given current world population distributions, the littoral regions appear to be where that conflict will take place. Regardless of location and level of conflict, the American public and elected leaders' aversion toward sustaining casualties in war will probably not diminish.

Force planners, strategists and technologists are taking these trends into account as they develop future weapons systems. Some of the technologies, like space-based weapons for example, require greater leaps of faith than others. Such leaps of faith were made to bring

³²Trotter, 32.

the aircraft carrier into existence almost a century ago. Shifting to a new concept or warfighting doctrine involves risks. Taken in a time of relative peace, those risks can be assessed and mitigated through testing and training. Procuring alternatives now for the aircraft carrier will allow full development and testing, while the current carrier force has years of service life remaining. The transition to the new technologies will be smoother, and the readiness of the operating forces will not suffer.

Conclusion

For nearly a century, the aircraft carrier has been a potent symbol of American resolve. Though never actually tested, the Carrier Battle Group would have been a formidable open-ocean foe to the Soviet fleet. With the demise of the Soviet Union, the world political landscape has changed. With it, the role of the Navy has changed as well. Peacetime engagement and forward presence have gained new importance. While the aircraft carrier performs both missions well, it is not the only naval asset capable of showing the flag abroad. In the equally important mission of deterrence, the reputation of the carrier is unsubstantiated. Likewise, the carrier's distinction for rapid response has suffered a paradigm shift. The increased speed at which information and intelligence flow in modern conflict compresses the time available to respond to a threat. An aircraft carrier that is not already in the immediate vicinity of the conflict will likely arrive too late.

In addition to speed of response, the trend of modern warfare is to be able to strike deep into enemy territory. With multi-role tactical aircraft, however, range has been sacrificed, forcing the carrier to move closer to the enemy's coastline. There the carrier is

highly vulnerable to attack. The concentration of firepower, command and control, and personnel on a single platform make the carrier a center of gravity for the enemy to strike.

Finally, procurement and operation of aircraft carriers and their air wings are rapidly becoming cost prohibitive. Alternative weapons systems like the arsenal ship, stealth battleship and unmanned aerial vehicles are waiting in the wings. Without funding being re-directed from carrier programs to these new concepts, they will remain just those; concepts. The current and future world political environment is such that now would be an optimal time to develop new warfare concepts. More economical and effective systems that are less vulnerable can be tested while the carrier force ages. If the systems perform well, the carriers can be removed from service early. In the unlikely event that those systems prove to be failures, CVX plans can be dusted off and resumed.

Transitioning the Navy away from the aircraft carrier will meet with stiff opposition from generations of naval aviators enamored with the majesty of the supercarrier. Convincing that audience that unmanned aviation is the way ahead will take more than point papers and theses. Such a radical departure from the status quo will likely require a legislative effort. Unfortunately, the aircraft carrier has a constituency of 4,000 suppliers in 43 states.³³ Momentum to bring about change will be slow in coming. If the other services are willing to give a push, a truly joint effort to move ahead into the twenty-first century may succeed.

³³Krepinevich, 36

Bibliography

- Barnett, Roger W. Surface Ship Survivability: Risk Management and Network Centric Warfare. Strategic Research Department Research Report 12-98. Newport, RI: Naval War College. Center For Naval Warfare Studies, 1998.
- Breemer, Jan S. "The End of Naval Strategy: Revolutionary Change and the Future of American Naval Power." Strategic Review, Spring 1994, 40-53.
- Burpo, John D. "Is the Day of the Aircraft Carrier Over?" Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1998.
- Chairman, Joint Chiefs of Staff, Joint Vision 2010. Washington, n.d.
- Chairman, Joint Chiefs of Staff, National Military Strategy of the United States of America. Washington, 1997.
- Coatanéa, Alain. "The New Carrier Group--Options for the French Navy." NATO's Sixteen Nations. 1994, 25-27.
- Davis, Jacquelyn K. Aircraft Carriers and the Role of Naval Power in the Twenty-First Century. National Security Paper Number 13. Cambridge: Institute for Foreign Policy Analysis, 1993.
- Erwin, Sandra I. "Design of Next Generation Navy Carriers Driven by Need to Cut Crew, Curb Costs." National Defense, March 1998. <<http://www.adpansia.org/magazine/98mar/navycar.htm>> (6 January 1999).
- Foxwell, David. "New Waves of Sea Power: Carriers Epitomize Modern, Mobile Forces--At a Cost." Jane's International Defense Review, February 1997, 31-36.
- Girvin, Charles R. "Twilight of the Supercarriers." U.S. Naval Institute Proceedings, July 1993, 40-45.
- Goodman, Jr., Glenn W. "Redesigning the Navy: Three New Ships Hold the Key to Long-Term Modernization of Surface and Submarine Fleets." Armed Forces Journal International, March 1998, 28-34.
- Headquarters, U.S. Marine Corps. Operational Maneuver From the Sea. Washington: January 1996.
- Hessman, James D. "'This Dangerous and Unpredictable World': A Carrier for the 22nd Century?" Sea Power, October 1997, 41-44.

- Houck, Kenneth T. "U.S. Tactical Aircraft Procurement: Into the Twenty-First Century." Research Report, U.S. Air University. Air War College, Maxwell Air Force Base, Alabama: 1994.
- "Iraq's Confrontations with U.S. Since Gulf War." Reuters, 6 February 1998. Lkd. Global NewsBank.
<<http://infoweb3.newsbank.com/bin/gate.exe?f=doc&state=8ddiv0.3.149>> (7 January 1999).
- Jewell, Angelyn and Maureen Wigge. "Surge 97: Demonstrating the Carrier's Firepower." U.S. Naval Institute Proceedings, September 1998, 79-82.
- Kelso, Frank B. III, "Aircraft Carriers--Power Projection From the Sea." NATO's Sixteen Nations, 1994, 80-82.
- Krepinevich, Jr., Andrew F. A New Navy For a New Era. Center for Strategic and Budgetary Assessments. Washington: 1996.
- _____. "Transforming the Navy's War-fighting Capabilities." Issues in Science and Technology, Fall 1996, 29-32.
- Laird, Robbin. "Present at the Creation: TMD Strategy Evolves to Meet a Proliferating Threat." Sea Power, October 1997, 47-50.
- Leopold, Reuven. "The Next Naval Revolution." Jane's Navy International, January/February 1996, 12-14, 16-20; reprinted., Strategy and Force Planning Faculty, eds., Strategy and Force Planning. 2d ed. Newport, RI: Naval War College Press, 1997. 602-604.
- _____. Sea-Based Aviation and the Next U.S. Aircraft Carrier Design: The CVX. MIT Security Studies Program Occasional Paper. Cambridge: Massachusetts Institute of Technology. Center for International Studies, 1998.
- "Military Affairs--The New Way of War." The Economist, May 1997. Lkd. Global NewsBank. <<http://infoweb3.newsbank.com/bin/gate.exe?f=doc&state=8ddiv0.3.77>> (7 January 1999).
- Mintz, John. "Navy, Air Force Shoot for Bigger Role in Iraq: Both Seeking to Justify Future Budgets." The Washington Post, 12 September 1996. Lkd. Global NewsBank. <<http://infoweb3.newsbank.com/bin/gate.exe?f=doc&state=8ddiv0.3.163>> (7 January 1999).
- Odom, William E. "Transforming the Military." Foreign Affairs, July/August 1997, 54-64.

- Polmar, Norman. "Carrier Questions--and Some Answers." U.S. Naval Institute Proceedings, April 1998, 103-104.
- Randol, Mark A. and Wallace J. Thies. "The Opportunity Costs of Large-Deck Carriers: Naval Strategy for the 1990s and Beyond." Naval War College Review, Summer 1990, 9-31.
- Stocker, Jeremy. "Carrier Decisions." RUSI Journal, October 1997, 46-50.
- Trotter, Thomas W. "The Future of Carrier Aviation." Naval War College Review, Winter 1993, 22-24.
- Truver, Scott C. "Sunrise or Sunset? U.S. Carrier Power Launches Itself Into the Future." Jane's International Defense Review, February 1997, 26-31.
- U.S. Congressional Budget Office. A Look at Tomorrow's Tactical Air Forces. Washington: 1997.
- U.S. Congressional Budget Office. Naval Combat Aircraft: Issues and Options. Washington: 1987.
- U.S. Department of the Navy. ... From the Sea: Preparing the Naval Service for the 21st Century. Washington: September 1992.
- U.S. Department of the Navy. Forward ... From the Sea. Washington: September 1994.
- U.S. Department of the Navy. Forward ... From the Sea: The Navy Operational Concept. Washington: March 1997.