

STATEMENT OF
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EVOLVING MISSIONS OF THE U.S. NAVY AND
SURFACE AND SUBSURFACE ASSETS
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Chairman Bartlett, Representative Taylor, distinguished members of the subcommittee, thank you for the opportunity to appear before you to discuss the evolving missions of the U.S. Navy, how the Navy's surface and subsurface assets execute those missions, and how the Navy envisions executing them in the future. As requested, my testimony will focus on the following:

- the evolving missions of the U.S. Navy (pages 1-9);
- the contributions of surface and subsurface combatants in execution of those missions (pages 10-15); and
- the suitability of the current and projected surface and subsurface combatant force mix (pages 16-23).

Evolving Missions Of The U.S. Navy

The broad roles of the Navy have tended to endure over time, and many of the specific missions that the Navy has performed in the past it continues to perform today. But Navy missions do evolve over time, in response to changes in the strategic environment and technology. As a result of changes in these two areas, the relative emphasis among specific Navy missions can shift, the character of some missions can change, and new specific missions can emerge. This section discusses how Navy missions have evolved over the last quarter-century — a period that encompasses the final decade or so of the Cold War (1981 to 1989-1991¹) and the first 15 years or so of the post-Cold War era — and how they may evolve further in coming years.

Navy Missions During Final Decade Of The Cold War

In the final decade of the Cold War, formal Navy force planning focused to a large degree on preparing for blue-water wartime operations against Soviet naval forces. Key Navy missions during this period included the day-to-day mission of strategic nuclear deterrence (accomplished with the Navy's nuclear-powered ballistic missile submarines, or SSBNs) and the potential wartime missions of sea control and power projection. The Navy's potential wartime missions were tied to the scenario of a NATO-Warsaw Pact conflict that would be centered in Europe but which could include Navy operations in other regions, particularly the Arctic and the Northwest Pacific.

To help deter potential Soviet aggression in Europe and Northeast Asia, and to posture the Navy for immediate wartime operations if deterrence failed, the Navy during the Cold War maintained forward-deployed forces near Europe and in the Western Pacific. In response to events in Southwest Asia, including the revolution in Iran, the Iran hostage crisis, the Iran-Iraq war, and the Soviet invasion of Afghanistan, the Navy during this period also increased its forward-deployed presence

¹The end of the Cold War is often viewed as starting with the fall of the Berlin Wall in November 1989 and finishing with the dissolution of the Soviet Union in December 1991.

in the Indian Ocean/Persian Gulf region. In response to concerns over importation of illegal drugs into the United States, this period also featured the emergence of an anti-drug mission for the Navy in the Caribbean and the East Pacific.

The Navy's potential wartime mission of sea control included a strong focus on blue-water anti-air warfare (AAW) and antisubmarine warfare (ASW) operations. The AAW mission included the outer air battle, a term referring to long-range AAW operations in which carrier-based E-2 Hawkeye AWACS aircraft and F-14 Tomcat fighters equipped with long-range Phoenix air-to-air missiles countered Soviet land-based maritime bombers equipped with anti-ship cruise missiles (ASCMs). Closer to the battle group, the AAW mission focused on defending against saturation attacks of large numbers of Soviet ASCMs launched from land-based aircraft, surface ships, and submarines in an environment featuring enemy electronic jamming. This is the task for which the Aegis air defense system was originally developed and deployed.

The wartime ASW mission was focused on detecting and countering large numbers of Soviet submarines, including fast, deep-diving, nuclear-powered submarines of various kinds (ballistic missile, ASCM-armed, and attack) and non-nuclear-powered attack submarines. Key Navy systems and platforms involved in the ASW mission included the ocean-bottom Sound Surveillance System (SOSUS) hydrophone arrays, TAGOS-type ocean-surveillance ships equipped with the Surveillance Towed Array Sonar System (SURTASS), land-based P-3 Orion maritime patrol aircraft, and nuclear-powered attack submarines (SSNs). Other platforms, such as carrier-based S-3 Viking ASW aircraft and surface combatants equipped with both sonars and ASW helicopters, also played a role. ASW has been (and continues to be) a mission to which multiple types of platforms contribute.

The wartime ASW mission included so-called strategic ASW, which referred to using U.S. ASW assets, particularly SSNs, to detect and attack Soviet ballistic missile submarines in their defended bastions close to the Soviet Union. The aim of strategic ASW was to pin down the Soviet submarine force, and the Soviet Navy generally, by forcing the Soviets to use attack submarines and other assets to defend their ballistic missile submarines. Another aim of strategic ASW was to gradually shift the strategic nuclear balance more and more in the U.S. favor during a potentially drawn-out conventional NATO-Warsaw Pact conflict, so as to make nuclear escalation less and less attractive to the Soviets as an option for ending the conflict on terms favorable to the Soviets.²

The Navy's potential wartime mission of power projection focused on long-range strike (land-attack) operations by Navy carrier-based attack aircraft (such as A-6 Intruders) and Tomahawk land attack missiles (TLAMs). TLAMs during this period carried nuclear as well as conventional warheads. Although nuclear-armed TLAMs could attack targets deep inside the Soviet Union, they were classified as non-strategic rather than strategic nuclear weapons.

Although the Navy's formal planning emphasis during this period was on preparing for blue-water operations against Soviet naval forces, the Navy and Marine Corps throughout the Cold War conducted numerous operations in littoral (near-shore) waters against the land- and sea-based forces of countries other than the Soviet Union. A partial list of such operations includes the Korean War (1950-1953), Formosa (Taiwan) (1950-1955), Lebanon (1958), Thailand (1962), the Cuban missile

²For a discussion, see CRS Report 87-138 F, *Nuclear Escalation, Strategic Anti-Submarine Warfare, and the Navy's Forward Maritime Strategy*, by Ronald O'Rourke. 82 pp. (February 27, 1987; out of print and available directly from the author.)

crisis (1962), the Vietnam War (1964-1973), the Dominican Republic (1965), Libya (1981), Lebanon (1982-1983), Grenada (1983), Italy (the interception of the plane carrying Achille Lauro hijackers) (1985), Libya (1986), the Persian Gulf tanker escort operation (1987-1988), Libya (1989), Panama (1989-1990), and the Persian Gulf War (Operation Desert Shield/Desert Storm) (1990-1991). Navy and Marine Corps activities during this period also included several smaller operations to protect or evacuate personnel endangered ashore.³

Key technological developments during this period that directly affected surface combatant and submarine missions included the Tomahawk missile, the Aegis combat system with the SPY-1 phased-array radar, and the vertical launch system (VLS). The Tomahawk created a new mission for surface combatants and SSNs by giving them an ability to attack targets, including deep-inland targets, at ranges that were previously possible for general-purpose Navy forces only with carrier-based aircraft. The combination of Tomahawk, Aegis, and VLS transformed surface combatants from defensive escorts into independently deployable, strike-capable combatants.⁴

Navy Missions In The Post-Cold War Era

End Of Cold War Shift In Formal Planing Emphasis. The end of the Cold War led to a fundamental shift in formal planning emphasis for the U.S. Navy. The Cold War emphasis on planning for blue-water operations against Soviet naval forces was replaced by a new emphasis on planning for operations in littoral waters against the land- and sea-based forces of various countries. This fundamental shift in formal planning emphasis was officially set forth in a Department of the Navy document entitled ...*From the Sea*, which was first published in September 1992.⁵ **Table 1** summarizes key elements of this shift.

³ For additional information on all these operations, see CRS Report RL32170, *Instances of Use of United States Armed Forces Abroad, 1798-2004*, by Richard F. Grimmett.

⁴For a discussion, see CRS Report 94-343 F, *Navy DDG-51 Destroyer Procurement Rate: Issues and Options for Congress*, by Ronald O'Rourke. (April 25, 1994; out of print and available directly from the author.) pp. 23-24. See also CRS Report RL31209, *Navy DD(X), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

⁵For a copy of the text this document available on the Internet, go to:
[<http://www.chinfo.navy.mil/navpalib/policy/fromsea/fromsea.txt>]

A follow-on document, entitled *Forward ... From the Sea*, was published in November 1994. For a copy of the text of this document available on the Internet, go to:

[<http://www.chinfo.navy.mil/navpalib/policy/fromsea/forward.txt>]

Table 1. End-of-Cold War Shift In Formal Navy Planning Emphasis

Cold War emphasis	Post-Cold War emphasis
Blue-water operations	Operations in littoral waters, which can present very different environmental conditions to Navy systems
Stand-alone operations	Joint and combined operations
Countering Soviet naval forces	Countering the very differently configured land- and sea-based forces of countries other than Russia
Operations to support NATO effort in NATO-Warsaw Pact conflict centered in Europe	Using Navy forces to influence events ashore in other parts of the world in varying crisis and conflict situations.

Source: Prepared by CRS.

This shift in planning emphasis resulted in an increased focus on several Navy missions, including:

- strike warfare,
- amphibious warfare,
- mine warfare,
- naval surface fire support (NSFS),
- support of special operations forces (SOF), and
- maritime intercept operations (MIO).

It also led to a change in the character of certain Navy missions:

- The focus of intelligence, surveillance, and reconnaissance (ISR) operations shifted away from the Soviet Union and toward a variety of other countries.
- In AAW, there was less emphasis on conducting the outer air battle and on countering saturation attacks by large numbers of ASCMs, and more emphasis on being able to operate radars in the cluttered near-shore environment, on being able to rapidly detect and counter land- and sea-based ASCMs fired at potentially short ranges, on being able to rapidly distinguish hostile ships and aircraft from non-hostile ones, and on conducting AAW operations within potentially more restrictive rules of engagement (ROE).
- In strike warfare, there was more emphasis on close air support (CAS) and on minimizing collateral damage.
- In anti-surface warfare (ASuW), there was more emphasis on countering small combatants, boats, and craft.
- In ASW, the previous emphasis on operating sonars in deep waters to counter large, fast, deep-diving, nuclear-powered Soviet submarines was replaced by an emphasis operating sonars in often-shallow waters to counter smaller, slower-moving, non-nuclear-powered submarines, mini- and midget-submarines, and swimmers.

- In mine warfare (MIW), the Cold War division of labor, in which U.S.-based Navy mine warfare ships were to help other ships break out of U.S. ports, while NATO-European mine warfare ships were to focus on clearing NATO-European ports, was replaced by an emphasis on making forward-deployed U.S. Navy forces capable of rapidly responding to mines in regions distant from both the United States and Europe. There was also an increased emphasis on being able to clear mines in very shallow waters and the surf zone, and on covert mine detection and clearing, so as to support amphibious operations.

Although the end of the Cold War resulted in a fundamental shift in the Navy's formal planning emphasis, the shift in actual day-to-day operations was less pronounced, because, as mentioned earlier, the Navy and Marine Corps during the Cold War conducted numerous operations in littoral waters against the land- and sea-based forces of countries other than the Soviet Union. Marine Corps officials noted at the time that the end of the Cold War had less of an effect on Marine Corps operations than it did on the operations of other services.

Homeland Defense And Global War On Terrorism. Terrorist attacks in recent years — such as the August 1998 attack on U.S. embassies in East Africa, the October 2000 attack on the Aegis destroyer Cole (DDG-67) in the port of Aden, Yemen, and the September 11, 2001 terrorist attacks on targets in New York and Washington — have caused Navy missions (like the missions of other U.S. services) to further evolve so as to include an increased emphasis on homeland defense and the global war on terrorism (GWOT).⁶ These new areas of emphasis have led to an increased Navy focus on:

- intelligence, surveillance, and reconnaissance (ISR) operations directed at non-state entities,
- improved maritime domain awareness (or MDA), which refers to having an improved real-time knowledge of activities on the world's oceans,
- coordination with the Coast Guard,
- time-critical precision strike,
- support for SOF,
- counter-WMD (weapons of mass destruction) capabilities,
- maritime intercept operations and (MIO) and patrol operations in very shallow waters and riverine environments (so-called green- and brown-water operations), and
- humanitarian assistance, disaster-relief, reconstruction, and civil-affairs capabilities.

China's Naval Modernization. China's naval modernization effort may lead in coming years to an increased Navy planning emphasis on capabilities for countering improved Chinese naval forces. This could include an increased emphasis on updated versions of some of the blue-water capabilities emphasized during the Cold War, as well as an increased emphasis on the new mission of countering theater ballistic missiles (TBMs). As discussed in a CRS report,⁷ potential

⁶See CRS Report RS22373, *Navy Role in Global War on Terrorism (GWOT) — Background and Issues for Congress*, by Ronald O'Rourke, and CRS Report RS21230, *Homeland Security: Navy Operations — Background and Issues for Congress*, by Ronald O'Rourke.

⁷CRS Report RL33153, *China Naval Modernization: Implications for U.S. Navy Capabilities — Background* (continued...)

implications of China's naval modernization for required U.S. Navy capabilities can be organized into three groups:

- capabilities for a crisis or conflict in the Taiwan Strait area;
- capabilities for maintaining U.S. Navy presence and military influence in the Western Pacific; and
- capabilities for detecting, tracking, and if necessary countering Chinese SSBNs equipped with long-range ballistic missiles.

Capabilities For Crisis Or Conflict In Taiwan Strait Area. Preparing for a potential operation in the Taiwan Strait area could lead to an increased emphasis on on-station or early-arriving forces, on forces with a capability to defeat China's anti-access weapons and platforms, and on forces with an ability to operate in an environment that might be characterized by information warfare/information operations (IW/IO) and possibly electromagnetic pulse (EMP) or the use of nuclear weapons directly against Navy ships.

An increased emphasis on on-station or early arriving forces could lead to a requirement for a Navy with an increased total number of ships, an increased portion assigned to the Pacific Fleet, an increased number of ships homeported in the Western Pacific, or some combination of these steps.

Defeating China's maritime anti-access forces likely would require capabilities for countering:

- large numbers of TBMs, including some possibly equipped with maneuvering reentry vehicles (MaRVs) capable of hitting moving Navy ships at sea;
- large numbers of land-attack cruise missiles and ASCMs, including some advanced ASCMs;
- substantial numbers of land-based fighters, strike fighters, maritime bombers, and surface-to-air missiles (SAMs), including some built to modern designs;
- a substantial number of submarines, including a few that are nuclear-powered and a significant portion that are built to modern designs;
- a substantial number of destroyers, frigates, and fast attack craft, including some built to modern designs; and
- potentially large numbers of mines of different types, including some advanced models.

Countering large numbers of TBMs, including some possibly equipped with MaRVs, could entail some or all of the following:

⁷(...continued)

and *Issues for Congress*, by Ronald O'Rourke. The discussion here is adapted from this report.

- operating, if possible, in a way that reduces the likelihood of being detected and tracked by China’s maritime surveillance systems;
- attacking the surveillance systems that detect and track U.S. Navy ships operating at sea, and the network that transmits this targeting data to the TBMs;
- attacking TBMs at their launch sites;
- intercepting TBMs in flight, which in some cases could require firing two or perhaps even three interceptor missiles at individual TBMs to ensure their destruction; and
- decoying MaRVs away from U.S. Navy ships.

Countering a substantial number of submarines would likely require a coordinated effort by an ASW network consisting of some or all of the following: distributed sensors, unmanned vehicles, submarines, surface ships, helicopters, and maritime patrol aircraft. Defeating torpedoes fired by China’s submarines would require U.S. submarines and surface ships to have systems for detecting, decoying, and perhaps destroying those torpedoes. In December 2004, the Navy approved a new concept of operations (CONOPS) — a new general approach — to ASW that shifts the Navy away from the traditional approach of operating large numbers of ASW platforms (aircraft, surface ships, and submarines), and toward a new approach that uses a smaller number of ASW platforms in conjunction with standoff weapons, unmanned vehicles, and networks of distributed sensors, some of them possibly as small as soda cans. The new concept has been characterized as shifting from a platform-intensive model of ASW to a sensor-rich model.

Operating effectively in an environment that could be characterized by IW/IO and possibly EMP or the use of nuclear weapons directly against Navy ships could require, among other things:

- measures to achieve and maintain strong computer network security;
- hardening of ships, aircraft, and their various systems against EMP; and
- hardening of ships against the overpressure, thermal, and radiation effects of a nuclear weapon that is detonated somewhat close to the ship, but not close enough to destroy the ship outright.

Capabilities for Maintaining Regional Presence and Influence. For the U.S. Navy, maintaining regional presence and military influence in the Western Pacific might place a premium on the following, among other things:

- maintaining a substantial U.S. Navy ship presence throughout the region;
- making frequent port calls in the region;
- conducting frequent exercises with other navies in the region;
- taking actions to ensure system compatibility between U.S. Navy ships and ships of allied and friendly nations in the region; and

- conducting frequent exchanges between U.S. Navy personnel and military and political leaders of other countries in the region.

Capabilities for Tracking and Countering China's SSBNs. Detecting, tracking, and if necessary countering China's SSBNs equipped with long-range ballistic missiles could require some or all of the following:

- an ocean-bottom sensor network analogous to the SOSUS arrays used during the Cold War;
- ocean-surveillance ships analogous to the TAGOS-type ships used during the Cold War; and
- enough SSNs so that some could be assigned to tracking and if necessary attacking China's SSBNs.

Technological Developments Since The End Of The Cold War. Technological developments since the end of the Cold War that have directly or indirectly affected surface combatant and submarine missions, or appear likely to do so in coming years, include (but are not limited to) the following:

- **Computer networking technology.** Networking technology may permit the Navy in coming years to mass effects without massing forces, permitting consideration of more highly distributed force architectures. Networked AAW operations will, among other things, permit Navy forces to project inland their AAW capability against cruise missiles. Networked ASW operations, as discussed earlier, may permit a less platform-intensive and more sensor-intensive approach to ASW.⁸
- **Unmanned vehicles (UVs),** including aerial vehicles (UAVs), unmanned combat aerial vehicles (UCAVs), unmanned surface vehicles (USVs), and unmanned underwater vehicles (UUVs), can extend the operational reach and mission capabilities of the manned platforms deploying them, and can thereby prompt changes in the planned mix of those platforms.⁹
- **Widespread application of precision-guided munitions (PGMs),** including those using Global Positioning System (GPS) satellite guidance, to the Navy's carrier-based strike-fighter force has turned a situation of sorties per target into targets per sortie, vastly increasing the number of aim points that can be attacked each day by a carrier air wing, making aircraft carriers much more cost effective as platforms for attacking targets that might otherwise be attacked by surface combatants or submarines.

⁸For additional discussion of networking technologies for the Navy, see CRS Report RS20557, *Navy Network-Centric Warfare Concept: Key Programs and Issues for Congress*, by Ronald O'Rourke.

⁹For more on UVs for naval forces, see CRS Report RS21294, *Unmanned Vehicles for U.S. Naval Forces: Background and Issues for Congress*, by Ronald O'Rourke.

- Radar, command and control, and interceptor **technologies for sea-based ballistic missile-defense operations** are enabling new Navy missions of theater and national missile defense.
- **Technologies for longer-ranged and more-accurate naval surface fire support (NSFS)**, including the improved 5-inch gun, an extended-range munition for this gun, the 155mm Advanced Gun System (AGS), an extended-range munition for the AGS, and possibly electromagnetic rail guns, will permit surface combatants to conduct volume attacks on targets further inland and with greater accuracy, thereby supporting new Marine Corps concepts of operations.
- **Technologies for a Navy long-range, high-speed precision strike weapon**, such as a conventionally submarine-launched armed ballistic missile or a supersonic or hypersonic cruise missile,¹⁰ would give the firing platform a capability for conducting long-range, time-critical, precision strike operations.
- **Potential directed-energy weapons, such as lasers**, could, among other things, enhance AAW capabilities, particularly at shorter ranges.
- **New technologies for handling equipment and supplies at sea** will help enable the new Navy-Marine Corps sea basing concept for staging forces at sea and conducting expeditionary operations ashore with little or no reliance on nearby land bases.¹¹
- **Integrated electric-drive propulsion technology** can, among other things, enable the use of systems such as electromagnetic rail guns and lasers.¹²

¹⁰For more on the option of a conventionally armed ballistic missile, see CRS Report RL33067, *Conventional Warheads For Long-Range Ballistic Missiles: Background and Issues for Congress*, by Amy F. Woolf. For more on both this option and the option of a high-speed cruise missile, see Statement of Ronald O'Rourke, Specialist in National Defense, Congressional Research Service, Before the House Armed Services Committee Subcommittee on Projection Forces Hearing on Conventional Long-Range Strike Operations, March 3, 2004, pp. 7-14.

¹¹For more on the sea basing concept, see CRS report RL32513, *Navy-Marine Corps Amphibious and Maritime Prepositioning Ship Programs: Background and Oversight Issues for Congress*, by Ronald O'Rourke.

¹²For more on this technology, see CRS Report RL30622, *Electric-Drive Propulsion for U.S. Navy Ships: Background and Issues for Congress*, by Ronald O'Rourke. (July 31, 2000)

Contributions Of Surface And Subsurface Combatants In Executing Navy Missions

In General

The stereotyped images of surface combatants as defensive escorts and SSNs as primarily ASW platforms are incorrect. Surface combatants and SSNs are both capable of performing an array of missions. **Table 2** presents a list of missions derived from the previous section, and judgments on whether surface combatants and SSNs can be viewed as primary or substantial contributors to each mission. Views may differ on judgments shown in the table, particularly among advocates of surface combatants or SSNs. As can be seen in the table, surface combatants can be a primary or substantial contributor to the execution of more of these missions than can SSNs. SSNs, however, can perform their missions covertly, which can increase the effectiveness of the missions they perform, and permit them to perform missions in locations that are denied to surface combatants or other Navy forces. Following the table are additional comments on each of these missions.

Table 2. Platforms And Navy Missions

Mission	Primary or substantial contributor to execution of mission?	
	Surface combatants	SSNs ^a
Strategic nuclear deterrence	no	no
Regional conventional deterrence	yes	yes
ISR	yes	yes ^a
Missile defense	yes	no
AAW	yes	no
Strike	yes	yes ^a
Naval Surface Fire Support (NSFS)	yes	no
Support of SOF	yes	yes ^a
ASuW	yes	yes ^a
MIO^b	yes	no
ASW	yes	yes ^a
Mine Warfare (MIW)	yes	yes ^a
Protection/evacuation^c	yes	no
Port calls for diplomacy	yes	yes
Humanitarian assistance, etc.^d	yes	no

Source: Prepared by CRS. Views may differ on judgments shown here, particularly among advocates of surface combatants or SSNs. See text for additional discussion of individual missions.

a Submarines can perform their missions covertly, which can increase the effectiveness of the missions they perform. Covertness also permits SSNs to perform missions in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing certain missions in certain locations.

b Maritime intercept operations, which are defined here as actual interception and boarding of ships; surveillance of ships in support of this mission is included in this table under ISR.

c Protection and evacuation of endangered personnel ashore.

d Humanitarian assistance, disaster relief, reconstruction, civil affairs.

Mission By Mission

Strategic Nuclear Deterrence. This mission is executed by SSBNs. Surface combatants and SSNs can contribute indirectly to this mission by protecting SSBNs as they leave or enter port. Potential threats to SSBNs leaving or entering port include enemy submarines and surface craft.

Regional Conventional Deterrence. Both surface combatants and SSNs can be forward deployed for purposes of contributing to regional conventional deterrence. The surface combatants would generally be more visible in such operations than the SSNs, which could permit the surface combatants to perform the mission with greater effect. The actual or potential presence of SSNs in the region, however, could be advertised to foreign leaders in that region. If foreign leaders believed one or more SSNs were present in the region when in fact none was, then the SSN force could be viewed as contributing to regional conventional deterrence in that region even though deployed SSNs were in fact all performing missions in other regions. This can be a force multiplier.

Intelligence, Surveillance, and Reconnaissance (ISR). Both surface combatants and submarines can conduct ISR operations. The covertness of SSNs permits them to conduct these operations in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing ISR operations in certain locations, such as locations that are close to the target being observed. Performing the mission covertly also reduces the chance that the target will know or suspect that it is being observed, which could prompt the target to alter its behavior to provide misleading information to the ISR platform. Surface combatants can use helicopters or UAVs to conduct overhead and inland observations. SSNs lack a capability for conducting overhead and inland observations, but could be given such a capability if equipped with a UAV. The submarine force in recent years has conducted tests in which submarines operated UAVs.

Missile Defense. Surface combatants are well suited to contribute to missile defense operations by acting as platforms for missile defense radars, interceptors, or both. Submarines might be used as missile defense interceptor launchers, but most discussions about launching missile defense interceptors from submarines have focused on SSBNs or converted Trident cruise-missile submarines (SSGNs).

Anti-Air Warfare (AAW). Surface combatants are well suited to contribute to AAW operations by acting as platforms for AAW radars, interceptors, or both. SSNs can be equipped with small SAMs (including shoulder-fired models) to enable them shoot down lower-flying aircraft, particularly aircraft that might pose a threat to the SSN.

Strike. Both surface combatants and SSNs can conduct strike operations with Tomahawk missiles. Cruisers and destroyers can generally store and fire larger numbers of Tomahawks than can SSNs, but SSNs can launch Tomahawks without prior warning and from unexpected locations, which can reduce the target's ability to take defensive actions. Surface combatants can conduct additional limited strike operations with their helicopters and armed UAVs.

Naval Surface Fire Support (NSFS). Surface combatants, which can be armed with guns or rockets, are well suited to act as NSFS platforms. Although SSNs can fire Tomahawks, they cannot provide the volume fire support that surface combatants can provide with guns and rockets.

Support of Special Operations Forces (SOF). Both surface combatants and SSNs can launch and recover SOF units. Surface combatants, because of their helicopters and UAVs and their more robust communication and networking links, might have more ability to support SOF units ashore than SSNs. SSNs, however, can launch and recover SOF units more covertly, which can be critical to the success of SOF missions.

Anti-Surface Warfare (ASuW). Both surface combatants and attack submarines can attack and destroy surface ships. Surface combatants, which have 5-inch guns, smaller-caliber guns, and missile-armed helicopters, have more ability to counter smaller surface craft. SSNs can perform the mission covertly, in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing the mission in certain locations. Performing the mission covertly can reduce the chance that the targeted ship will know or suspect that it is being targeted and take defensive actions. Conversely, if the enemy suspects, correctly or not, that an SSN is present, it could constrain surface ship operations or devote multiple platforms to the task of finding the SSN, thus diverting those platforms from performing other missions. If no SSN is present but the enemy behaves as if one were, then the SSN force could be viewed as contributing to the ASuW mission at that location even though deployed SSNs were in fact all performing missions in other locations. This can be a force multiplier.

Maritime Intercept Operations (MIO). The MIO mission is defined here as actual interception and boarding of ships; surveillance of ships in support of this mission is included in this discussion as a part of the ISR mission. Surface combatants, which can maneuver to block the paths of other surface ships, operate helicopters with boarding teams, and easily launch boats with boarding teams, are well suited to this mission.

Antisubmarine Warfare (ASW). Both surface combatants and SSNs can conduct ASW operations. ASW operations are frequently team efforts involving a combination of Navy platforms. Depending on the exact circumstances, the lead or most important platform in an ASW operation can be either an SSN, a surface combatant and its helicopter, or a land-based maritime patrol aircraft. Since they can conduct this mission covertly, SSNs can do so in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing the mission in certain locations.

Mine Warfare (MIW). Both surface combatants and SSNs can be equipped to lay mines or to detect and counter enemy mines. The ability of both types of ships to detect and counter enemy mines will be improved in coming years by UVs. Surface combatants might be able to embark more mines or mine warfare equipment than SSNs, but SSNs can lay mines and detect and counter enemy mines covertly, which can permit them to do so in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing the mission in certain locations. If an operation to detect and counter enemy mines is being performed in support of a planned amphibious landing, the SSN's ability to perform the mission covertly can be of particular value in preserving tactical surprise regarding the location of the landing.

Protection/Evacuation.¹³ Surface combatants, with their ability to operate helicopters and UAVs, launch boats, use their smaller-caliber guns, and receive and transfer dozens of evacuated personnel, are well suited to operations for protecting and evacuating endangered personnel ashore.

¹³Protection and evacuation of endangered personnel ashore.

An SSN can contribute to this mission in a limited way by, for example, launching an SOF team to evacuate a very small number of people back to the SSN. This ability can be valuable if the people being evacuated are of particular importance.

Port Calls For Diplomacy. Both surface combatants and SSNs can be used to make port calls for diplomatic purposes. In theory, the SSNs' nuclear power plants might make them potentially less welcome in the ports of countries with strong anti-nuclear sentiments, but the Navy works to minimize this issue, which applies to most of the Navy's aircraft carriers as well.

Humanitarian Assistance, Etc.¹⁴ Surface combatants, with their ability to operate helicopters and UAVs, launch boats, embark substantial numbers of reconstruction and civil-affairs personnel, and transfer significant amounts of supplies ashore, are well suited for humanitarian assistance, disaster-relief, reconstruction, and civil-affairs operations. SSNs might be able to contribute to this mission in a limited way by transferring small amounts of personnel and supplies ashore. A few observers over the years have expressed interest in the idea of connecting an SSN at pier to a local power grid so as to provide emergency power to the grid following a disaster that disrupted civilian power generation. If connecting the SSN to the grid were feasible, the total amount of power that an SSN might provide to the grid would be relatively small.

¹⁴Humanitarian assistance, disaster relief, reconstruction, and civil affairs.

Contributions To Homeland Defense And The Global War On Terrorism (GWOT)

Table 3 summarizes the potential contributions of surface combatants and SSNs to the subset of missions from **Table 2** that can be viewed as relating directly to the relatively new Navy missions of homeland defense and the global war on terrorism. Views may differ on judgments shown in the table, particularly among advocates of surface combatants or SSNs.

Table 3. Missions Directly Relating To Homeland Defense And GWOT

Mission	Primary or substantial contributor to execution of mission?	
	Surface combatants	SSNs ^a
ISR	yes	yes ^a
Strike ^b	yes	yes ^a
Support of SOF	yes	yes ^a
ASuW ^c	yes ^c	yes ^c
MIO ^d	yes	no
MIW ^e	yes	yes ^a
Protection/evacuation ^f	yes	no
Port calls for diplomacy	yes	yes
Humanitarian assistance, etc. ^g	yes	no

Source: Prepared by CRS. Views may differ on judgments shown here, particularly among advocates of surface combatants or SSNs. See text for additional discussion of individual missions.

a Submarines can perform their missions covertly, which can increase the effectiveness of the missions they perform. Covertness also permits SSNs to perform missions in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing certain missions in certain locations.

b Strikes on terrorist camps and other facilities.

c For homeland defense and the GWOT, the anti-surface warfare mission (i.e., attacking and destroying ships, as opposed to conducting surveillance of ships (ISR) or intercepting ships (MIO)) may focus more on countering small surface craft. Surface combatants, but not SSNs, might be viewed as primary or substantial contributors to ASuW operations against small surface craft.

d Defined here as actual interception and boarding of ships; surveillance of ships in support of this mission is included in this table under ISR.

e Detecting and countering mines purchased and deployed by terrorists.

f Protection and evacuation of endangered personnel ashore.

g Humanitarian assistance, disaster relief, reconstruction, civil affairs.

Potential Countering Of Improved Chinese Military Forces

Table 4 summarizes the potential contributions of surface combatants and SSNs to the subset of missions from **Table 2** that can be viewed as relating directly to the potential emerging mission of countering improved Chinese military forces. Views may differ on judgments shown in the table, particularly among advocates of surface combatants or SSNs.

Table 4. Missions Directly Relating To Countering Improved Chinese Military Forces

Mission	Primary or substantial contributor to execution of mission?	
	Surface combatants	SSNs ^a
Strategic nuclear deterrence	no	no
Regional conventional deterrence	yes	yes
ISR	yes	yes ^a
Missile defense	yes	no
AAW	yes	no
Strike	yes	yes ^a
Support of SOF	yes	yes ^a
ASuW	yes	yes ^a
ASW	yes	yes ^a
MIW	yes	yes ^a
Port calls for diplomacy	yes	yes

Source: Prepared by CRS. Views may differ on judgments shown here, particularly among advocates of surface combatants or SSNs. See text for additional discussion of individual missions.

a Submarines can perform their missions covertly, which can increase the effectiveness of the missions they perform. Covertness also permits SSNs to perform missions in locations that are denied to surface combatants or other Navy forces, making SSNs potentially the only option for performing certain missions in certain locations.

Suitability Of Current And Projected Force Mix

Current And Projected Mix Of Surface And Subsurface Combatants

Table 5 shows the current mix of surface combatants and SSNs (defined here as the mix as of December 31, 2005) and the mix projected in the Navy's proposed 313-ship fleet.¹⁵

Table 5. Mix Of Surface Combatants And SSNs
(Numbers of ships, and percent of total number of battle force ships)

	281-ship fleet of 12/31/05	Proposed 313-ship fleet
Surface combatants	100 (35.6%)	143 (45.7%)
<i>Cruisers and destroyers</i>	70 (24.9%)	88 (28.1%)
<i>Frigates</i>	30 ^a (10.7%)	0 (0%)
<i>LCSs</i>	0 (0%)	55 (17.6%)
SSNs	54 (19.2%)	48 (15.3%)

Source: Prepared by CRS.

a Includes 21 active-duty ships and 9 ships in the Naval Reserve Force.

As shown in the table, compared to the fleet as of December 31, 2005, the Navy's proposed 313-ship fleet includes more surface combatants and fewer SSNs. Compared to the fleet as of December 31, 2005, surface combatants under the 313-ship proposal would account for a higher percentage of the fleet (about 10.1 percentage points more), while SSNs would account for a smaller percentage (about 3.9 percentage points less). Under the 313-ship proposal, today's frigates would effectively be replaced by LCSs. The increase in the number and percentage share of surface combatants under the 313-ship proposal is not entirely explained by the introduction of large numbers of LCSs, because the number and percentage share of cruisers and destroyers is projected to increase.

As requested, this section discusses three questions relating to the current and projected force mix:

- Is it operationally effective?
- Is it cost effective?
- Should changes be made to rebalance the force?

¹⁵For more on the Navy's proposed 313-ship fleet, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Is It Operationally Effective?

Current Mix. The current mix of surface combatants and SSNs constitutes a powerful force with considerable capability to perform many of the Navy's missions. The force might be viewed as having operational limitations in areas such as the following:

Surface combatants

- capacity for networked operations;
- signature reduction for reduced detectability;
- missile defense;
- near-shore AAW radar capability;
- long-range, high-speed, precision strike;
- NSFS at extended ranges;
- exploitation of UVs for various missions, including mine countermeasures;
- defense against small boats and craft; and
- ability to operate in shallower waters.

SSNs

- ship quantities for meeting regional combatant commander requests for deployed SSNs;
- capacity for networked operations;
- long-range, high-speed, precision strike;
- exploitation of UVs for various missions, including mine countermeasures and overhead and inland ISR; and
- ability to deploy weapons and UVs with diameters greater than 21 inches.

Projected Mix. The projected mix of surface combatants and attack submarines will redress many of the operational limitations listed above. Areas where operational limitations may remain under the projected mix include the following:

Surface combatants

- long-range, high-speed, precision strike

SSNs

- ship quantities for meeting regional combatant commander requests for deployed SSNs;
- long-range, high-speed, precision strike;
- overhead and inland ISR; and
- ability to deploy weapons and UVs with diameters greater than 21 inches.

The limitation for both surface combatants and SSNs in the area of long-range, high-speed, precision strike may persist due to the current absence of a firm Navy program for developing and procuring a high-speed cruise missile for surface combatants and submarines. The limitation for SSNs in overhead and inland ISR may persist due to the current absence of a firm Navy program for developing and procuring a submarine-launched UAV for ISR. The limitation for SSNs in deploying weapons and UVs with diameters greater than 21 inches may persist because the Virginia-class SSNs now being procured are equipped with 21-inch diameter torpedo tubes rather than larger-diameter tubes. This limitation, however, will be offset by the ability of the Navy's four converted Trident

SSGNs to deploy weapons and UVs with diameters greater than 21 inches.

The limitation for SSNs in ship quantities for meeting regional combatant commander requests for deployed SSNs could persist if these demands remain at levels comparable to those in recent years. As detailed in Appendix A to this testimony, the SSN force in recent years, with a total of more than 50 boats, reportedly has been sufficient to provide only about two-thirds of the deployed SSNs requested by regional combatant commanders, suggesting that a force of 70 or more SSNs might be needed to fully meet these requests.

Is It Cost Effective?

Current Mix. Observers can differ on the question of whether today's mix of surface combatants and SSNs is cost effective, depending on their own standards of cost effectiveness. The force might be viewed as having limitations in its cost effectiveness in areas such as the following:

- the operational limitations noted in the previous section;
- less-than-full exploitation of options available to new-design ships for substantially reducing crew size and thus operation and support (O&S) costs;
- mechanical-drive propulsion systems rather than integrated electric-drive propulsion systems that can be more fuel-efficient;¹⁶ and
- less-than-complete application of modularity and open architecture approaches for facilitating life-cycle system upgrades.

Projected Mix. As noted earlier, the projected mix of surface combatants will address most but not all of the operational limitations of the current mix. The projected mix will also address the three other limitations listed above, at least to some degree. Beyond this, however, assessing the cost effectiveness of the projected mix of surface combatants and SSNs is hampered by the following:

- uncertainty regarding the procurement cost of the DD(X), an item on which there is substantial disagreement between the Navy on the one hand and the Congressional Budget Office (CBO) and the Cost Analysis Improvement Group (CAIG) within the Office of the Secretary of Defense (OSD) on the other;
- uncertainty regarding the annual O&S cost of the DD(X), an item on which there is disagreement between the Navy and CBO;
- uncertainty regarding the total acquisition cost of the LCS program, particularly the total acquisition cost of LCS mission modules;
- the lack of a formal Navy analysis conducted prior to the Navy's announcement of the LCS program in November 2001 demonstrating that a ship like the LCS would be more cost-effective than potential alternative approaches for performing the

¹⁶For more integrated electric-drive propulsion, see CRS Report RL30622, *Electric-Drive Propulsion for U.S. Navy Ships: Background and Issues for Congress*, by Ronald O'Rourke. (July 31, 2000)

LCS's stated missions;¹⁷

- the absence of certain information from the Navy about potential less-expensive alternatives to the current DD(X)/CG(X) design, including a smaller cruiser and destroyer¹⁸ and an AGS-equipped variant of the basic LPD-17 hull design;¹⁹
- uncertainty regarding future personnel costs, which influence life-cycle O&S costs;
- uncertainty regarding future oil costs, which influence life-cycle O&S costs for surface combatants; and
- uncertainty regarding features of the future strategic environment, which could affect the relative need for various surface combatant and SSN mission capabilities.

The future surface combatant and SSN force mix will be shaped under current plans by the procurement of DD(X)s destroyers, CG(X) cruisers, LCSs, and Virginia-class SSNs. Observations that can be made regarding the potential cost effectiveness of these four ship classes include the following:

- The higher the procurement costs of the DD(X) and CG(X) turn out to be, the less cost-effective the two ships will be. DOD witnesses testified in 2005 that the DD(X) would not be cost-effective above procurement costs similar to those

¹⁷Potential alternative approaches for performing the LCS's stated missions included (1) manned aircraft, (2) submarines equipped with UVs, (3) a larger (perhaps frigate-sized) surface combatant equipped with UVs and operating further offshore, (4) a non-combat littoral support craft (LSC) equipped with UVs, or (5) some combination. In testimony to the House Armed Services Committee in April 2003, the Navy acknowledged that, on the question of what would be the best approach to perform the LCS's stated missions, "The more rigorous analysis occurred after the decision to move to LCS." (Spoken testimony of Vice Admiral John Nathman, Deputy Chief of Naval Operations (Warfare Requirements and Programs), at an April 3, 2003 hearing on Navy programs before the Projection Forces subcommittee of the House Armed Services Committee. See U.S. Congress, House Committee on Armed Services, Subcommittee on Projection Forces, Hearing on National Defense Authorization Act for Fiscal Year 2004 — H.R. 1588, and Oversight of Previously Authorized Programs. 108th Cong., 1st sess., Mar. 27, and Apr. 3, 2003, (Washington: GPO, 2003), p. 126.) For an article discussing this part of the hearing, see Jason Ma, "Admiral: Most LCS Requirement Analysis Done After Decision To Build," *Inside the Navy*, Apr. 14, 2003. For additional discussion, see the section on program cost effectiveness in Appendix D of CRS Report RL32109, op cit.

¹⁸Reducing payload DD(X) and CG(X) payload features might lead to a smaller and less-expensive cruiser-destroyer design. One possibility for a smaller design would be a ship that preserves the DD(X)'s two AGSs while reducing other features. Another possibility would be a ship that preserves CG(X) radar capabilities (but not necessarily the current DD(X) deckhouse) while reducing other features. CRS on June 23, 2005, requested the Navy to provide information about the potential sizes of such ships, so as to provide a basis for better understanding the potential impact of various ship features on DD(X)/CG(X) ship size and cost. The Navy on August 4, 2005, indicated to CRS that it is reluctant to provide this information to CRS. For additional discussion of this option, see CRS Report RL32109, op cit.

¹⁹The option of an AGS-equipped variant of the basic LPD-17 hull design has been suggested by Robert Work of the Center for Strategic and Budgetary Assessments (CSBA). For additional discussion of this option, see CRS Report RL32109, op cit.

estimated by CBO and CAIG.²⁰

- The higher the annual O&S costs of the DD(X) and CG(X) turn out to be, the less cost-effective the two ships will be.
- The higher the total acquisition cost of the LCS program turns out to be, the less cost-effective the program will be.
- The higher future personnel costs turn out to be, the less cost effective all four of these ship classes might be. Higher future personnel costs, however, could also reduce the cost-effectiveness of many other military systems, leaving the relative cost effectiveness of these ships compared to other military systems unclear.
- The higher future oil costs turn out to be, the less cost effective the three surface combatant classes might be. Higher future oil costs, however, could also reduce the cost-effectiveness of many other fossil-fueled military systems, leaving the relative cost effectiveness of these ships compared to other fossil-fueled military systems unclear.

Should Changes Be Made To Rebalance The Force?

If resources are constrained and tradeoffs are confined to surface combatants and SSNs, then increasing the number of surface combatants would likely require reducing the number of SSNs, and vice versa.

Arguments For More Surface Combatants and Fewer SSNs. Those who might favor increasing the number of surface combatants and reducing the number of SSNs might argue one or more of the following:

- Prior to the Navy's 313-ship proposal, the Navy in early 2005 proposed a fleet of 260 to 325 ships, including 63 to 82 LCSs and 37 to 41 SSNs. Prior to leaving office in July 2005, the previous Chief of Naval Operations, Admiral Vernon Clark, mentioned the idea of building a total of 75 to 100 LCSs. In light of the Navy's 260- to 325-ship proposal of early 2005 and Admiral Clark's comments regarding potential total LCS numbers, consideration might be given to increasing the planned number of LCSs to 63 or more, and to reducing the planned number of SSNs to no more than 41.
- Surface combatants might be able to accommodate the kinds of antennas and related equipment needed for advanced, high-bandwidth networked operations more easily than SSNs. Surface combatants can in general launch and recover UAVs of all kinds more easily than SSNs. Surface combatants can also take greater advantage than SSNs of new NSFS technologies and directed-energy weapons such as lasers. As a result, surface combatants in coming years may be able to take more comprehensive advantage of technologies that promise to increase the capabilities, and thus the cost effectiveness, of the platforms that use them. If so, then this could

²⁰See CRS Report RL32109, op cit.

make surface combatants in the future more cost effective relative to SSNs than they are today, which could argue in favor of rebalancing the planned fleet to include more surface combatants and fewer SSNs.

- Although the SSN force in recent years has been able to meet only about two-thirds of the regional combatant commander requests for deployed SSNs, experience to date suggests that the risks associated with this situation might be acceptable, particularly if there are options for using other kinds of military systems to compensate for the shortfall in deployed SSNs.

Arguments For Fewer Surface Combatants and More SSNs. Those who might favor reducing the number of surface combatants and increasing the number of SSNs might argue one or more of the following:

- The ability of the SSN force in recent years to meet only about two-thirds of regional combatant commander the requests for deployed SSNs suggests that the Navy's planned force of 48 SSNs could fall substantially short of the number required to fully meet regional combatant commander requests for deployed SSNs in coming years. The potential degree of shortfall of this kind might be substantially greater for SSNs than for other parts of the Navy's proposed 313-ship fleet. If so, then the operational risks associated with the proposed 313-ship fleet might be concentrated among those arising from not having enough deployed SSNs. Rebalancing the fleet to include more SSNs and fewer ships of other kinds would spread operational risks across the fleet in a more even fashion, reducing the risk of the force-structure equivalent of a single-point failure. Even if the shortfall in deployable SSNs hasn't caused any serious problems to date, that doesn't mean there is no risk of such problems occurring in the future.
- The internal Navy study on submarine requirements that led to the early-2005 Navy proposal for a Navy with 37 to 41 SSNs has been criticized for reflecting insufficient input from the submarine community. In contrast to that study, a Joint Chiefs of Staff (JCS) study on SSN requirements that was completed in 1999 concluded that "a force structure below 55 SSNs in the 2015 [time frame] and 62 [SSNs] in the 2025 time frame would leave the [regional combatant commanders] with insufficient capability to respond to urgent crucial demands without gapping other requirements of higher national interest. Additionally, this force structure [55 SSNs in 2015 and 62 in 2025] would be sufficient to meet the modeled war fighting requirements." The study also concluded that "68 SSNs in the 2015 [time frame] and 76 [SSNs] in the 2025 time frame would meet all of the [regional combatant commanders'] and national intelligence community's highest operational and collection requirements."²¹ This study, which was conducted by personnel drawn from various military services, took into account several years of operational experience with the Navy's post-Cold War missions. It did not, however, take into account information about the extent of China's naval modernization effort that has come to light since 1999.

²¹For additional discussion, see CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O'Rourke.

- Surface ships are more vulnerable than SSNs to MaRV-equipped ballistic missiles, ASCMs, and EMP. In light of the potential in coming years for China or other countries to field improved ocean-surveillance systems for detecting and tracking surface ships, and to threaten Navy forces with MaRV-equipped ballistic missiles, improved ASCMs, and EMP, the fleet should be rebalanced to rely less heavily on surface ships and more heavily on submarines.

Potential Oversight Questions For Congress. Potential oversight questions regarding the balance of surface and subsurface combatants include the following:

- Does the Navy’s proposed 313-ship fleet fully exploit opportunities for reducing planned force levels by increasing the number of Navy ships that are forward-homeported in the Western Pacific or other regions?
- Was the Navy’s decision to plan for a force of 48 SSNs rather than a higher number influenced by a view that the procurement needed to maintain a force of 48 SSNs consistently over the longer run poses an affordability challenge, and that the procurement needed to maintain a force of more than 48 SSNs consistently over the long run would pose an even greater affordability challenge?²²
- Was the Navy’s decision to plan for a force of 55 LCSs rather than a lower number²³ influenced by a desire to create an affordable force structure plan that included at least 300 ships?
- What is the operational significance of the Navy having enough SSNs to meet about two-thirds of regional combatant commander requests for deployed SSNs? What types of missions are not being performed by SSNs for the regional combatant commanders because deployed SSNs are not available? To what extent can these missions be performed by other systems and platforms? What is the resulting operational risk?
- Some supporters of SSNs are concerned that the budget creates a built-in bias against nuclear-powered ships (including SSNs) because the procurement cost of a nuclear-powered ship includes the cost of its fuel core (which, in the case of an SSN, is now designed to last the entire life of the ship), while the procurement cost of a non-nuclear-powered ship (such as a surface combatant) does not include the cost of the fuel it will use during its life, or a portion of the cost of procuring and operating the replenishment ships that refuel non-nuclear-powered ships at sea. Is this concern valid?
- Some observers are concerned that the Navy’s plan to fund LCS mission modules,

²²For additional discussion of SSN procurement rates and resulting SSN force levels, see Appendix B of this testimony.

²³Over the history of the LCS program, potential LCS force levels as low as 30, and as high as 100, have been mentioned by Navy officials.

which might account for a substantial portion of the LCS program's total acquisition cost, through the Other Procurement, Navy (OPN) account rather than in the Shipbuilding and Conversion, Navy (SCN) account will make the cost of these modules less visible and thereby possibly create a bias in favor of LCSs in decisions about which kinds of ships to procure with available SCN funding. Is this concern valid?

- Some supporters of SSNs are concerned that flag-rank admirals from the submarine community are under-represented in the resource-allocation offices of the Navy, and that this may be causing a bias against submarines in Navy resource-allocation decisions. Is this concern valid?

Mr. Chairman, distinguished members of the subcommittee, this concludes my testimony. Thank you again for the opportunity to appear before you to discuss these issues. I will be pleased to respond to any questions you might have.

Appendix A. Number Of Deployed SSNs Requested By Regional Combatant Commanders vs. Number Available²⁴

Some Navy submarine officers and DOD officials in recent years have argued that an attack submarine force of roughly 55 boats — the approximate number in the force in recent years — is insufficient to meet day-to-day demands for attack submarines from U.S. regional military combatant commanders, at least not without operating attack submarines at higher-than-desired operational tempos. Navy submarine admirals have stated that since the end of the Cold War, demands for attack submarines from regional U.S. commanders have increased, not decreased, that some demands for attack submarines are going unfilled, and that the high operational tempo of the attack submarine force could reduce time available for training and expend submarine reactor core life more quickly than planned, potentially shortening attack submarine service lives.

In November 2004, Admiral Frank Bowman, who was Director of the Navy’s nuclear propulsion program until November 5, 2004, stated that U.S. theater combatant commanders wanted the equivalent of 15 attack submarines to be on station continuously, but that the 54-boat attack submarine force at that time was sufficient to provide only about 9.²⁵

The reference to the Navy being able to provide about nine attack submarines refers to the fraction of the attack submarine force that, on average over the long run, can be maintained on station in overseas operating areas at any given moment. The Navy reported to CRS in 1999 that, on a global basis, an average of 5.8 attack submarines are needed to keep one attack submarine continuously on station in a distant operating area. This attack submarine “stationkeeping multiplier” changed little between 1992 and 2002, and is broadly consistent with the stationkeeping multipliers for other kinds of Navy ships.²⁶ Using this multiplier, keeping a total of about 9 attack submarines continuously on station in overseas operating areas would nominally require a total attack submarine force of about 52 boats, and keeping 15 boats continuously on station would require a total force of 87 boats.

In July 2004, Admiral Bowman stated that the theater commanders wanted the equivalent of 13.5 attack submarines to be on station continuously in six different theaters of operation, but that the 54-boat attack submarine force at that time was sufficient to provide only about 9.²⁷ In June

²⁴This appendix reprints a portion of CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O’Rourke.

²⁵Christopher P. Cavas, “[Interview With] Adm. Frank “Skip” Bowman,” *Defense News*, Nov. 29, 2004, p. 30.

²⁶Source: Navy Office of Legislative Affairs (NOLA) point paper to CRS of March 25, 1999 (record number LA-586-002), and NOLA e-mail to CRS of December 17, 2002, stating that the figures in the 1999 point paper had not changed significantly. An NOLA point paper to CRS dated August 8, 1996, stated that the global stationkeeping multiplier for attack submarines was 5.8. An NOLA point paper to CRS dated September 10, 1992, stated that the number was 5.7. The 1992 figure was published by CRS in CRS Report 92-803 F, *Naval Forward Deployments and the Size of the Navy* (out of print; for a copy, contact the author at 707-7610), by Ronald O’Rourke.

²⁷Robert A. Hamilton, “New War Brings New Debate over Size of Submarine Fleet,” *New London (CT) Day*, July 5, 2004. In Aug. 2004, Rear Admiral Paul F. Sullivan, the commander of the submarine force of the

(continued...)

2004, he similarly stated that the theater commanders “asked for a continuous forward presence of more than 13 boats, whereas today’s force structure can only provide around 9.”²⁸ Also in June 2004, then-Vice Admiral Kirk Donald, who at the time was the commander of the Navy’s submarine forces, stated: “With our current force structure, depot maintenance workload, and an interdeployment readiness cycle tuned to be as efficient as we can make it, we can provide the Combatant Commanders with about 65% of the ‘presence with a purpose’ they requested.”²⁹ (In November 2004, Donald succeeded Bowman as Director of the Navy’s nuclear propulsion program and was promoted to full admiral.)

In March 2004, Admiral Bowman stated that “Today the navy is unable to meet all the combatant commanders’ submarine requirements” and that “only about 65% of requirements can be met.”³⁰ In September 2003, John Grossenbacher, a recently retired Navy submarine admiral, stated that attack submarines are more in demand than at any time in the Cold War, that the attack submarine force is “about as thin as we can be and still maintain a worldwide deployable and world class submarine force,” and that as the force declines in size, some demands for submarines to perform covert ISR missions may go unmet.³¹

²⁷(...continued)

U.S. Pacific Fleet, said that “At any given time, roughly eight to 10 of the Navy’s submarines are able to resound to emergent fleet requirements.” (David Rush, et al., “Submarines Vital To Navy’s Fleet Response Plan,” *Navy Newsstand* [<http://www.news.navy.mil/>], Aug. 19, 2004.

²⁸“Naval Submarine League Symposium, [Text of] Keynote Address By Admiral F. L. “Skip” Bowman, U.S. Navy, Director, Naval Nuclear Propulsion, June 9, 2004,” *Submarine Review*, July 2004.

²⁹“Naval Submarine League Symposium Remarks by VADM Kirk Donald, 09 June 2004,” *The Submarine Review*, July 2004, p. 83.

³⁰ Andrew Koch, “[Interview with] Adm. Frank Bowman, Director of US Naval Nuclear Reactors,” *Jane’s Defence Weekly*, Mar. 31, 2004. The article stated:

[Admiral] Frank Bowman, director of US Naval Nuclear Reactors, the service’s senior submariner, says he “fully supports those studies” if they lead to a reduction in what is being asked of the force. “Today the navy is unable to meet all the combatant commanders’ submarine requirements,” Adm Bowman says, explaining that “only about 65% of requirements can be met. There is prima facie evidence in the real world that to execute the missions those commanders have been assigned, they need these submarines.

“I would not oppose a finding that said some of the submarine tasking today can be assigned to other [existing] platforms or future platforms because it would ease the tension between the desires of the combatant commanders and the [submarine] inventory and therefore the ability of the navy to meet those requirements,” Adm Bowman says.

One area being considered is whether intelligence, surveillance and reconnaissance (ISR) missions can be performed by other means, such as distributed sensor networks. Adm Bowman says he would like “to perhaps find some relief for our submarines so that missions of higher priority that we are not able to do today because of the ISR [taskings] could be [taken on].”

Except for “[Admiral],” material above in italics and brackets below appears as in the original.

³¹ Robert A. Hamilton, “Lack of Subs Could Slow Pace of Technology, Admiral Warns,” *New London (CT)* (continued...)

In June 2003, a senior DOD official wrote a letter to the General Accounting Office stating: “Combatant commanders have requested 14.4 SSNs for [calendar year 2003] for national and combatant commander intelligence, surveillance and reconnaissance (ISR), Tomahawk strike, carrier battlegroup support, and Special Operations Forces equipped SSN missions.” The letter also stated that “Considering the sustainability and training requirements given its current SSN force structure, the Navy is able to provide 10.0 of the requested 14.4 SSNs deployed annually.”³²

In June 2003, Admiral Grossenbacher (then still on active duty) stated that the attack submarine force was operating at its maximum rate but that this was still insufficient to meet day-to-day

³¹(...continued)

Day, Sept. 30, 2003. The article stated:

From almost 100 submarines in the early 1990s, the number has fallen steadily to just over 50, and their services are more in demand than at any time in the Cold War, said Vice Adm. John J. Grossenbacher, who retired as commander of Naval Submarine Forces this month....

Grossenbacher said several studies that have looked at submarine force requirements have set the minimum size of the fleet at 68 to 72 submarines. Studies by other groups have set a smaller number, but he called them “misinformed,” and often don’t allow for sufficient time between deployments....

“The problem we have today is just numbers,” Grossenbacher said. “We don’t have enough. ... In my opinion, we’re about as thin as we can be and still maintain a worldwide deployable and world class submarine force.”

As the size of the force continues to decline — the Navy is building one submarine a year, which will eventually result in a force of 30 boats — Grossenbacher said some requests for the covert surveillance services that submarines provide are going to “drop off the plate.”

“The question becomes, ‘What is it that you don’t want to know?’” Grossenbacher said.

³²Hunter Keeter, “DOD Answers Concerns over Virginia-class Multiyear, Details Sub Force Shortfalls,” *Defense Daily*, June 27, 2003. The article stated:

Glenn Lamartin, director of defense programs with the office of the undersecretary of defense, in a June 23 letter to [the General Accounting Office], outlined that “the pre-9/11 demand was 9.9 SSNs and the post 9/11 demand has been 12.9 SSNs.”

“Combatant commanders have requested 14.4 SSNs for [calendar year 2003] for national and combatant commander intelligence, surveillance and reconnaissance (ISR), Tomahawk strike, carrier battlegroup support, and Special Operations Forces equipped SSN missions,” Lamartin wrote.

“Considering the sustainability and training requirements given its current SSN force structure, the Navy is able to provide 10.0 of the requested 14.4 SSNs deployed annually.”...

Citing a 1999 study by the Joint Chiefs of Staff, Lamartin said that dropping below 55 attack submarines in the 2015 time frame and 62 in the 2025 time frame would leave regional warfighting commanders “with insufficient capability to respond to urgent crucial demands without gapping other requirements of high national interest.”

demands for attack submarines. He stated that the Navy would need about 70 attack submarines to meet the demands being placed on the force.³³ Another submarine admiral, in a different article, stated the same month that attack submarine operational tempo was about 15 percent to 20 percent higher than preferred, and that this could affect the amount of time available for training.³⁴

³³Jason Ma, “Grossenbacher: Sub Force Is Operating at Fastest, Sustainable Pace,” *Inside the Navy*, June 23, 2003. The article stated:

The submarine force is operating at a maximum rate that still maintains a surge capability, but that is still not enough to meet the needs of operational commanders, said Vice Adm. John Grossenbacher, commander of naval submarine forces.

Instead of the current 54 attack subs, the Navy really needs 70, he said at the Naval Submarine League’s conference June 11 in Alexandria, VA. But with 54, “operational commanders are not getting all that they need” and the sub forces are struggling to support tactical development, operational testing and long-term “self-investments,” he said.

Grossenbacher and Rear Adm. John Padgett, commander of submarine forces in the Pacific Fleet, closely monitor the fuel expenditure of the subs to meet wartime demands or surges. To avoid early depletion of the reactor core, they would reduce operations if necessary, he said. “We’re walking that fine line right now,” he added.

“I think we’re getting about as much as we can out of the force and running them at the fastest pace that we can sustain over time, maintain long-term readiness, as well as something in the bank for surges,” Grossenbacher said.

³⁴Jason Ma, “Admiral: Subs Must Be Both Surge-Ready and Deployed Forward,” *Inside the Navy*, June 16, 2003. The article stated:

In preparing for increased surge capability, the submarine force must also remain deployed forward and should avoid becoming a “garrison force,” said Rear Adm. John Padgett, commander of submarine forces in the Pacific Fleet.

Chief of Naval Operations Adm. Vern Clark’s “Fleet Response Plan” calls for a more responsive fleet that can surge a large number of ships on short notice, requiring new maintenance and training cycles to achieve increased readiness and availability.

Submarines are forward-deployed to support battle space preparations and to ensure that operators understand the battle space, Padgett said at the Naval Submarine League’s annual conference last week in Alexandria, VA.

“I am concerned that the surge mentality might become a bastion mentality,” he said. “I would argue, from my perspective, that we do not need a garrison force submarine force. We need to remain a forward-deployed force.”

Submarines must maintain forward deployment because they conduct much of their training with the navies of allied countries in the Western Pacific like Japan, South Korea, Singapore and Australia, Padgett said. Such training includes scenarios with diesel submarines, a threat that some Navy officials have noted is becoming more sophisticated. ...

(continued...)

In March 2003, Admiral Bowman stated that the high operational tempo for attack submarines has been using up reactor core life faster than planned and that as a result, Los Angeles-class submarines may need to be retired earlier than expected.³⁵ And in January 2003, Admiral Grossenbacher stated that demands for submarines to perform covert ISR missions has been high since the terrorist attacks of September 11, 2001, and that the attack submarine force was having to turn down some requests for attack submarines from regional combatant commanders due to insufficient forces.³⁶

³⁴(...continued)

Ultimately, force structure dictates the ability to forward deploy subs, and the Navy needs more subs, he said. Having submarine homeports in Guam and Japan partly addresses the lack of enough subs, but the operational tempo is about 15 percent to 20 percent higher than what he would like, affecting training and maintenance, he said. Although the Navy is managing the shortfall in subs, the tendency is to put operational requirements over exercise requirements, which could have a “detrimental effect.” The problem is Navy-wide and not unique to the sub forces, he added.

³⁵Jason Ma, “Industry, Navy Officials Push to Boost Annual Submarine Buy Rate,” *Inside the Navy*, Mar. 3, 2003. The article stated:

The Los Angeles-class subs may retire sooner than expected, [Admiral Frank Bowman] said.... Because demand for subs has increased since the war on terrorism, the submarine fleet has been operating longer and at faster speeds than usual. If that continues, sub reactor cores will not last for the expected 30 years, he said.

Attack submarines are nearing a 90 percent operational tempo and are transiting at 20 knots rather than 16 knots, he said. The ratio of time in port to time deployed is about 2-to-1 instead of 3-to-1 before the war on terrorism, he added.

“Something’s got to give; something will give,” Bowman said. “So we’re trying to make ends meet, but what’s going to give at the end of the day is the reactor core endurance.”

See also Dale Eisman, “Subs Could Be Exhausted Early if Heavy Usage Continues,” *Norfolk Virginian-Pilot*, Feb. 26, 2003; David Lerman, “Attack Subs May Be in Too Deep,” *Newport News Daily Press*, Feb. 26, 2003.

³⁶Matthew Dolan, “Subs in High Demand, Force Commander Says,” *Norfolk Virginian-Pilot*, Jan. 27, 2003. The article stated:

Submarines have been pushed so hard in the war on terrorism that the Navy is having to turn down requests from combat commanders around the world....

The stealthy ability of submarines to engage in surveillance, reconnaissance and intelligence gathering has been in high demand since the Sept. 11 attacks, [Admiral Grossenbacher] said....

“The current operational tempo that we’re operating at is manageable, but I’d like it to be lower. It’s not a crisis.”

Articles making similar points have been published since the mid-1990s, and particularly since 1999, when the attack submarine force declined to less than 60 boats.³⁷

³⁷For examples between November 1994 and January 2003, see the following: Jason Ma, “Grossenbacher: Subs Can Maintain Optempo a ‘Couple More Years,’” *Inside the Navy*, Nov. 25, 2002; Vernon Loeb, “Espionage Demands Prod Navy on Sub Construction,” *Washington Post*, July 5, 2002: 19; Randy Woods, “Atlantic, Pacific Admirals Say Subs Cannot Sustain Current Optempo,” *Inside the Navy*, June 17, 2002; Greg Jaffe, “Overuse of Nuclear Submarines Risks Burning up Reactor Cores,” *Wall Street Journal*, June 26, 2002; Andrew Koch, “USN SSN Force Faces Overstretch,” *Jane’s Defence Weekly*, June 19, 2002; Hunter Keeter, “Bowman: Submarine Force Level Inadequate to Meet Requirements,” *Defense Daily*, June 13, 2002; Christian Bohmfalk, “Basing Attack Subs on Guam Expected to Increase Fleet’s Presence,” *Inside the Navy*, Feb. 12, 2001; Robert Holzer, “With Limited Subs, U.S. Navy Looks Westward to Guam,” *Defense News*, August 28, 2000: 4; Robert Burns, “U.S. Considers Increase in Submarine Fleet, Mainly for Spy Role,” *Fort Worth Star-Telegram*, August 18, 2000; David Brown, “Officials Sound Alarm on Sub Shortage,” *Navy Times*, July 10, 2000: 20; Albert H. Konetzni, Jr. “‘Two Diverging Paths’ for Pacific Fleet Submarine Force,” *Sea Power*, July 2000: 29; Frank Wolfe, “Submarine Commanders Want 75 Fast Attack Subs for Missions, Exercises,” *Defense Daily*, June 28, 2000: 5; Hunter Keeter, “Konetzni: Navy Needs Greater Funding Commitment to Submarine Force,” *Defense Daily*, June 16, 2000: 7; Robert Holzer, “Intelligence Operations Suffer as Submarine Fleet Dwindles,” *Defense News*, April 17, 2000: 1, 36; Robert Holzer, “Utility of Subs Rises as Targeting Grows More Precise,” *Defense News*, April 10, 2000: 17; Josh Corless, “Numbers Count as Submarine Commitments Stretch USN,” *Jane’s Navy International*, March 2000: 18-24; Robert A. Hamilton, “Support Growing for More Submarines,” *New London (CT) Day*, March 7, 2000; Mike Gordon, “Opposition Surfaces, ‘Silent Service’ Says No to Further Cuts,” *Navy Times*, January 17, 2000: 14-16; Bradley Graham, “Pentagon Warns Against Cutting Attack Sub Fleet,” *Washington Post*, January 4, 2000: 3; Robert Holzer, “U.S. Submariners Urge Halt to Dwindling Fleet,” *Defense News*, June 28, 1999: 6; David Abel, “Some Say US Sub Force Is Spread Too Thin,” *Boston Globe*, June 28, 1999: 5; Josh Corless, “Problems Beneath the Waves,” *Jane’s Navy International*, June 1999: 10; Robert Holzer, “Overwork Strains U.S. Sub Fleet,” *Defense News*, March 15, 1999: 4, 42; Robert Karniol, “Intelligence Rises for US Pacific Subs,” *Jane’s Defence Weekly*, December 16, 1998: 13; Frank Wolfe, “Navy Fears Drop Below 50 Attack Submarines,” *Defense Daily*, June 15, 1998: 6-7; Bryan Bender, “U.S. Submarine Operations Rise Since End of Cold War,” *Defense Daily*, November 1, 1996: 183; Robert Holzer, “Study Reveals U.S. Sub Force Flaws,” *Defense News*, June 10-16, 1996: 3; “Navy Sub Community Pushes for More Subs than Bottom-up Review Allowed,” *Inside the Navy*, November 7, 1994: 1, 8-9.

Appendix B. SSN Procurement Rates And Resulting SSN Force Levels³⁸

Force-Level Consequences Of Various Steady Procurement Rates

Table 6 presents the force-level consequences through FY2050 of steady SSN procurement rates of 1, 1.5, and 2 boats per year. The table also shows the 30-year SSN procurement profile from Navy’s February 2006 report to Congress on the Navy’s 30-year shipbuilding plan, which increases the procurement rate to 2 boats per year in FY2012, and then decreases it to 1.5 boats per year for FY2029-FY2036.³⁹

The force-level consequences of these procurement rates reflect the age distribution of the SSN force. The SSN force is not evenly distributed in age because it includes a large number of boats procured in the 1980s and a relatively small number procured since FY1990.

The table shows, among other things, that none of these procurement profiles — not even 2 boats per year starting in FY2007 — is sufficient to avoid dropping below 48 SSNs for some period of time starting between FY2018 and FY2026.

³⁸This appendix reprints a portion of CRS Report RL32418, *Navy Attack Submarine Force-Level Goal and Procurement Rate: Background and Issues for Congress*, by Ronald O’Rourke.

³⁹ U.S. Department of the Navy, *Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY2007*. Washington, 2006. 8 pp.

Table 6. Steady Procurement Rates & Resulting Force Levels

(number procured each [left] and number in service that year [right])

FY	1/year		1.5/year starting FY12		1.5/year starting FY09		Navy 30-year plan (Feb. 06)		2/year starting FY12		2/year starting FY09		2/year starting FY07	
07	1	56	1	56	1	56	1	56	1	56	1	56	2	56
08	1	57	1	57	1	57	1	57	1	57	1	57	2	57
09	1	57	1	57	2	57	1	57	1	57	2	57	2	57
10	1	56	1	56	1	56	1	56	1	56	2	56	2	56
11	1	57	1	57	2	57	1	57	1	57	2	57	2	57
12	1	58	2	58	1	58	2	58	2	58	2	58	2	58
13	1	59	1	59	2	59	2	59	2	59	2	59	2	59
14	1	55	2	55	1	55	2	55	2	55	2	55	2	55
15	1	55	1	55	2	56	2	55	2	55	2	56	2	58
16	1	51	2	51	1	52	2	51	2	51	2	53	2	55
17	1	49	1	49	2	51	2	49	2	49	2	52	2	54
18	1	46	2	47	1	48	2	47	2	47	2	50	2	52
19	1	45	1	46	2	48	2	47	2	47	2	50	2	52
20	1	44	2	46	1	47	2	47	2	47	2	50	2	52
21	1	43	1	45	2	47	2	47	2	47	2	50	2	52
22	1	41	2	44	1	45	2	46	2	46	2	49	2	51
23	1	40	1	43	2	45	2	46	2	46	2	49	2	51
24	1	38	2	42	1	43	2	45	2	45	2	48	2	50
25	1	36	1	40	2	42	2	44	2	44	2	47	2	49
26	1	33	2	38	1	39	2	42	2	42	2	45	2	47
27	1	31	1	36	2	38	2	41	2	41	2	44	2	46
28	1	29	2	35	1	36	2	40	2	40	2	43	2	45
29	1	28	1	34	2	36	1	40	2	40	2	43	2	45
30	1	28	2	35	1	36	2	41	2	41	2	44	2	46
31	1	28	1	35	2	37	1	42	2	42	2	45	2	47
32	1	29	2	37	1	38	2	44	2	44	2	47	2	49
33	1	30	1	38	2	40	1	46	2	46	2	49	2	51
34	1	31	2	40	1	41	2	48	2	48	2	51	2	53
35	1	32	1	41	2	43	1	49	2	50	2	53	2	55
36	1	33	2	43	1	44	2	51	2	52	2	55	2	57
37	1	33	1	43	2	45	n/a	51	2	53	2	56	2	58
38	1	33	2	44	1	45	n/a	52	2	54	2	57	2	59
39	1	33	1	44	2	46	n/a	52	2	55	2	58	2	60
40	1	33	2	45	1	46	n/a	53	2	56	2	59	2	61
41	1	33	1	45	2	47	n/a	53	2	57	2	60	2	62
42	1	33	2	46	1	47	n/a	54	2	58	2	61	2	63
43	1	33	1	46	2	48	n/a	n/a	2	59	2	62	2	64
44	1	33	2	47	1	48	n/a	n/a	2	60	2	63	2	65
45	1	33	1	47	2	49	n/a	n/a	2	61	2	64	2	66
46	1	33	2	48	1	49	n/a	n/a	2	62	2	65	2	66
47	1	33	1	48	2	50	n/a	n/a	2	63	2	66	2	66
48	1	33	2	49	1	49	n/a	n/a	2	64	2	66	2	66
49	1	33	1	49	2	50	n/a	n/a	2	65	2	66	2	66
50	1	33	2	50	1	49	n/a	n/a	2	66	2	66	2	66

Source: Prepared by CRS using Navy data. n/a = data not available

The projections in **Table 6** assume a 6-year construction period⁴⁰ and 33-year service life for SSNs. If service life turns out to be less than 33 years, resulting force levels would be lower than those shown in the table.

Procurement Profiles For Maintaining Forces Of 30 To 70 Boats

Table 7 presents notional SSN procurement profiles for the 25-year period FY2007-FY2031 for supporting SSN forces of 30, 40, 48, 50, 55, 60, and 70 boats (excluding any SSGNs). None of the profiles calls for procuring more than four boats per year — the maximum annual rate that was achieved for SSNs during the Cold War years of the 1980s, when the Navy was working toward achieving and maintaining a force of 100 SSNs.

For the Navy's reported planned force level of 48 SSNs, **Table 7** shows three profiles — A, B, and C — that increase the procurement rate to two boats per year in FY2012, FY2009, and FY2007, respectively. As can be seen from these three profiles, starting to procure two boats per year earlier reduces the number of subsequent years in which three boats need to be procured.

⁴⁰Exceptions to the 6-year construction period include the second boats procured in FY2007 and FY2008, which are assumed to enter service 8 years and 7 years after they are procured, respectively, due to lack of advance procurement funding for the FY2007 boat in FY2005 and FY2006 and for the FY2008 boat in FY2006.

Table 7. Notional Procurement Profiles for Various Force Sizes
(Years with 3 or 4 boats shown in bold)

FY	Size of force supported — total number of boats in force																	
	30		40		48						50		55		60		70	
					A (2/year starts FY12)		B (2/year starts FY09)		C (2/year starts FY07)									
07	1	56	1	56	1	56	1	56	2	56	2	56	2	56	2	56	2	56
08	1	57	1	57	1	57	1	57	2	57	2	57	2	57	3	57	3	57
09	1	57	1	57	1	57	2	57	2	57	2	57	2	57	3	57	4	57
10	1	56	1	56	1	56	2	56	2	56	2	56	2	56	4	56	4	56
11	1	57	1	57	1	57	2	57	2	57	2	57	3	57	4	57	4	57
12	1	58	2	58	2	58	2	58	2	58	2	58	3	58	3	58	4	58
13	1	59	2	59	2	59	2	59	2	59	2	59	3	59	3	59	4	59
14	1	55	2	55	3	55	2	55	2	55	2	55	2	55	2	55	4	55
15	1	55	2	55	2	55	2	56	2	58	2	58	2	58	2	60	4	61
16	1	51	2	51	3	51	2	53	2	55	2	55	3	55	3	59	4	60
17	1	49	2	49	3	49	2	52	2	54	2	54	3	55	3	60	4	61
18	1	46	2	47	3	47	3	50	2	52	3	52	3	54	3	59	3	61
19	1	45	2	47	3	47	3	50	2	52	3	52	3	55	3	60	3	63
20	1	44	2	47	3	48	3	50	3	52	3	52	3	55	3	60	4	65
21	1	43	2	47	3	48	3	50	3	52	3	52	3	55	3	60	3	67
22	2	41	2	46	3	48	3	49	3	51	3	51	3	55	3	60	3	68
23	2	40	2	46	2	49	2	49	2	51	2	51	2	56	2	61	2	70
24	1	38	1	45	1	49	1	49	1	50	1	51	1	56	1	61	1	70
25	1	36	1	44	1	49	1	49	1	49	1	51	1	56	1	61	1	70
26	0	33	0	42	0	48	0	48	0	48	0	50	0	55	0	60	0	70
27	0	31	0	41	0	48	0	48	0	48	0	50	0	55	0	60	0	70
28	0	30	0	40	0	48	0	48	0	48	0	50	0	55	0	60	0	70
29	0	30	0	40	0	48	0	48	0	48	0	50	0	55	0	60	0	70
30	0	30	0	40	0	48	0	48	0	48	0	50	0	55	0	60	0	70
31	1	30	1	40	1	48	1	48	1	48	1	50	1	55	1	60	1	70

Source: Prepared by CRS using U.S. Navy data.

The following points arise from the figures in the table and the data underlying the figures:

- **For a 30-boat force.** Supporting a force of 30 boats could involve maintaining an average procurement rate of about 1 boat per year into the 2020s. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to 30 boats by 2028 and remain there after that. The force could be reduced to 30 boats much sooner by accelerating the retirement of older SSNs.

- **For a 40-boat force.** Supporting a force of 40 boats could involve maintaining an average procurement rate of 2 boats per year from FY2012 to FY2023. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to 40 boats by 2028 and remain there after that. The force could be reduced to 40 boats much sooner by accelerating the retirement of older SSNs.
- **For a 48-boat force.** Supporting the Navy's reportedly planned force of 48 boats could involve procuring a total of 35 boats during the 16-year period FY2007-FY2022, or an average of about 2.2 boats per year. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to about 48 boats by 2018 (Profile A) or FY2026 (Profiles B and C) and remain about there after that. As stated earlier, starting to procure two boats per year earlier reduces the number of subsequent years in which three boats need to be procured. The force could be reduced to 48 boats sooner by accelerating the retirement of older SSNs.
- **For a 50-boat force.** Supporting a force of 50 boats could involve procuring a total of 37 boats during the 16-year period FY2007-FY2022, or an average of about 2.3 boats per year. If all SSNs are operated to the end of their expected 33-year lives, then the force would decline to 50 boats by 2026 and remain there after that. The force could be reduced to 50 boats sooner by accelerating the retirement of older SSNs.
- **For a 55-boat force.** Supporting a force of 55 boats could involve procuring a total of 42 boats during the 16-year period FY2007-FY2022, or an average of about 2.6 boats per year.
- **For a 60-boat force.** Achieving and maintaining a force of about 60 boats could involve procuring a total of 47 boats during the 16-year period FY2007-FY2022, or an average of about 2.9 boats per year. The force would reach 60 boats by 2015 and remain about there after that.
- **For a 70-boat force.** Achieving and maintaining a force of about 70 boats could involve procuring a total of 57 boats during the 16-year period FY2007-FY2022, or an average of about 3.6 boats per year. The force would reach 70 boats by 2023 and remain about there after that.

Attack Submarine Service Lives

As mentioned earlier, SSNs have expected service lives of 33 years. The notional procurement profiles outlined above reflect this figure. As also mentioned earlier, however, the current high operational tempo for the SSN force could reduce the service lives of SSNs to something less than 33 years by accelerating the rate at which reactor core life is used up. If the service lives of existing SSNs turn out to be less than 33 years due to either higher-than-planned rates of reactor core use or general wear and tear on the ships, then the procurement rates needed to maintain SSN forces of various sizes may need to be greater than shown in the notional profiles outlined above.

Conversely, if the service lives of SSNs can be increased to something greater than 33 years,

then procurement rates needed to maintain SSN forces of various sizes could possibly be lower than shown in the notional profiles outlined above. If, for example, the service lives of Navy SSNs can be extended to 40 years, then an annual procurement rate of 1 or 1.5 boats per year would, over the long run, be sufficient to maintain a force of 40 to 60 boats, rather than 33 boats.

The feasibility and potential cost of extending the service lives of the Navy's SSNs is not clear. The Navy a few years ago increased the expected service lives of its SSBNs (including the four being converted into SSGNs) from 30 years to 42 years, with the new 42-year life to consist of two 20-year operating periods with a two-year refueling in between. The typical mission profile of an SSBN, however, may be less stressful on the boat than is the typical mission profile of an SSN. Compared to SSBN operations, SSN operations can involve submerging and surfacing more frequently (placing more frequent cyclic stress on the submarine's pressure hull) and more frequent high-speed runs (which can lead to higher rates of wear and tear on propulsion machinery).

Unlike earlier Navy SSNs, which were built with reactor cores intended to last about 15 years, Seawolf- and Virginia-class boats have cores that are intended to last the 33-year expected life of the ship. Extending the lives of Seawolf- or Virginia-class boats 40 years, if feasible, could thus involve changing their life-cycle maintenance plans to include a refueling at about age 33 or earlier.