



United States Government Accountability Office
Washington, DC 20548

November 19, 2004

The Honorable Roscoe G. Bartlett
Chairman, Subcommittee on Projection Forces
Committee on Armed Services
House of Representatives

Subject: *Information on Options for Naval Surface Fire Support*

Dear Mr. Chairman:

Land-, air-, and sea-based components form the “fires triad” that is used to support Marine Corps amphibious assault operations. The sea-based part of the fires triad is referred to as Naval Surface Fire Support (NSFS). From World War II until the Persian Gulf War in 1991, NSFS resided mainly in the capability of the 16-inch guns on the Navy’s *Iowa* class battleships. The thick armor of these battleships and the 24-nautical-mile range of their 16-inch guns gave the battleships increased survivability in high-threat scenarios. The last *Iowa* class battleship was decommissioned in 1992.

Their retirement left a void in the NSFS part of the fires triad. To field a replacement NSFS capability, the Navy developed a two-phased plan in 1994. In the near-term to midterm, it would modify the capability of 5-inch guns on existing destroyers and cruisers, and develop extended-range guided munitions for the modified 5-inch gun. In the far term, it would field a sufficient number of new destroyers fitted with an even-longer-range advanced gun system and ultimately a very-long-range electromagnetic gun or “Rail Gun.”

However, in 1996, congressional authorizers became concerned that the Navy would not be able to produce a replacement NSFS capability comparable to the battleships until well into the twenty-first century. In that year’s Defense Authorization Act,¹ the Congress directed the Secretary of the Navy to restore at least two *Iowa* class battleships to the naval vessel registry until a capability was developed equal to or greater than that provided by the battleships. By 1999 the Navy had placed the *Iowa* and *Wisconsin* battleships back on the naval vessel registry and has been maintaining them in an inactive state since then.

¹ National Defense Authorization Act for Fiscal Year 1996, Pub. L. No. 104-106, Sec. 1011.

In recent years, the Navy's efforts to develop a NSFS replacement capability have not progressed as quickly as planned. Given concerns about the gap in NSFS capability, you requested that we review (1) the validated requirements for NSFS, (2) the estimated cost and schedule for reactivating and modernizing two *Iowa* class battleships to provide NSFS, and (3) the status of Navy efforts to develop a replacement NSFS capability. This letter summarizes our findings and transmits the detailed briefing that we prepared for your staff. (See encl. I.)

To address our engagement objectives, we interviewed responsible officials and reviewed official documents, including internal memos, operational requirements documents, and related studies, from the Marine Corps Combat Development Command, the Navy's Inactive Ships Program Office, the Navy's Surface Warfare Directorate, the Navy's Guided Projectile Office, the Joint Staff (J-8) Force Application Assessment Division, and the U.S. Naval Fire Support Association. We also toured the Battleship *Wisconsin* (BB-64) and the USS *Winston Churchill* (DDG-81). We conducted our work from April through September 2004 in accordance with generally accepted government auditing standards.

Results in Brief

The Navy and Marine Corps have only recently begun the process to establish validated NSFS requirements that address the overall capabilities needed and the balance between different systems that will be required to provide effective, continuous, and sustaining support fire for forces operating ashore. Validated requirements for some specific systems have been established, however.

The cost and schedule for reactivating and modernizing two *Iowa* class battleships have not been fully developed. However, the Navy believes that reactivation of the battleships should not be pursued for a number of reasons. These include, among other things, manpower requirements and modernization needed to integrate the battleships into today's modern Navy. Therefore, the Navy has no plans to conduct the detailed studies needed to identify the full extent of needs and costs.

The Navy's fielding of a replacement NSFS capability has been delayed. The near-term and midterm efforts to extend the range of munitions fired from the 5-inch guns on its cruisers and destroyers have been delayed from 2001 to possibly as late as 2011, but other program options have been discussed including the option of canceling or reducing the extended-range munitions program to fund development of another gun system. Far-term plans to help fill the NSFS gap by 2015 using a new destroyer with advanced gun systems were revised in 2001 to employ a

different destroyer concept—the DD (X). The Navy currently expects sufficient numbers of DD (X) destroyers to be ready to help fill the NSFS gap by 2018 at the earliest.

Validated Requirements for NSFS Overall Have Not Been Established

The role of naval surface fire support has been evolving in tandem with the Navy's amphibious assault doctrine, and for well over a decade, since the decommissioning of the last of the *Iowa* class battleships, both the Navy and Marine Corps have strived to address the specifics of how to fulfill NSFS requirements. Until recently, these services have had difficulty with reconciling their respective positions. Operational requirements documents for several systems, such as the new destroyer, that will contribute to the NSFS mission have been developed. On several occasions, the Marine Corps has specified to the Navy what they believe the replacement NSFS capability should be and the timing of the capability. However, no single document has ever addressed the overall capabilities and the balance between different systems that will be required to provide effective, continuous, and sustainable supporting fire for increasingly capable expeditionary forces operating ashore.

Although no formal NSFS requirement currently exists, in August 2004, the Navy and Marine Corps agreed on an approach to correct the problem by formally agreeing to develop an Initial Capabilities Document (ICD) that would address the overall capabilities needed for naval fire support. The goal of this ICD is to document and address the overall capabilities required of naval fire support. This will assist in determining the most effective and efficient balance of capabilities and in determining the cumulative offensive power that naval forces must be capable of generating. An integrated product team chaired by the Marine Corps' Deputy Commandant for Combat Development office, in coordination with the Office of the Chief of Naval Operations, will conduct the required analyses, develop the ICD, and endeavor to gain the Department of Defense's approval for the ICD.

Full Cost and Schedule for Reactivating and Modernizing Battleships Have Not Been Analyzed

To reactivate two *Iowa* class battleships to their decommissioned capability, the Navy estimates costs in excess of \$500 million. This does not include an additional \$110 million needed to replenish gunpowder for the 16-inch guns because a recent survey found that it is unsafe. In terms of schedule, the Navy's program management office estimates that reactivation would take 20 to 40 months, given the loss of corporate memory and the shipyard industrial base.

Reactivating the battleships would require a wide range of battleship modernization improvements, according to the Navy's program management office. At a minimum, these modernization improvements include command and control, communications, computers, and intelligence equipment; environmental protection (including ozone-depleting substances); a plastic-waste processor; pulper/shredder and wastewater alterations; firefighting/fire safety and women-at-sea alterations; a modernized sensor suite (air and surface search radar); and new combat and self-defense systems. Although detailed studies would be needed to identify the full extent of modernization needs and costs, the Navy has no plans to conduct these studies.

The Navy's program management office also identified other issues that would strongly discourage the Navy from reactivating and modernizing the battleships. For example, personnel needed to operate the battleships would be extensive, and the skills needed may not be available or easily reconstituted. Other issues include the age and unreliability of the battleships' propulsion systems and the fact that the Navy no longer maintains the capability to manufacture their 16-inch gun system components and ordnance.

Delays in Fielding Replacement NSFS Systems After Retiring Battleships Extend Gap in NSFS Capability

Following the retirement of the last *Iowa* class battleship in 1992, the Navy laid out a two-phase plan to provide a replacement NSFS capability:

- The near-term and midterm phases called for modifying the 5-inch guns on the current class of destroyers and cruisers planned for production and developing extended-range guided munitions (ERGM) to be used in the upgraded guns for improved range.
- The far-term phase called for developing a longer-range advanced gun system to be fitted on a new destroyer and eventually a Rail Gun with even greater range.

In the near-term and midterm, expected fielding of the ERGM system for use in upgraded 5-inch guns on current destroyers and cruisers has been delayed from 2001 to possibly as late as 2011. Technical and design

problems on the ERGM, which has been under development since 1996, have led to test failures and delays.² The Navy has awarded a contract to a different company for developing an alternative technology. The Navy now intends to issue a solicitation in 2005 to hold full and open competition for development and low-rate production for the extended-range munitions for the 5-inch gun. Other program options have also been discussed to include canceling or reducing the extended-range munitions program to fund the development of another gun under consideration for the future destroyer called the “hypersonic naval rail gun.” Also, the Navy is considering the benefits of installing modified 5-inch guns on the current cruisers to fire the extended-range guided munitions. However, if undertaken, the Navy does not intend to use these platforms in an NSFS role. This decision will reduce the number of ships able to provide NSFS by 41 percent in those scenarios where a 25-nautical-mile standoff range of the ships from the shore is needed to protect them from shore-based threats. Without the 5-inch gun modification to handle the extended-range guided munitions, the range of the cruisers’ guns is only 13 nautical miles.

In the far term, the fielding of an advanced gun system has been delayed. Initial plans called for fielding 32 new destroyers, designated the DD 21, with advanced gun systems between 2008 and 2020 to fill the NSFS gap. In 2001, the Navy announced that it would replace the DD 21 with another destroyer concept called the DD(X). The Navy now expects to field 24 DD(X) destroyers between 2011 and 2023. A sufficient number of DD(X) destroyers to help close the NSFS gap will not be available until 2018. We reported that the ship’s construction plan was risky because some technologies are unproven and the design is not yet stable.

Agency Comments

DOD provided us with technical comments, which we incorporated in our letter where appropriate.

As agreed with your staff, we plan no further distribution of this letter until 14 days from its issue date. At that time, we will send copies of this letter to other congressional committees; the Secretary of Defense; the Director, Office of Management and Budget; and other interested parties. Copies are available to others upon request. The letter will also be available on the GAO Web site at <http://www.gao.gov>.

² For more details on these problems, see our report, *Defense Acquisitions: Assessments of Major Weapon Programs* (GAO-04-248, Mar. 31, 2004), pp. 57 and 58.

Should you or your staff have questions on the matters discussed in this report, please contact me on (202) 512-4841 or Jim Morrison, Assistant Director, at (202) 512-7078. Contributors to this report include Jerry Clark, Robert Swierczek, and Martha Dey.

A handwritten signature in black ink that reads "R E Levin". The letters are written in a cursive, slightly slanted style.

Robert E. Levin
Director, Acquisition and Sourcing Management

Enclosure

Enclosure I



Acquisition and Sourcing Management

Briefing to the Staff of the
Subcommittee on Projection Forces,
Committee on Armed Services,
House of Representatives

Information on Options for Naval Surface Fire Support

1



Naval Surface Fire Support

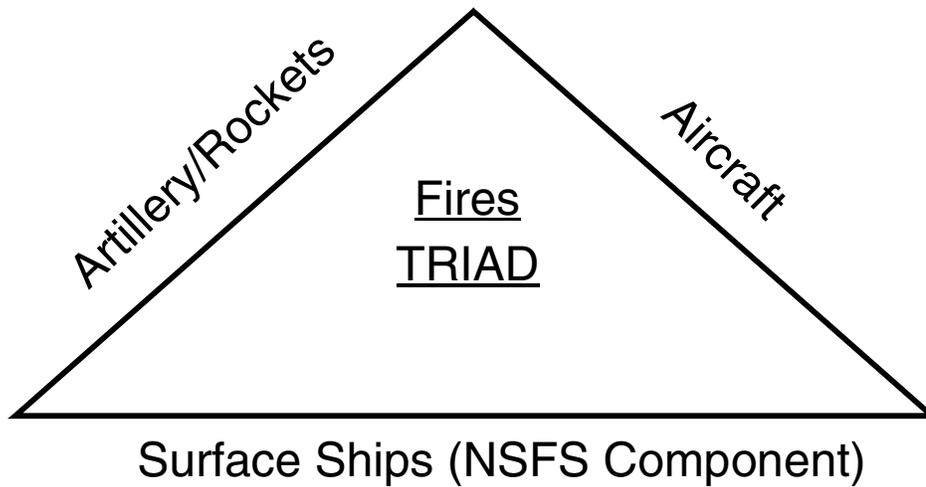
QUESTIONS

1. What are the validated requirements for naval surface fire support (NSFS)?
2. What are the estimated cost and schedule for reactivating and modernizing two of the Iowa Class battleships to conduct naval surface fire support?
3. What is the status of the Navy's efforts to develop a replacement NSFS capability?



Naval Surface Fire Support **BACKGROUND**

- “Fires TRIAD” supports Marine Corps amphibious assault operations
- Fires TRIAD composed of complementary land (artillery/rockets), air (aircraft), and sea (surface ship) components





Naval Surface Fire Support **BACKGROUND (cont.)**

- Iowa Class battleships with their 16-inch guns were used for NSFS between WWII and the 1991 Persian Gulf War
- 1992 -- Navy decommissioned last Iowa class battleship
- FY92-93 -- National Defense Authorization Act directs Secretary of Navy to establish naval surface fire support R&D program
 - Navy states that shift away from large caliber guns, the retirement of the last battleships, and the current emphasis on amphibious assault from over the horizon eroded capability to provide fire support for forces ashore
 - According to Navy this trend resulted in the congressional direction that the Navy establish an NSFS R&D program
- 1994 -- Navy develops near-/mid- and far-term phased approach to address current shortfalls in NSFS capability



Naval Surface Fire Support **BACKGROUND (cont.)**

- 1995 -- Navy removes the Navy's four inactive Iowa class battleships from the naval vessel registry (NVR)
 - NVR is the official inventory of ships and service craft in custody or titled to the U.S. Navy
 - Ships remain on the NVR until they are disposed of
- 1996 -- Congressional authorizers were concerned that Navy's future years defense program could not produce a replacement fire support capability comparable to the battleships until well into the next century. The National Defense Authorization Act of Fiscal Year 1996 directed the Secretary of the Navy to restore at least two Iowa class battleships to the NVR
 - Two battleships must be retained until the Secretary of the Navy certifies that the Navy has within the fleet an operational surface fire support capability that equals or exceeds the capability that the battleships could provide if returned to active service
- 1998/1999 -- Navy placed the battleships Iowa and Wisconsin back on the NVR
 - According to Navy program management officials, maintenance costs for the Iowa and Wisconsin totaled over \$7 million for fiscal years 2000-2004



Naval Surface Fire Support
Question #1 NSFS Requirements

**Question #1 - What are the validated requirements
for naval surface fire support (NSFS)?**



Naval Surface Fire Support
Question #1 NSFS Requirements (cont.)

Past efforts to address NSFS requirements

- May 1992 -- Navy's NSFS Mission Need Statement identified NSFS shortfalls and listed several alternatives to address them
- February 1993 -- Navy begins development of Cost and Operational Effectiveness Analysis (COEA) for NSFS
 - Navy plans called for COEA to be followed by an Operational Requirements Document (ORD) to provide detailed NSFS characteristics
- October 1994 -- Navy concludes that the assumed NSFS requirements needed to be reevaluated and updated to guide NSFS plans
- December 1994 – Chief of Naval Operations (CNO) approves revised NSFS plan and in January 1995 directs that Navy initiate upgrades to the 5-inch gun and develop precision-guided munitions for use in the modified 5-inch gun.
 - Initial operational capability before 2001
- December 1994 – Navy signs memo transmitting COEA stating that retirement of the battleships with their large caliber guns had eroded Navy's capability to provide NSFS for forces ashore
 - COEA proposed a variety of gun and missile weapon systems as solutions to the NSFS requirement



Naval Surface Fire Support
Question #1 NSFS Requirements (cont.)

Past efforts to address NSFS requirements (cont.)

- November 1995 – Operational Requirements Document for an extended range guided munitions for use in existing 5-inch guns signed
- October 1996 --The Johns Hopkins University Applied Physics Laboratory published NSFS Road Map Study Phase1 report
 - Report concludes that there was a need for a new vision to convey the evolving role of NSFS--recommends that the Navy with the Marine Corps and Army establish requirements for Navy fire support for the joint land battle
- December 1996 -- Marine Corps Combat Development Command (MCCDC) memo to CNO outlining NSFS requirements and their milestones
 - NSFS is essential to augment organic fire support during the critical early phases of an amphibious operation
 - NSFS initial operational capability by 2010 and a fully operational capability by 2014
 - December 1996 MCCDC memo was followed by June 1999 and March 2002 memos to the CNO. The March 2002 memo
 - reemphasized the Marine Corps requirements for NSFS stated in the December 1996 and June 1999 memos
 - recommended establishment of a Capstone Requirements Document to address NSFS requirements



Naval Surface Fire Support
Question #1 NSFS Requirements (cont.)

Past efforts to address NSFS requirements (cont.)

- November 1997 -- DD 21 ORD signed
 - One of the primary missions identified for the DD 21 was to conduct NSFS
 - The first of 32 DD 21s to be procured in 2005 and entered into service in 2010
 - In 2001 the DD 21 was replaced by the DD(X) destroyer
 - Delivery of the first DD(X) has slipped to 2011
 - Marine Corps believes DD(X) with its Advance Gun Systems will help meet their NSFS performance requirements

- April 2002 -- Navy informed Senate Armed Services Committee that they concur with the Marine Corps position on NSFS requirements stated in the March 2002 MCCDC memo

- August 2002 -- CNO reports to Congress that a dramatic improvement in sea-based fires capability is required to align NSFS with Marine Corps doctrine
 - Report updates Navy's two-phased approach to provide NSFS support
 - Near/mid term phase is projected to deliver the initial operational capability of the ERGM for the 5-inch gun in 2005
 - Far-term approach is to develop a more robust set of NSFS weapon systems for installation in the DD(X)



Naval Surface Fire Support
Question #1 NSFS Requirements (cont.)

Current efforts to address NSFS requirements

- February 2004 -- ORD for Extended Range Munitions (ERM) signed
- February 2004 – ORD for DD(X) destroyer signed
- August 2004 -- Marine Corps issues charter for an integrated process team for development of the Initial Capabilities Document (ICD) – “Joint Fires In Support Of Expeditionary Operations In The Littorals.” Charter states that
 - A significant gap exists in Joint and Service capabilities associated with naval fires and expeditionary warfare
 - No single document has ever addressed the overall capabilities – nor the balance between different systems – that will be required to provide effective, continuous, and sustainable supporting fires for increasingly capable expeditionary forces operating ashore
 - Formally stating the overall capabilities required of naval fires will assist not only in determining the most effective and efficient balance of capabilities but ultimately in determining the cumulative offensive fire power that naval forces must be capable of generating
 - Navy and Marine Corps agree that the ICD will be the basis for resolving NSFS requirements issues
 - Marine Corps representatives believe that validated requirements will help them compete with other programs for funding



Naval Surface Fire Support
Question #2 Battleship reactivation

Question #2 - What are the estimated cost and schedule for reactivating and modernizing two of the Iowa Class battleships to conduct naval surface fire support?



Naval Surface Fire Support
Question #2 Battleship reactivation (cont.)

Full reactivation and modernization costs have not been analyzed

- Navy's 1999 estimate for reactivation cost was \$430 million for both ships
 - Reactivation would return the ships to their decommissioned capability

- Current cost to reactivate estimated to be in excess of \$500 million for both ships
 - Cost assumption based on 1999 estimate with a 4% annual inflation rate
 - Cost assumption does not consider availability of shipyard space to complete the reactivation

- \$500 million reactivation cost does not include estimated \$110 million needed to replenish gun powder for battleships' 16-inch guns
 - Recent survey found powder to be unsafe



Naval Surface Fire Support
Question #2 Battleship reactivation (cont.)

Full reactivation and modernization costs have not been analyzed (cont.)

- The Navy has not conducted and does not plan to conduct studies to define battleship modernization needs and costs
- Navy program management office has identified the following as the minimum battleship modernization improvements they believe would be needed
 - C4I (Command & Control, Communications, Computers and Intelligence) equipment,
 - environmental protection (including ozone depleting substances)
 - plastic waste processor
 - pulper/shredder and gray (waste) water alterations
 - normal firefighting/safety and women-at-sea alterations
 - sensor suite (air and surface search radar)
 - combat systems
 - self defense systems



Naval Surface Fire Support
Question #2 Battleship reactivation (cont.)

**According to the Navy program management office,
reactivation time has increased**

- 1999 estimate to reactivate battleships was 14 months
- Current estimate of 20 to 40 months to reactivate the battleships
- Increased reactivation time due in part to
 - Loss of corporate memory
 - Shipyard industrial base

Time to modernize has not been estimated



Naval Surface Fire Support
Question #2 Battleship reactivation (cont.)

- Navy program management office lists reasons that would discourage the Navy from battleship reactivation and modernization
 - Personnel – reactivation would require additional personnel that the Navy does not have as well as significant training costs
 - Self Defense/C4SI – operation within modern battle group structure would require significant upgrades
 - Propulsion – System is old, unreliable, potentially unsafe and lacking skilled personnel
 - Ordnance – Navy no longer maintains capability to manufacture 16-inch gun system components and ordnance
 - Cost – Estimate to reactivate both ships to their decommissioned capability would increase to address modernization needs
 - Schedule – Loss of corporate memory and shipyard industry base expected to increase reactivation time

- Marine Corps supports the strategic purpose of reactivating two battleships in accordance with the National Defense Authorization Act of 1996 and supports the Navy’s modernization efforts to deliver a sufficient NSFS capability that exceeds that of the Iowa class battleships



Naval Surface Fire Support
Question #3 Replacement Capability

Question #3 - What is the status of the Navy's efforts to develop a replacement NSFS capability?



Naval Surface Fire Support
Question #3 Replacement Capability(cont.)

In 1994 Navy developed plan to field replacement NSFS capability

- Near-/mid-term plan:
 - Modify capability of 5-inch guns on current destroyers and cruisers
 - Develop extended range guided munitions to fire in upgraded 5-inch guns
 - Develop a long range land attack missile

- Far-term plan:
 - Develop and produce a new destroyer fitted with an advanced gun system
 - Pursue electromagnetic technology (Rail Gun) with an even greater range for the new destroyer



Naval Surface Fire Support
Question #3 Replacement Capability(cont.)

Near-/mid-term plans to field replacement NSFS capability have changed

- 1994 -- Navy proposed a near-/mid-term NSFS plan that would upgrade their 5-inch guns on current destroyers and cruisers and fit it with extended range guided munitions
- 1996 – Navy awards contract to develop extended range guided munitions (ERGM) system.
 - Initial plans to field near/mid term replacement NSFS capability by 2001 were not realized on expected timeline because of technical and design problems with the ERGM system.
- 1998 – Navy pursues development of a Land Attack Standard Missile (LASM) to provide a long range missile capability by FY04 but the program was terminated during FY03 budget development
- October 2003 – Navy issues solicitation for alternative precision guided munitions concept
- May 2004 -- Navy awarded a contract to a different company to develop an alternative extended range munitions technology.



Naval Surface Fire Support
Question #3 Replacement Capability(cont.)

Near-/mid-term plans to field replacement NSFS capability have changed (cont.)

- June 2004 – Navy discusses options for accelerating Rail Gun development to meet DD(X) schedule
 - According to Navy officials funding for Rail Gun research is deficient
 - Options discussed to address funding deficiency included canceling or descopeing the extended range munitions program
- August 2004 – Navy again modifies plans for extended range munitions for 5-inch gun
 - Navy notifies industry of intent to issue a solicitation in 2005 for System Development and Demonstration with a low rate initial production option of precision-guided, extended range munitions to be fired in the Navy’s 5-inch gun
 - According to program official, depending on which system is selected, initial operational capability could be as late as 2011
- October 2004 – Navy is currently reconsidering decision to not put 5-in guns on cruisers
 - Even if cruisers receive new gun, the Navy does not intend to use them in the NSFS role
 - Will reduce available NSFS capable platforms by 41 percent if 25 nautical mile stand-off range is adhered to



Naval Surface Fire Support
Question #3 Replacement Capability(cont.)

Concerns have been raised about sufficiency of far-term plans to field replacement NSFS capability

- 1994 -- Navy identified the need for a far term NSFS plan
 - Plan evolved from the DD 21 to the proposal to develop the DD(X) destroyer with advance gun systems
 - Current production plans call for sufficient DD(X) destroyers in combination with DDG destroyers outfitted with extended range munitions to fill NSFS gap by 2018
 - September 2004 GAO reported (GAO-04-973) that there is risk to the DD(X) construction plan
 - Program plans to award the contract for detail design and construction of the lead ship before the technologies are proven and the design is stable



Naval Surface Fire Support
Question #3 Replacement Capability (cont.)

Current NSFS gun range capability falls short of Marine Corps stated range requirement

- Marine Corps 2002 memo to CNO lists the following near term NSFS gun range requirement
 - Desired/Objective – 63 nautical miles from ship to shore
 - Minimal Acceptable/Threshold – 41 nautical miles from ship to shore

- Current NSFS guns are not able to achieve Marine Corps stated NSFS gun range requirements when ships are positioned 25 nautical miles from shore due to increased land based threats
 - The 5-inch guns with a range of 13 nautical miles currently in use on destroyers and cruisers unable to meet range objective
 - Desired/Objective range could be met with anticipated increase in range using ERGM currently in development
 - The 16-inch guns with a range of 24 nautical miles used on battleships unable to meet range objective when 25-nautical-mile standoff range is required
 - Minimal Acceptable/Threshold range to target could be achieved if battleships operated closer to shore
 - Desired/Objective range to target could be achieved with previously tested but not fielded advanced projectiles



Naval Surface Fire Support
Question #3 Replacement Capability(cont.)

Recent Navy analysis found that the need for replacement NSFS capability continues to exist

- Navy officials stated that their analysis confirms a capabilities gap exists during the early stages of a conflict

- Analysis confirms that ships are best gap filler based on
 - Immature theater
 - Lack of air superiority
 - Capacity
 - Number of people placed in danger
 - All weather
 - Capability (24 hours/7 days per week)
 - Cost



Naval Surface Fire Support

Summary

- Marine Corps and Navy have had difficulty reconciling their positions for formalizing NSFS requirements
 - Recent agreement to have a Navy/Marine Corps developed Initial Capabilities Document expected to eventually result in validated NSFS requirements
- Full battleship reactivation and modernization costs have not been analyzed
- Gap in NSFS capability since retirement of the battleships expected to continue until end of next decade or later
 - NSFS replacement capability has not progressed as quickly as planned
 - Plans for improved 5-inch gun near/mid term NSFS replacement capability delayed from 2001 to possibly as late as 2011
 - Marine Corps states that DD(X) with advance gun systems will help meet their NSFS needs
 - Plans for DD(X) far-term NSFS replacement capability will not be achieved until 2018 or possibly later

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