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THE SUBMARINE FORCE IN JOINT OPERATIONS

by

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Preface

I am a career Naval Officer who served on four submarines over the last 13 years. My experience includes nine years of sea duty on both fast attack (SSN) and fleet ballistic missile (SSBN) submarines. I've had the good fortune to conduct almost every submarine mission there is. The majority of my 'time on the pond' occurred prior to the wall coming down and I learned most of my operational skills while going up against the bad guys. I am very proud to have served with a wide variety of outstanding men, both officer and enlisted.

I am distressed at the possible demise of the Submarine Force because of "fiscal constraints." I foresee the Submarine Force becoming so small it looses the experience base necessary to retain dominance in the art of submarining. There are many very capable submariners and not enough submarines.

I chose this project to inform sister service members of the unique capabilities of submarines and to air my views on some ways to ensure the Submarine Force's continued success in both day to day operations and actual warfighting. I hope my recommendations at least raise a few eyebrows.

Thanks to CDR Baker for trying to keep me focussed and ensuring I presented this in a somewhat logical manner.

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Abstract

Problem Statement. The Submarine Force brings unique and powerful capabilities to the JFC but Submariners must ensure the sister services, and the rest of the Navy, understand what those capabilities are. Submarine Force leaders must take steps now to ensure the Submarine Force and the submarine maintain their dominant position in the nation's arsenal of warfighting capabilities.

Methodology. Research methodology consisted of searching military periodicals and submarine force web sites.

Findings. Many unclassified sources describing current and future submarine capabilities exist and are readily accessible. Many arguments for how the Submarine Force should approach the future are also readily available.

Conclusion. Submarines provide the JFC with a very capable, flexible platform with the unique characteristic of covertness. Diesel submarines **can** provide the needed capabilities, but the 'diesel vs. nuclear' propulsion issue will not be solved on paper; it must be solved in the water. The Submarine Force should rent or buy a number of diesel submarines from other countries and test them. The Submarine Force should convert the two oldest TRIDENTs to ensure continued dual Dry Deck Shelter capabilities. A squadron of submarines should be deployed with Carrier Battle Groups to ensure better submarine contribution to the CVBG and JFC.

Chapter 1

Introduction

The United States Submarine Force significantly contributed to ensuring the security of our nation since the first effective combat use of submarines in World War I. The employment of submarines has come full circle from use as a coastal defense and fleet support platform in World War I to the premier, independently operated hunter-killer and strategic assets of the Cold War to today's littoral, joint force enabler.

The fleet submarines of World War I and World War II were slow, fragile submersibles more than true submarines. They transited and attacked almost exclusively on the surface; submerged operations were primarily for evasion of enemy warships. The advent of nuclear propulsion in USS NAUTILUS in 1954 gave the submarine nearly unlimited range and endurance for at-sea operations. Submerged operations in nuclear submarines were limited by the ability to control the submarine's atmosphere and the amount of food storage space rather than battery capacity. The continued research and development, driven by the arms race with the Soviet Union, eventually lead to the construction of STURGEON, LOS ANGELES, and SEAWOLF class fast attack submarines (SSNs) and the extremely quiet OHIO class, or TRIDENT, ballistic missile submarines (SSBNs).

During the Cold War SSBN crews became expert at their mission to 'Hide with Pride' - being able to go on 10 week patrols and successfully evade the enemy SSNs trying to locate them. SSN crews became expert at finding, localizing, closing, and following enemy submarines without being counter-detected. During 3 to 6 month deployments SSNs concentrated on Anti-Submarine Warfare (ASW) and Anti-Surface Warfare (ASUW), always ready for the Soviet Fleet to come down the Greenland-Iceland-United Kingdom (GIUK) gap in order to interdict Allied shipping lanes. Communications on deployment or patrol consisted almost exclusively of receive only; radio transmissions from the ship were restricted to emergency type reports. Submarine Commanding Officers were expected to continue their long tradition of operating independently and aggressively. SSBNs provided our most survivable nuclear deterrent and SSNs continuously practiced the ASW and ASUW skills they knew they would someday need to use.

With the end of the Cold War, and large defense budgets, came the enlightened view of Joint Operations—the synergistic combination of the various Services' core competencies to improve the overall warfighting capability of the United States. The United States Submarine Force is a powerful, unique, and flexible part of the Navy's contribution to the Joint Force Commander (JFC), but today's Submarine Force leaders must take action to ensure the continued contribution in the future. First, they must educate the country's leadership and budget controllers on the importance of our continued dominance in traditional submarine blue water missions. Second, they must educate the other Services in the unique capabilities submarines currently provide the JFC in littoral warfare and future capabilities currently in development. Third, they must

make a concerted effort to solve the ‘nuclear vs. diesel’ problem, convince Congress to fund the conversion of the two oldest TRIDENTs to DDS/ASDS carriers, and improve submarine contributions to the CVBG.

This paper will introduce the reader to the traditional blue water and current littoral capabilities of the submarine force, present new capabilities in development, and propose three courses of action to ensure the submarine remains a dominant platform when needed during future conflicts.

Chapter 2

Blue Water Capabilities

During the Cold War the Submarine Force had three primary missions aimed principally at the Soviet Union and her substantial naval fleet. Early in the Cold War her threat was one of quantity; later the threat was both quantity and high quality ships and submarines. The SSBN mission of nuclear deterrence required very quiet submarines, an extremely reliable communications system, and a superb warhead delivery system. The SSN missions of ASW and ASUW placed a premium on stealth, speed, superior sensors, and aggressive, daring submarine Commanding Officers. The Submarine Force successfully completed their assigned missions and significantly contributed to "winning" the Cold War. The specifics of what various submarines did and how well they did it are highly classified, but the generalities of the three open ocean missions can be told.

Nuclear Deterrence

> *The 41 nuclear powered Polaris submarines built between 1959 and 1967 were the most survivable part of the U.S. deterrent, and since survivability was essential to the credibility of retaliatory forces, submarine-based systems eventually became* primus inter pares *in the U.S. nuclear arsenal.*[1]
>
> —Merrick Casey
> Loren Thompson

Nuclear deterrence has been the sole mission of SSBNs since 1960 and TRIDENT SSBNs currently provide the most survivable leg of the Nuclear Triad of land based missiles, long range bombers, and SSBNs.[2] TRIDENT submarines operate with a two crew concept, allowing for rapid turn-around after a patrol and more at sea time for the submarine without unduly stressing the crew. A nominal schedule for a ship is 77 days at sea followed by a 35-day maintenance period followed by another patrol. The off-going crew exchanges the ship early in the maintenance period, assists with the maintenance, then trains while the ship is at sea with the other crew.[3] This schedule allows the ship to be at sea about 70% of the year while the crews operate at a lower operations tempo and receive outstanding training at the two TRIDENT Training Facilities.

There are 18 TRIDENTs deployed with 24 missiles each; 8 ships employ the C-4 ballistic missile and 10 ships employ the improved D-5 missile. Both missiles are three stage solid propellant rockets with the capability to carry multiple warheads. The D-5 missile has a range exceeding 4000 nautical miles with an accuracy measured in hundreds of feet and is capable of carrying up to twelve Multiple Independently Targeted Re-entry Vehicles (MIRVs).[4] The D-5 missile system will eventually be back-fitted to all operational TRIDENTs.

Anti-Submarine Warfare

Part of the arms race with the Soviets was in the area of ASW. Each class of SSNs the United States built was faster, quieter, and more capable compared to its predecessor. Each class of SSN was also the premier submarine in the world when introduced. The Soviet Union was just as concerned about survivability of strategic assets as the United States was and also built quieter and more capable submarines. It became the mission of

American SSNs to be able to locate, close, and follow Soviet submarines without the enemy counter-detecting the US submarine. The ASW mission had primarily two aspects; first, being in a position to sink Soviet SSBNs before they could launch a pre-emptive attack on the United States; and second, to destroy Soviet SSNs or cruise missile submarines (SSGNs) to protect US carrier battle groups.

The ASW approach and attack problem is straightforward, but not easy. First, detect the opposition without being detected. Looking for a quiet submarine in the ocean's vastness is like looking for a needle in a haystack; thus, US and Allied anti-submarine tactics rely both on cueing from sources external to the submarine and superior on-board sensors and data processing. Second, submariners conduct target motion analysis (TMA) while closing to within range of their weapons system.[5] Third, the submariner must place the ship in an advantageous "firing position" relative to the enemy. Even casual observers may conclude that positional advantage improves weapons' performance. The submariner, however, analyzes this positioning problem in such detail as to minimize the target's ability to hear the torpedo launch transient. The American crew's proficiency at proper target classification is very important because the most advantageous firing position depends on the target submarine's sensors.

The US submarine fleet's ability to conduct unequalled ASW operations was due to superior submarines, sensors, weapons, and crews. When STURGEON class submarines began operating in the early 1970s they provided a stepped improvement in quieting. US sonar sensor and processing technology stayed well ahead of the Soviets' throughout the Cold War. US torpedoes provided the most envied American hardware advantage. The Mk48 and the Mk48 Advanced Capability (ADCAP) torpedoes can operate with or

without wire guidance and use active and/or passive homing with re-attack capabilities. They are deadly against targets up to five nautical miles away and travel at speeds greater than 28 knots.[6] The most significant advantage the US Navy held during the Cold War, and continues to hold, is crew superiority. The submarine crews' proficiency at conducting ASW is frequently monitored by submarine staffs and inspection teams and continuously practiced on deployment.

Anti-Surface Warfare

The arms race with the Soviets included both sides building more and better surface ships, surface sensors, and surface fired weapons systems. The postulated World War III scenario included US Carrier Battle Groups (CVBGs) meeting Soviet Surface Action Groups (SAGs) in the middle of the oceans and 'duking it out' for control of the sea lines of communication. Both sides improved their sensors, weapons, and self-defense countermeasures at about the same rate. By the 1980s both sides knew they would need to employ submarines to 'take out the heavy' in the other group. The Soviets improved their SSNs and SSGNs; the US designed the LOS ANGELES class SSN. This SSN's mission specifically included ASW against Soviet submarines trying to sink the US carrier and ASUW against capital ships in the Soviet SAG.

The LOS ANGELES class SSN was designed almost exclusively for CVBG escort; they were fast, quiet, and could launch Mk48 and ADCAP torpedoes, Harpoon Anti-Ship Missiles (no longer carried), and both land attack and anti-ship (no longer carried) Tomahawk cruise missiles.[7] The new submarines showed another step improvement in quieting and an increase in operating speed to allow them to support the CVBG.

Escort duties included conducting ASW sweeps hundreds of miles ahead of the CVBG and conducting attacks against the SAG. The KIROV class Soviet cruiser was a particularly special target. It was outfitted with state of the art Surface to Air missiles, Surface to Surface missiles, and anti-cruise missile defenses. While operating in concert with a SAG she was a nearly impenetrable target. However, with the exception of the helicopters she carried, her ASW defenses were minimal; it would have been the job of an SSN to sink the vulnerable and lucrative KIROV target.

Conclusion

Over the course of 30 or so years of the Cold War, the US Submarine Force became expert at the traditional missions of deterrence, ASW, and ASUW. A major reason for the mission success was the investment in new submarines, sensors, and weapons. The paramount reason, though, was the dedication and aggressiveness of the submarine officers and crews.

Some people argue the 'fall of the Soviet Union' means submarines are no longer needed for open ocean missions; some argue submarines are not needed at all. Despite the uncertain future of the Russian navy, Russian political and naval leadership understands the importance of their submarine force. Russian officials have stated they want to retain 20-26 SSBNs, 12 SSGNs, 40 SSNs, and 40 diesel submarines.[8] It is imperative the United States invest in new submarines and the force structure necessary to remain the premier submarine force in the world. To yield our position for another country to become the dominant submarine force would simply throw away the time, money, effort and sacrifice made over the past 40 years. Once lost, our position may be unrecoverable.

Notes

[1] Merrick Carey and Loren Thompson, "Submarines and the Future of Seapower", *Strategic Review*, v 24, no 4 (Fall 1996): 21.

[2] *Navy Fact File: Fleet Ballistic Submarines*; on-line, Internet, 3 November 1997, available from http://www.chinfo.navy.mil/navpalib/factfile/ships/shipssbn.html.

[3] *US Submarine Classes*, on-line, Internet, 3 November 1997, available from http://www.norfolk.navy.mil/sublant/subclass.htm.

[4] Deputy Chief of Naval Operations, *Force 2001 Vision… Presence… Power… A Program Guide to the US Navy 1997 Edition*, (Washington DC), 54.

[5] TMA is the process of determining the target's bearing, range, course, and speed in order to place a torpedo close enough to the target for the torpedo to detect the target and home to detonation. TMA is usually accomplished using only passive sonar which provides only bearings to the target. The submarine must conduct various maneuvers and use both manual plots and computer systems to accurately determine the targets course, speed, and range.

[6] *Navy Fact File: Torpedoes*, on-line, Internet, 3 November 1997, available from http://www.chinfo.navy.mil/navpalib/factfile/weapons/wep-torp.html.

[7] *Submarine Types*, on-line, Internet, 3 November 1997, available from http://www.csp.navy.mil/subs.html.

[8] CDR Cosentino, "Back to the Future", *United States Naval Institute Proceedings*, v 123, no 3 (March 1997): 45.

Chapter 3

Littoral Capabilities

> *We're dominant in the blue water, that's for sure, and we want to remain that way. But now, there's a lot of discussion, appropriately, on developing our capacity in the littorals. In the post-Cold War era, that is of utmost importance.*[1]
>
> —Senator Joseph I. Lieberman

Dr. Jaquelyn K. Davis, executive vice-president of the Institute for Foreign Policy Analysis, recently wrote "today's nuclear submarine force provides the National Command Authority with an unparalleled joint asset, both as a formidable sea-control resource in its own right and as a premier force enabler for naval, air, and ground operations in the littoral environment."[2] The enduring characteristics of submarines—stealth, endurance, firepower, and mobility—enable the submarine force to support the following roles and missions:

- Deterrence
- Sea Denial
- Battle Group Operations
- Surveillance and Intelligence
- Special Operations
- Precision Strike
- Peacetime Engagement[3]

Many of the 'new' littoral missions were actually around during the Cold War but security restrictions kept most of them secret. Deterrence, sea denial (ASW and ASUW), and battle group operations were discussed in the previous chapter. This chapter

discusses the unique capabilities submarines offer the JFC in surveillance and intelligence, special operations, strike warfare and littoral sea denial.

Surveillance and Intelligence

Submarines provide the unique capability to *covertly* enter an area and conduct acoustic, visual, and electronic surveillance. The submarine can gather intelligence on enemy submarine and surface fleet movements, conduct visual/photo beach reconnaissance, and intercept, record, and analyze enemy communications and radar emitters. The submarine can stay on station for 60 – 90 days and covertly depart without the enemy ever knowing surveillance was conducted. Reconnaissance aircraft can't see through clouds, satellites lack persistence, and surface ships are not covert.

Special Operations

Similarly, submarines can *covertly* insert and extract Special Operations Forces (SOF). The Submarine Force is most familiar with working with Navy Sea-Air-Land (SEAL) teams, but has also demonstrated the ability to conduct operations with Army, Air Force, and Marine Corps special operations personnel. Special operations include combat search and rescue, reconnaissance, sabotage, diversionary attacks, monitoring enemy movements and communications, infiltration/exfiltration, and pre-amphibious landing surveys.[4] Any US submarine can conduct combat swimmer operations and a number can conduct Dry Deck Shelter (DDS) operations.

Each submarine has two escape trunks designed for crew evacuation which can be used for swimmer "lock-in/lock-out." Two or three combat swimmers enter the trunk, shut the lower hatch, flood the trunk with water, open the outer hatch and swim out.

Personnel inside the submarine shut the outer hatch, drain the water out of the trunk, open the lower hatch and repeat the process. Major drawbacks of this operation are the high number of cycles and amount of time required to launch or retrieve a large number of swimmers, and the difficulty of transferring necessary equipment such as Combat Rubber Raiding Craft (CRRC) and outboard engines. A procedure that solves these problems is dry deck launch/recovery.

During dry deck launches the submarine surfaces, swimmers and their equipment are quickly staged topside, CRRCs are inflated, and outboard engines prepared. The submarine re-submerges and the group of swimmers departs. When the operation is complete the swimmers rendezvous with the submarine, the submarine surfaces (partially or completely, depending on the class of submarine and sea conditions), and all personnel and equipment are loaded onboard and the submarine re-submerges. This type operation is especially useful when extracting non-swimmers from shore or when employing large numbers of swimmers. The major drawback is the loss of covertness and increased risk of counter-detection and attack when the submarine is surfaced. A system that combines the covertness of the lock-in/lock-out with the high density of dry deck launches or recoveries is the Dry Deck Shelter (DDS).

Several STURGEON class SSNs and two former SSBNs are modified to carry DDSs. The DDS is a large chamber carried on the main deck of the submarine and can be accessed while submerged; the SSNs can accommodate one while the converted SSBNs can carry one or two DDSs. A DDS can be used for two similar swimmer operations – Mass Swimmer Lock-out or SEAL Delivery Vehicle (SDV) operations. During Mass Swimmer Lock-out up to 40 combat swimmers with gear and CRRCs

access the DDS while the submarine is submerged. The entire chamber is flooded, the ten foot diameter outer door is opened, and all swimmers exit at nearly the same time. The outer door is shut, the chamber drained, and the submarine is able to continue her tasking. After rendezvous the reverse is conducted to recover the swimmers and their gear while the submarine remains submerged.

SDV operations are similar to the Mass Swimmer Lock-out, but the size of the SDV limits the number of swimmers employed. SDVs are essentially underwater sleds; they are 22 feet long 'wet' submersibles driven by an electric motor and batteries. The SDV is driven near the surface, but fully submerged, by a Pilot/Navigator team at a speed of about four knots and has a range of about 36 nautical miles.[5] (Because the SEALs are exposed to the environment water temperature can be a more limiting factor than battery capacity.) The Mk XIII SDV can transport up to four other combat swimmers and the Mk IX SDV two-man vehicle can be fitted with two Mk 31 torpedoes. The Mk 31 is a straight running torpedo with a range of about 3 nautical miles.[6] SDVs used with DDSs allow both the submarine and the SEALs to remain submerged during the entire mission. This additional covertness allows operations closer to shore and the enemy.

Precision Strike

> *We are never going to be the predominant strike platform. I think we recognize that and had never intended to be. But we provide covert, precision strike when covertness and surprise are necessary. Submarines are able to bring the Tomahawk weapon into places that we can't bring other Tomahawk shooters.*[7]
>
> —VADM Richard W. Mies
> COMSUBLANT

Submarines provide the unique capability to *covertly* launch precision strikes using Tomahawk Land Attack Cruise Missiles (TLAM). This covertness provides an opportunity for national leadership to use non-military instruments of power during crisis resolution without provoking the other party by overtly placing surface warships in the area. If diplomacy solves the crisis the submarine can depart the area without having demonstrated an aggressive American stance. Should diplomatic, informational, and economic options fail, the submarine can have ordnance on target within minutes. All US SSNs have the capability to launch TLAMs. The STURGEON class carry only torpedo tube launched weapons; LOS ANGELES class SSNs can carry up to 25 torpedo tube launched weapons and the last 23 hulls carry an additional 12 TLAMs in their Vertical Launch System (VLS); the SEAWOLF class can carry up to 50 torpedo tube launched TLAMs.[8]

The TLAM is a subsonic, all weather, land attack cruise missile with a range of about 600 nautical miles. The submarine programs the missile flight profile from the launch point to the 'landfall waypoint' after which a pre-stored flight plan is followed. High accuracy is ensured by use of a Global Positioning System (GPS) receiver, inertial and terrain contour matching (TERCOM) guidance, and a Digital Scene Matching Area Correlation (DSMAC) system. TERCOM compares measured topography to a stored map for mid flight corrections over land. When the missile is close to its target the DSMAC system ensures accurate final homing to the target. TLAMs can carry a 1000-pound HE warhead or a sub-munitions dispenser with combined effect bomblets.[9].

Mining Operations

Submarines provide the unique capability to *covertly* conduct both offensive mining operations and countermining operations. Most SSNs can carry Submarine Launched Mobile Mines (SLMM). SLMMs are launched from the submarine's torpedo tubes, travel a pre-set distance up to about 17,000 yards, sink to the ocean floor, and then activate. The mine can be pre-set to actuate after a certain number of ships have passed by or attack a specific sound signature; they also have a pre-set scuttle timer.[10] Covertly laying mines ensures the enemy will not conduct mine countermeasure operations. Prior to conducting our own amphibious landing, however, we may need to conduct our own mine clearing operations.

Submarines provide the unique capability to covertly conduct mine countermeasures, allowing pre-amphibious landing operations to go unnoticed by the enemy. SEALs and/or combat swimmers can operate from submerged submarines in concert with Unmanned Underwater Vehicles (UUVs) to detect and either blow up or otherwise de-activate enemy mines.[11]

Anti-Diesel ASW

Submarines provide the best capability to effectively conduct anti-submarine warfare against diesel submarines. Diesel submarine proliferation has given many Third World countries the opportunity to effectively control littoral and choke point areas. One enemy diesel submarine lucky enough to get one torpedo hit on a CVN or an AEGIS cruiser could easily turn US resolve and have a huge impact on a conflict. Finding one diesel submarine could be a pre-requisite for Joint Force mission success.

The challenge of finding a quiet nuclear submarine in the open ocean is difficult, but the challenge of finding and destroying a diesel submarine in littoral waters can be nearly impossible. Many particulars are classified and will not be addressed here. In general, though, a diesel submarine operating on battery power is quieter, slower, and operating more shallow than a nuclear submarine. Thus, diesels hold to a much smaller operating area meaning that concentrating search efforts in the right place is critical.

Both open ocean ASW and littoral ASW require a combined team effort between surface ships, aircraft, and submarines but the submarine is especially needed against a diesel. The submarine's inherent stealth makes it possible to search for a diesel with the diesel unaware of the threat. The two most likely methods of locating a diesel are passive detection of transient noises or use of active sonar. Transients might include noise from a dropped deck plate, a burst of propeller cavitation, or hull noises from depth (and therefor pressure) changes. A submarine can exploit these intermittent transients because she listens 24 hours a day when on station. Surface ships conducting ASW searches are limited in their speed, require local air superiority, and cannot change the depth of hull mounted systems. Most often the diesel knows the surface ship is there. ASW aircraft have relatively short on-station times, also require air superiority, and the diesels can counter-detect the aircraft.

A diesel submarine is also vulnerable to active sonar. ASW surface ships and ASW aircraft have limited active capabilities with the same drawbacks already discussed. Submarines are better able to determine and exploit the Sound Velocity Profile (SVP) by placing the submarine at the best depth for the prevailing conditions. Sophisticated

computer programs are used to determine the depth, power level, and type of pulse to maximize the chance of detection.

After detection the diesel submarine must be localized to an area of uncertainty small enough for the torpedo to search out. If the diesel was located by detecting transients this can be a very long and tedious process unless active sonar is used. If the diesel was detected by active sonar his location is known well enough to shoot. The surface/air launched Mk 46 torpedo was upgraded in 1989 for shallow water engagements,[12] but is a "fire and forget" weapon. The submarine launched Mk48 ADCAP is the weapon of choice against a diesel because the firing submarine can continue monitoring the diesel and steer the weapon if required.

Conclusion

Today's submarines bring a wide array of options to the JFC. VADM Mies, in remarks to the Navy Submarine League Annual Symposium, listed the submarine's 'enduring attributes':

- Stealth–unlocatable, credible, non-provocative presence, surprise
- Endurance–protracted on-station dwell time with minimal logistics tail; self-sustaining
- Agility–global reach; to respond rapidly without the need for air superiority; sustained high speed capability
- Lethality–a high ratio of offensive to defensive weapons because stealth brings its own defense; a high payload of not only precision weapons but *heavyweight* weapons
- Survivability–self-defense inherent in stealth; virtually invulnerable from attack; supports the national threshold not to put our people at risk
- Versatility–multi-mission; variable payloads; growth potential for alternative roles and ability to tailor the submarine for the mission
- Reliability–high operational readiness
- Responsiveness–robust connectivity; readily reconstitutable[13]

These enduring attributes tie back directly to the littoral capabilities of surveillance and intelligence, special operations, strike, and sea denial. The unique, common denominator is the ability of the submarine to do its assigned missions covertly.

VADM Mies, in the same presentation, concluded (original emphasis)

> We have come full circle—we have moved away from the almost exclusive blue water ASW focus that the Cold War necessitated to multi-mission operations in both blue water and littorals. The bottom line is that *submarines don't only exist to fight other submarines*. In fact, *submarines have utility across the full spectrum of operations*, from peacetime engagement *operations other than war*, through crisis response and deterrence, to warfighting operations in support of a joint commander.[14]

Notes

[1] James D. Hessman and Nathaniel F. Caldwell, "To Basically Be There A More Important Role for Navy/USMC in Post Cold War Era" (Interview with Sen Joseph I. Lieberman (D-Conn)), *Sea Power*, v 40, no 7 (July 1997): 10.

[2] Dr. Jacquelyn K. Davis, "The Submarine's Role in the Twenty-First Century", *Sea Power*, v 40, no 7 (July 1997): 35.

[3] *Submarine Roles and Missions*, on-line, Internet, 3 November 1997, available from http://www.norfolk.navy.mil/sublant/roles.htm.

[4] Ibid.

[5] Glenn W. Goodman, "The Littoral Alliance", *Sea Power*, v 39, no 7 (July 96): 29-30.

[6] CDR Massimo A. Anniti, "Underwater Special Operations Craft", *Military Technology*, v 20, no 3 (March 1996): 89.

[7] VADM Richard W. Mies, "Remarks to the Navy Submarine League Annual Symposium, June 5, 1997"; rpt. in *Navy Submarine League Quarterly*: 30.

[8] http://www.norfolk.navy.mil/sublant/subclass.htm.

[9] *Navy Facts: Tomahawk*, on-line, Internet, 3 November 1997, available from http://www.chinfo.navy.mil/navpalib/factfile/missiles/wep-toma.html.

[10] *Submarine Weapons*, on-line, Internet, 3 November 1997, available from http://www.norfolk.navy.mil/sublant/weapons.htm.

[11] LCOL Arthur P. Brill JR, USMC, "The Last Twenty Feet", S*ea Power*, v 38, no 11 (Nov95): 46.

[12] http://www.chinfo.navy.mil/navpalib/factfile/weapons/wep-torp.html.

[13] Mies, 38.

[14] Ibid.

Chapter 4

Future Capabilities

The current fleet of TRIDENT SSBNs, and STURGEON, LOS ANGELES, and SEAWOLF class SSNs is clearly the most advanced and most capable submarine fleet in the world. Foresight and competition during the last part of the Cold War ensured continued improvement in systems and platforms. Fiscal constraints after the fall of the Soviet Union, an increased concern for future conflicts in the littorals, and an increased emphasis on joint operations have shaped current new systems in development. Some of the more important submarine systems being developed are the New Attack Submarine (NSSN); the Advanced SEAL Delivery System (ASDS); adaptation of kinetic warheads for ballistic missiles, modification of the Army's Tactical Missile System (ATACMS) for launch from an SSN; and the use of Unmanned Underwater Vehicles (UUVs) and Unmanned Aerial Vehicles (UAVs). These new systems are particularly important in littoral scenarios.

NSSN

The NSSN was designed to retain blue water mission dominance against late generation Russian submarines while also dominating in littoral missions.[1] She will be configured to conduct offensive and defensive mining operations, SOF insertion/extraction, battle group support, intelligence collection and surveillance

missions, sea control operations, and land attack. She is also specially configured to adapt to future mission requirements.[2] The NSSN will be able to conduct SEAL operations using the current Dry Deck Shelter (DDS) / SEAL Delivery Vehicle (SDV) system and the future Advanced SEAL Delivery System (ASDS). She is also configured with a 9-man SOF entry/exit chamber for lock-in/lock-out operations.

Advanced SEAL Delivery System (ASDS)

The ASDS will be a dry 65 feet long mini-submarine with a speed of eight knots and a range of 125 nautical miles. This system eliminates the exposure to the environment inherent to the SDVs and will lessen the physical and mental fatigue of the SEALs or combat swimmers.[3] A qualified submarine officer will pilot the SDV with a SEAL officer co-pilot and carry up to eight other SEALs or combat swimmers. The primary launch vehicles will be LOS ANGELES, SEAWOLF, and NSSN class submarines.[4]

Kinetic Energy Warheads / ATACMS

One result of the arms race was a dramatic increase in the accuracy of nuclear warheads delivered from ballistic missiles, even after a 4000-mile flight. Another was the development of the Army Tactical Missile System (ATACMS), a semi-ballistic inertially guided missile fired from the Army's Multiple Launch Rocket System.[5] Both developments are being modified to dramatically increase the firepower and weapons mix of submarines.

Three concepts adaptable to ballistic missiles are Kinetic Energy Projectiles (KEPs), Single Large Mass Projectiles (SLMPs), and Deep Penetrators. KEPs consist of relatively small pieces of tungsten or steel deployed from a hyper-velocity re-entry body

just prior to impact to form a lethal cloud of penetrators. The SLMP would use a large mass at very high velocity to transfer the maximum amount of kinetic energy on the target in the form of a shock wave. The Deep Penetrator is a hyper-velocity warhead concept that could possibly provide significant penetration capability against hardened targets and underground facilities.[6] Non-nuclear warheads could be installed on SSBN missiles to provide some middle ground between 'no action' and using a nuclear weapon.

ATACMS missiles are being modified for launch from SSN Vertical Launch System (VLS) tubes and other surface ships. ATACMS have a range of about 50 nautical miles with warheads such as 250 pounds of M-74 grenades or Brilliant Anti-Armor precision guided sub-munitions. Kinetic energy warheads could be used on these missiles also.[7]

UUVs and UAVs

The Navy's highest priority in Unmanned Underwater Vehicles (UUVs) is development of a covert mine countermeasure. The Near-term Mine Reconnaissance System is being developed to use commercial off the shelf systems to create a UUV with various sonars that can be launched, controlled, and recovered from LOS ANGELES class SSNs.[8]

Unmanned Aerial Vehicles (UAVs) provide the submarine with an external reconnaissance system to greatly improve its strike, special forces, and surveillance and intelligence missions. A LOS ANGELES class SSN demonstrated these capabilities by controlling a Predator UAV using ultra high frequency satellite communications while submerged. The submarine conducted tactical reconnaissance on a land-based mobile missile battery, relayed information to the JFC, selected SOF ingress/egress routes, and monitored missile battery movement in support of the SOF strike mission.[9]

Conclusion

These future capabilities are in development because of the foresightedness of national and submarine leadership in the 1980s and early 1990s. Our current problem is determining the innovations and revolutionary systems we need to be working on for future generations. We must determine now what follow-on submarines will be built, how to continue the superb Submarine/SEAL teamwork, and how to better employ submarines working for the JFC.

Notes

[1] Carey and Thompson: 25.
[2] *Force 2001*: 41
[3] *Force 2001*: 41
[4] *Advanced SEAL Delivery System*, on-line, Internet, 3 November 1997, available from http://www.chinfo.navy.mil/navpalib/cno/n87/asds.html.
[5] LCDR Joseph N Giaquinto, LCDR Lawrence L. McDonald, CDR J. Patrick Madden, "The Quick Strike Submarine", *United States Naval Institute Proceedings*, v 121, no 6 (June 1995): 43.
[6] Ibid.
[7] Ibid.
[8] *Force 2001*: 79.
[9] *Surveillance – Unmanned Aerial Vehicles*, on-line, Internet, 3 November 1997, available from http://www.chinfo.navy.mil/navpalib/cno/n87/uav.html.

Chapter 5

Recommendations

Numerous articles have been written, speeches made, and testimony given about what to do with submarines in the future. In terms of sheer numbers the force is continuing to 'right size' down to 50 SSNs, 14 SSBNs, and possibly only one TRIDENT base. Both Submarine Type Commanders, however, feel strongly they need 72 SSNs to meet CINC requirements.[1] It is also crucial to SSBN survivability and deterrence to maintain two TRIDENT homeports and a two-ocean presence.[2] The two submarines capable of dual DDS operations, USS KAMEHAMEHA and USS JAMES K. POLK, are nearing their inactivation yet there is no plan for follow-on dual DDS platforms. The increased emphasis on CVBG operations for submarines has not necessarily translated to actual increase in synergy of operations yet. These three issues must be addressed now.

The submarine force and national leadership need to look outside the nuclear propulsion paradigm for designing new submarines, take aggressive steps to convert at least two TRIDENTs to dual DDS carriers, and improve the integration of submarines into the CVBG.

Nuclear vs. Diesel Submarines

The questions of whether diesel powered attack submarines (SSKs) are a viable option for future submarine designs and whether they could replace SSNs have gone

unanswered for quite some time. Much of the debate has centered on costs and whether SSKs can perform submarine missions as well as SSNs.

The current SSN building program calls for building a total of three SEAWOLF class SSNs to be followed by NSSNs. There are some alternatives available. First, reopen the production of LOS ANGELES class SSNs. This is a proven platform but the start up costs of re-opening production lines is almost certainly prohibitive. Second, continue building SEAWOLFs and investigate technology for a follow-on submarine. Here the costs **are** prohibitive. Third, presume there is no current threat to our country which can only be countered with submarines and use the time to experiment – build one or two NSSNs, test them, make improvements, and build some more.[3] This is a dangerous alternative that could leave us vulnerable to a future, as of yet unseen, enemy. Last, investigate non-nuclear alternatives. SSKs would cost much less than NSSNs, have proven capabilities such as those in Australia's COLLINS class, and are well suited for littoral missions such as SOF, mining, and surveillance and intelligence gathering. Building SSKs could also lead to exporting some submarines to our allies.

Diesel submarines can be smaller and therefore operate in somewhat shallower water than large SSNs. A side benefit of a smaller SSK could be reduced chances of visual, heat, or magnetic counter-detection. The Swedes, Germans, Australians, and Italians are making great strides in research and development of air independent systems, which would greatly increase the operational flexibility of the SSK. Smaller and slower SSKs could be satisfactory for littoral missions because high sustained speeds and long range would not be needed. SSKs could also be used to provide invaluable anti-diesel ASW

training to other submarines, would be less expensive to operate, and would provide flexibility in future design considerations due to less stringent requirements.[4]

Other considerations add to the argument for SSKs. By building less expensive SSKs, more could be built, increasing the number of submarines available to the CINCs and lowering the individual operations tempo per submarine. The submarine force could further reduce the old emphasis on proficiency in the nuclear propulsion plant and further increase the emphasis on operational and warfighting skills. Quality of life would be improved because the crew of an SSK would not need to conduct reactor plant start-ups at 0200 or conduct long complex propulsion plant evolutions to set plant conditions for nuclear maintenance. Without a nuclear reactor there would be no Nuclear Power Warship berthing restrictions and more locations would be available for peacetime engagement port calls.

Regardless of the ability of SSKs to conduct littoral warfare SSNs are needed and will be needed in the foreseeable future to conduct blue water missions. The high speed and endurance of SSNs are absolutely required to conduct open ocean search and attacks of adversarial SSBNs and SSNs. The number of SSNs required is arguable; that we need them is a fact. The question then becomes "Should we build just SSNs or a mix of SSNs and SSKs?"

Many countries have proved SSKs are viable platforms for littoral operations. The only way to prove SSKs can fulfill US mission requirements in littoral, joint operations is to try them. Evaluate the best SSKs the world has and 1) buy one, 2) rent one, or 3) buy the plans and build one, then operate it in fleet exercises and evaluate its ability to meet operational requirements. Better yet, rent, buy, or build two or three different SSKs from

two or three different countries. This would allow evaluations of SSK vs. SSN and SSK vs. SSK; then the best SSK could be selected for use and a building program started. This will solve the SSK vs. SSN question where it should be solved - in the water instead of on paper. If the SSK does not prove itself (and it was bought) it could still be used for fleet exercises or UNITAS cruises. If the SSK does prove itself, the Submarine Force will have more submarines and the nation will have a more economical force.

TRIDENT DDS / ASDS

Senator Joseph Lieberman (D-Conn) and former Congressman Jim Courter (twice BRAC Chairman and current director of the defense program of the Alexis de Tocqueville Institute) support converting the four oldest OHIO class SSBNs to a SSGN configuration. Writing in *United States Naval Institute Proceedings*, Mr. Courter discussed a baseline configuration of 22 missile tubes carrying 6 conventional missiles, TLAM or ATACMS variants, each. The two remaining tubes would be used for swimmer delivery systems[5]. Though Mr. Courter discussed the ability of the TRIDENT to host up to four platoons of SOF, he admitted the driving factor for the conversion would be strike warfare. Strike warfare is important, but the driving issue should be the SEAL mission. Every SSN in the fleet and numerous surface warships are TLAM capable but there are now very few SOF platforms.

The two current dual DDS submarines, POLK and KAMEHAMEHA, and the five DDS capable SSNs are scheduled for de-commissioning in a few years. The planned back-fitting of ASDS to LOS ANGELES class SSNs will lessen the impact of the SSN de-commissionings until the ASDS capable NSSN is delivered, but there is no plan to replace the dual DDS carriers. The dual DDS carriers provide a much greater SOF

platform than the single DDS carriers. The dual DDS submarine provides more room on the submarine, allows for more flexible mission planning, and has inherent redundancy.

The old 'boomers' that were converted to dual DDS carriers are huge compared to STURGEON SSNs. On the SSBN the SEALs and crew can be berthed without 'hot racking' - three men sharing two bunks on a rotating basis. Enough exercise equipment can be loaded for the SEALs (and crew) to maintain the physical conditioning required for mission success. Mission planning, briefings, and operations can be conducted with minimum crew disruption. Submarine crew training and casualty drills can be conducted with minimum impact on the SEALs. Both the submarine crew and SEAL teams can better maintain operational proficiency.

The dual DDS carriers have more mission flexibility than the single carriers. One DDS can be loaded with an SDV and the other DDS loaded with CRRCs. This allows the flexibility to conduct SDV operations, Mass Swimmer Lock-outs, or both. An empty DDS also allows the ability to recover an SDV launched from shore or another submarine (USS JOHN MARSHALL demonstrated the capability to recover and launch another country's SDV during a multi-lateral exercise in the Mediterranean). The ability of the SEALs to maintain physical conditioning allows the submarine/SEAL team to stay on station longer. The longer the submarine can stay on the station the longer national leadership has to attempt a diplomatic resolution before the decision must be made to conduct the mission or depart the area.

The dual DDS submarine has inherent redundancy compared to the single DDS. The two DDSs operate and interface with the submarine systems totally independently. Therefor, a material casualty on one system would not result in aborting the mission. The

mission would need to be modified if it originally used both DDSs, but it could still be conducted while attempts were made to fix the inoperable DDS. Two DDSs also would allow scavenging, if necessary, from one DDS to ensure the other is fully operational.

The dual DDS submarine, with its greater mission flexibility than a single DDS submarine, is a superb platform for the JFC. The necessity of maintaining this capability must be balanced against the strategic deterrence value of the first two TRIDENT submarines. The Cold War is over. Nuclear deterrence is still a paramount mission, but the number of warheads needed has certainly declined. The submarine force should make the commitment to littoral warfare by back-fitting OHIO and MICHIGAN with dual DDSs and dual ASDSs before inactivating POLK and KAMEHAMEHA. In the meantime, the research and development necessary to modify TLAM and ATACMS could continue, and FLORIDA and GEORGIA converted to SSGN/DDS/ASDS platforms later.

Improving CVBG Operations

Submarines are unique platforms with unique issues. In many instances it takes a submariner to know how to best employ a submarine and how to employ it safely. Some changes have been made to Carrier Battle Group (CVBG) staffs to improve the integration of submarines into the CVBG, but more must be done. CDR Kevin Peppe, Commanding Officer, USS ATLANTA (SSN 712), recommended assigning an entire squadron of submarines to the CVBG. His recommendation should be followed.

Submarine unique issues include the problems of Prevention of Mutual Interference (PMI), water space management, communications' effect on speed, and the effect of communicating on sonar searches. PMI minimizes the risk of collision by coordinating

waterspace to insure friendly submarines are not operating in the same area at the same time. PMI also considers surface ships with towed sonar arrays and other towed bodies. Usually the Submarine Type Commander staff controls operating area assignments, transit routes, and exercise geometries to ensure PMI and can coordinate it with only one way communications to a specific submarine, if necessary. Water space management is the coordination of waterspace to insure friendly ASW assets do not attack a friendly submarine. Water space management must be coordinated 'in situ' and almost always requires the submarine to communicate with the attacking platform or CVBG staff. Submarine communications restrict the submarine both in speed and depth. In general a submarine must be slow and shallow to receive messages. The submarine must be even slower and shallower to transmit either text messages or voice communications. The slow speed obviously impacts the submarine's speed of advance and the requirement to be shallow can adversely impact the submarine's ability to continue tracking another submarine, which is probably the target. These issues, unfamiliar to most surface warriors and aviators, make assignments of submarine officers to a CVBG staff a necessity.

Senior active-duty submarine officers, usually a post-command captain, have been detailed to CVBG staffs, submarine qualified junior officers have been detailed to destroyer squadron staffs, and PMI control can be delegated to the CVBG commander. A Submarine Element Coordinator and a supporting Submarine Advisory Team, augmented by Naval Reservists, was created for fast paced exercises. These assignments have been helpful in submarine control during CVBG operations.[6] CDR Peppe's recommendation

to assign an entire squadron of SSNs, including a squadron commander and his staff, to the CVBG would further improve operations.

The operational benefits of assigning an entire squadron of submarines to a CVBG are threefold. First, the carrier battle group would be stronger and more able to carry out the nation's business. Second, the submarine force would be forced to recognize it does not only operate independently. Finally, the true capabilities of submarines working in concert with the CVBG would be determined vice the capabilities thus far determined on paper.[7] The creation of more major command and squadron staff billets and the experience of planning and executing joint operations would also benefit submariners.

The major drawback to assigning an entire squadron of submarines to a CVBG is the effect on other submarine missions. Both Submarine Type Commanders feel they need 72 SSNs to meet existing and anticipated CINC requirements; there will be only 50.[8] CDR Peppe acknowledges the afloat squadron commander would be the provider of submarines for other operations. This shift in emphasis would put CVBG operations ahead of blue water ASW in the list of submarine priorities and would further demonstrate the submarine force's resolve to improve its contribution to the JFC in littoral operations. This is a paradigm shift the submarine force should make.

Notes

[1] Meis, 35.

[2] Meis, 37.

[3] LCDR Gary Watson, Jr., "Running Too Silent & Too Deep?", *United States Naval Institute Proceedings*, v 123, no 4 (April 1997): 33-34.

[4] CDR Paul Murdock, "SSNs Aren't Enough", *United States Naval Institute Proceedings*, v 122, no 2 (February 1996): 50-51.

[5] Jim Courter, "The Boomer Reborn", *United States Naval Institute Proceedings*, v 123, no 11 (November 1997): 52.

[6] CAPT Kenneth Hart, "The Silent Service Must Communicate", *United States Naval Institute Proceedings*, v 123, no 2 (February 1997): 76-77.

Notes

[7] CDR Kevin Peppe, "SSNs: Supporting the Battle Group?", *United States Naval Institute Proceedings*, v 123, no 5 (May 1997): 41.

[8] Mies, 35.

Chapter 6

Conclusion

> *Submarines were the first really stealthy weapons and will be the most stealthy weapons until technology makes the oceans transparent, which will not happen soon.*[1]
>
> —George Will

The Submarine Force was instrumental in winning the Cold War. It demonstrated its expertise in the traditional blue water missions of nuclear deterrence, Anti-Submarine Warfare, and Anti-Surface Warfare throughout three decades. Though the Cold War is over, it is paramount to national security to maintain a strong fleet of SSBNs and SSNs to ensure our dominance of the world's oceans.

The submarine's enduring characteristics of stealth, endurance, firepower, and mobility make it a superb force enabler for the Joint Force Commander in littoral operations. The submarine brings the unique capabilities of covert surveillance and intelligence collection, covert special operations, covert precision strike, covert mining and countermining, and covert anti-diesel submarine operations to the fight. The New Attack Submarine, the Advanced SEAL Delivery System, the Army's Tactical Missile System, and unmanned aerial and underwater vehicles will ensure even more littoral capabilities in the future. These capabilities must be followed by new programs to ensure the Submarine Force and the submarine continues to bring unique and powerful capabilities to the JFC.

Submarine Force leaders must address three issues which will guide the force for the future. First, the 'diesel vs. nuclear' propulsion issue must be solved in order to determine what the mix of next generation submarines will be. The only way to validate the capabilities of diesel submarines is to buy some and test them against US capability requirements. Second, the force must maintain its dual Dry Deck Shelter capability. OHIO and GEORGIA should be back-fitted to carry dual DDSs and / or the ASDS before POLK and KAMEHAMEHA are de-commissioned. Lastly, the Force must break its paradigm of blue water mission priority over littoral missions and assign a Squadron Commander and a squadron of submarines to deployed CVBGs.

Notes

[1] George F. Will, "Wonders in the Deep", *Newsweek*, v 126, no 10 (4 September 1995): 68.

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