POST-COLD WAR SUBMARINE FORCE CHANGES

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This thesis addresses how the United States and the United Kingdom submarine forces changed after the end of the Cold War in 1991. Specifically, this thesis examines reduction in the number of platforms, personnel, and funding of each nation's submarine force to that of their respective navies and armed forces over the next decade. This research also identifies changes to the submarine mission because of the changing international landscape and the personnel and funding reductions along with the introduction of the Tomahawk missile to each submarine fleet. Additionally, the fall of the Soviet Union introduced more changes to each country's submarine force including the cancellation of the expensive *Seawolf* class attack submarine in favor of the cheaper *Virginia* class, the elimination of diesel submarines from the Royal Navy, and the constraints placed by the START treaty on ballistic missile submarines.

Analysis of how and why these two countries changed their respective submarine forces following the end of the Cold War provides understanding of the reasons and basis for the size, composition, and use of each nation's submarine fleet. This understanding offers guidance for future decisions for military leaders involving submarines.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

POST-COLD WAR SUBMARINE FORCE CHANGES, by LT Justin Branley, 66 pages.

This thesis addresses how the United States and the United Kingdom submarine force changed after the end of the Cold War in 1991. Specifically, this thesis examines reduction in the number of platforms, personnel, and funding of each nation's submarine force to that of their respective navies and armed forces over the next decade. This research identifies the changes to the submarine mission because of the changing international landscape and the personnel and funding reductions along with the introduction of the Tomahawk missile to each submarine fleet. Additionally, the fall of the Soviet Union introduced more changes to each country's submarine force including the cancellation of the expensive *Seawolf* class attack submarine in favor of the cheaper *Virginia* class, the elimination of diesel submarines from the Royal Navy, and the constraints placed by the START treaty on ballistic missile submarines.

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ACRONYMS

ABM	Anti-Ballistic Missiles
ISR	Intelligence, Surveillance, and Reconnaissance
MIRV	Multiple Independent Re-entry Vehicle
NATO	North Atlantic Treaty Organization
SLBM	Submarine Launched Ballistic Missile
SOF	Special Operating Forces
SSBN	Nuclear-powered ballistic missile submarine
SSGN	Nuclear-powered guided missile submarine
SSN	Nuclear-powered attack submarine
START	Strategic Arms Reduction Treaty
TLAM	Tomahawk Land Attack Missile
USN	United States Navy
USSR	Union of Soviet Socialist Republics
VLS	Vertical Launch Systems

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CHAPTER 1

INTRODUCTION

Background

The end of the Cold War was a momentous event with severe international ramifications. After over forty years of tension, the main adversary of Western nations—the Warsaw Pact led by the Union of Socialist Soviet Republics (USSR)—vanished in a quick succession of events. These included the fall of the Berlin Wall in November 1989, the end of the Warsaw Pact in February 1991, and the dissolution of the USSR in December 1991. The newly formed Russian Federation lacked the same military capabilities and intent as the USSR. Western nations responded by drastically reducing the size of their armed forces electing to spend resources on other priorities in order to cash in a long-awaited "peace dividend." This shifting of priorities greatly affected the composition and purpose within each nation's Armed Forces. In less than a decade, the United States Navy (USN) went from 73 nuclear attack submarines (SSN) and 36 ballistic missile submarines (SSBN) to 50 nuclear attack submarines and 14 ballistic missile submarines while the Royal Navy went from 16 nuclear attack submarines, four ballistic missile submarines, and eleven conventional submarines to twelve nuclear attack submarines, four ballistic missile submarines, and no conventional submarines.

Primary Research Question

How did the end of the Cold War change the American and British submarine programs?

Secondary Research Questions

How did the changes in the American submarine program compare to the British? How did they differ?

What does the extant literature have to say about changes in the American and British submarine programs after the Cold War?

What changes to submarine design and construction occurred after the end of the Cold War?

How did the purpose and use of submarines change following the Cold War? What missions were added? What missions became obsolete?

Assumptions

1. The so-called "special relationship" between the United States and the United Kingdom caused changes in the United States Navy that affected the Royal Navy and vice versa.
2. Because of the special relationship between the two countries, capabilities of shared weapon systems and technology can be assumed to be identical except where otherwise noted.
3. Budgetary comparisons can be made using FY 2012 US dollars by using the exchange rate of the moment to convert British pounds into US dollars and then adjusting for inflation to demonstrate the relative purchasing power.

Limitations and Delimitations

Limitations: Any primary sources requiring travel outside the Leavenworth, Kansas area will be unavailable for this project.

Delimitations: This study will be limited in scope to the American and British submarine programs. The effects on other nations' submarine programs and on other parts of the armed forces will be provided for context only. The time period covered will be from 1991 to 2001. The history of the submarine force from 1945 to 1991 will be referenced for background and context.

Literature Review

The available literature that covers submarines following the end of the Cold War varies. Open source primary sources are abundant in the form of contemporary journal articles, government documents, and research papers that were written throughout the 1990s as changes were happening.[1] However, secondary sources are comparatively scarce. Not many books directly address the post-Cold War changes to the submarine force of either the United States or the United Kingdom. Significantly fewer articles and papers address the topic from a historical perspective and provide analysis on the changes.

George Baer's *One Hundred Years of Sea Power: The U.S. Navy 1890-1990* (1994) and Robert Love's *History of the U.S. Navy* (1992) each provide exceptional and complementary information about the submarine force throughout the Cold War. The political insights in each book greatly assist in understanding how the United States

[1] For a later example from the *Journal of the Royal United Services Institute* (RUSI), see the discussion with strategists Malcom Chalmers, Colin Gray, Michael Clarke, Max Hastings, and Hew Strachan, "Defense in the Round," 153, no, 6 (December 2008): 4-35.

submarine service assumed its size and shape at the end of the Cold War. Unfortunately, both books end just as the changes following the collapse of the Soviet Union occur.

One of the few books that covers the USN following the collapse of the Soviet Union is Captain Peter D. Haynes's *Toward a New Maritime Strategy: American Naval Thinking in the Post-Cold War Era* (2015). In his book, Haynes provides an excellent history and analysis of the evolution of American maritime and naval strategy from the Maritime Strategy of the 1980s to the present day "A Cooperative Strategy for 21st Century Seapower." He shows all the factors and circumstances involved in the development of each strategic document, from the effects of internal politics to the results of inter-service rivalries. While his book does not specifically focus on submarines, it provides incredibly valuable background and context for understanding why and how the American submarine force changed following the Cold War. Haynes provides tremendous insight not only for anyone studying the immediate aftermath of the Cold War but also anyone involved in today's strategic maritime environment.

Another work that covers the United Kingdom's perspective of this era is Peter Hennessy and James Jinks' *The Silent Deep: The Royal Navy Submarine Service Since 1945* (2015). Utilizing a treasure trove of primary sources, Hennessey and Jinks provide a detailed history of the British submarine force following World War II. Unlike Love and Baer, whose books were published immediately following the Cold War, Hennessy and Jinks were able to cover and analyze the British submarine force in the years after the collapse of the Soviet Union. While only one 38 page chapter specifically addresses the Royal Navy submarine service during the aftermath of the Cold War (with another 70 page chapter covering present day and future operations), the book remains a valuable

resource not only for the information and insights in those chapters but also for the background and context provided by the rest of the book.

Commodore Eric Thompson's *On Her Majesty's Nuclear Service* (2018) is notable for being one of the only books that is a memoir about the topic. Thompson's autobiography covers his time in the Royal Navy submarine service from the introduction of the Polaris missile through the initial aftermath of the Cold War. His firsthand account describing the difficulties associated with post-Cold War budget cuts on personnel and operations is valuable.

Summary

The following highlights the general structure of the thesis following this introductory chapter.

Chapter 2 covers the history of the submarine force from 1945 to 1991 to provide context and a reference position for the rest of the thesis. Chapter 3 addresses the reduction in the size of each country's submarine force following the disbanding of the Soviet Union. This chapter compares the reduction in the number of platforms, personnel, and funding of each nation's submarine force to that of their respective Navies and Armed Forces. In 1992, the Royal Navy decided to eliminate its diesel-powered submarines and utilize an all nuclear-powered submarine force. In the face of significant budget cuts, the USN cancelled future construction of the *Seawolf* class attack submarine after only three to build the less capable and less expensive *Virginia* class submarine. It reduced the number of *Ohio*-class submarines to eighteen from a planned force structure of twenty-four.

Chapter 4 examines the changes to submarine operational missions because of the changing international landscape and the personnel and funding reductions previously discussed. The role of the submarine force expanded from a focus on anti-submarine warfare and anti-surface warfare operations to a multi-mission platform. The introduction of the Tomahawk land attack missile (TLAM) variant to each nation's submarine force added a power projection capability to attack submarines that became, over time, their primary mission. Special operations and intelligence, surveillance, and reconnaissance (ISR) missions rose in number and impact. The Strategic Arms Reduction Treaty (START) signed in 1991 and implemented in 1994 affected the number of American ballistic missile submarines available and contributed to the conversion of four into guided missile submarines (SSGNs). Submarine hull lives were extended, and fuel conservation was implemented to save money and maximize availability of submarines for national tasking.[2] Each Navy emphasized the capabilities of submarines to justify their existence considering a reduced threat from the former Soviet Union.

Chapter 5 addresses conclusions, including a synthesis of the analysis and main "take aways." It also makes recommendations and identifies further research areas, which other researchers might pursue in order to build on this line inquiry or develop new ones.

[2] Arms Control Association, "START I at a Glance," accessed 5 June 2019, https://www.armscontrol.org/factsheets/start1.

CHAPTER 2

HISTORY OF THE SUBMARINE FORCE

This chapter covers the history of submarines from their first military use during the American Revolution until the collapse of the Soviet Union. The submarine was initially meant to provide an asymmetric advantage against surface ships. Submarines demonstrated the effectiveness of this mission during both World War I and II. However, by the end of the Cold War, the primary submarine mission was nuclear deterrence followed by sea control. Deterrence is the concept of preventing an unwanted action of an adversary by either physically denying the ability to execute that action or by severely retaliating such that the consequences of the adversary's action become unacceptable. Nuclear deterrence seeks to prevent an adversary's use of nuclear weapons against a country and its allies through the threat of a retaliatory nuclear strike. Sea control is the establishment of a dominance in naval forces such that the stronger side can perform a host of maritime activities, from landing amphibious forces to merchant shipping, free from an adversary's reprisal or interference and that the stronger side can deny an adversary the ability to perform maritime operations. Ballistic missile submarines provided a survivable second-strike capability while attack submarines escorted ballistic missile submarines as protection from adversary submarines. In the event of war with the Soviet Union, attack submarines would help keep the sea lines of communication from America to Europe open by sinking the Soviet surface fleet as well as helping with the anti-submarine warfare effort if the USSR used its submarines in a manner similar to that of the Germans in World Wars I and II.

Birth of the Submarine

The United States first used a submarine during the American Revolution with *Turtle* against the British. On 6 September 1776, *Turtle* became the first submarine to be used in combat when it attacked the HMS *Eagle*, Admiral Lord Richard Howe's flagship, in New York harbor.[3] While the attack was unsuccessful to the extent that the British did not even know that there had been an attack, the concept of undersea warfare intrigued naval professionals. The United States submarine force celebrated its organizational birthday on 11 April 1900 when the United States Navy purchased the USS *Holland* (SS-1) from the Irish-American inventor John P. Holland.[4]

The Royal Navy submarine service began shortly after in December 1900 with the purchase of five submarines, *Holland I-V*, from Holland. This was ironic given that Holland was Irish and had initially conceived of the weapon as a tool of coercion against the British overlords of his homeland. Initially, the British attempted to hide their interest in submarine warfare, going so far as to compare submariners to pirates and threaten public execution of any caught submariner. However, Admiral John "Jacky" Fisher, the First Sea Lord, recognized the high potential of submarines, and the Royal Navy began World War I with the largest submarine force in the world.[5]

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[3] Brayton Harris, *Submarines: A Political, Social and Military History* (New York: Berkley, 1997), 32-33.

[4] Ibid., 130.

[5] For a full disclosure of Fisher's innovative ideas see Nicholas A. Lambert, "Admiral Sir John Fisher and the Concept of Flotilla Defence, 1904-1909," *The Journal of Military History* 59, no. 4 (October 1995): 639-660.

World War I

World War I changed the world's perception on the use and the effectiveness of submarines in battle. However, this was mainly because of the Germans and not the United States or United Kingdom. The Germans changed the paradigm of submarine warfare by using submarines for sea control. Prior to U-boat operations during World War I, the navies of the world viewed submarines as a coastal defense platform and nothing more. The Imperial German Navy greatly increased the world's respect for the submarine's lethality and capability by not only using U-boats as an effective commerce raiding platform through the policy of unrestricted submarine warfare but also as a sea control platform by sinking surface warships and other submarines.[6]

The USN submarine force contributed negligibly to the overall war effort. United States submarines sank a grand total of zero enemy ships during the war. Ironically, the USN made significant contributions to the anti-submarine warfare effort particularly with the introduction of the convoy system that ultimately led to the destruction of half of the German submarine fleet.

The Royal Navy's submarine service, while not as successful as the German U-boats, performed significantly better than their American counterparts during World War I. Because of the dominance of the Royal Navy's surface fleet, the Royal Navy's submarines had no chance of achieving the same success as their German counterparts.

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[6] For a short article on this see John T. Kuehn, "Terrorists and Submarines: Lessons for Afghanistan from the Antisubmarine Campaign of World War I," *Joint Force Quarterly*, no. 58 (3rd Quarter 2010): 105-108.

While the Royal Navy suffered setbacks from German U-boats, their submarines sunk German warships to include German U-boats.

Following World War I, the United States applied the lessons learned from Germany's submarine performance to the design, construction, and application of future submarines. The United States no longer viewed submarines as merely a coastal defense platform. Instead, the USN prepared to use submarines to gain command of the sea. However, the preparations were for a new ocean against a new adversary. War with Japan loomed, and the United States determined to use submarines to gain the advantage during any potential future conflict in the Pacific.[7]

World War II

Both the United States and the United Kingdom began World War II with larger and more capable submarine forces than each possessed during World War I. This time, the Allies were ready for the German U-boats operating in the North Atlantic Ocean. The Allies prevented the German U-boats from achieving the same levels of success that they had reached during World War I, even though the Germans fielded far more U-boats during World War II. However, Allied submarines were not very useful during the Battle of the Atlantic. Not until improvements to sonar and torpedoes during the Cold War arms race would submarines become the best platform to hunt and destroy another submarine.

[7] See Jeffrey K. Juergens, "The Impact of the General Board of the Navy on Interwar Submarine Design" (Master's Thesis, Command and General Staff College, Fort Leavenworth, KS, June 2009).

During World War II, the Allies had to be content using convoys with destroyers and escort carriers to counter the wolfpack tactics of the German U-boats.[8]

Unlike the Atlantic, Allied submarines did play an integral role in the Pacific theater. Beginning with the order immediately following Pearl Harbor to execute unrestricted submarine warfare against Japan, American submarines were vital to the defeat of Imperial Japan.[9] Initially, American submarines were operationally ineffective, for examples the twenty-eight submarines present during the defense of the Philippines accomplished nothing to halt the Japanese advance.[10] Conservative tactics and defective torpedoes took most of the blame. Once the USN dealt with these problems, submarines inflicted massive casualties upon the Japanese merchant fleet. The combination of unrestricted submarine warfare and strategic bombing crippled Japanese industry and guaranteed Allied victory over Japan.[11]

The end of World War II led to a massive reduction of national navies, to include their submarine forces. While the number of submarines declined, innovation continued. With the USS *Albacore*, the United States introduced the tear drop hull to the world, greatly improving submarine performance while underwater, making it faster. Naval

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[8] John Terraine, *The U-Boat Wars, 1916-1945* (New York: G. P. Putnam's Sons, 1989).

[9] See Joel Holwitt, *Execute Against Japan, The U.S. Decision to Conduct Unrestricted Submarine Warfare* (College Station, TX: Texas A&M University, 2009).

[10] Ibid., 309-311.

[11] This conclusion is supported by the Naval Analysis Division, "US Strategic Bombing Survey for the Far East (USSBSFE)," accessed 5 June 2019, https://www.ibiblio.org/hyperwar/AAF/USSBS/IJO/index.html.

Reactors worked diligently to implement nuclear power on submarines to provide much greater operational reach. Nuclear strategists viewed submarines as the ideal nuclear weapons platform and pushed for the development of submarine launched nuclear missiles.[12]

Nuclear Power

The development of naval nuclear propulsion led to the first nuclear powered submarine the USS *Nautilus* (SSN-571). After years of development, on 17 January 1959, *Nautilus* was "underway on nuclear power." Admiral Hyman G. Rickover spearheaded the efforts for nuclear power. Rickover had been an innovative electrical engineer for most of his naval career through World War II, reputedly wiring the first dreadnought battleships with electrical systems. *Nautilus* was the culmination of nearly twenty years of effort Rickover spent building the Naval Nuclear Propulsion Program. Beginning the journey as a Captain and ending as a four-star Admiral, he relentlessly pushed for the use of nuclear power on all vessels, not just submarines. Shortly after the success of *Nautilus*, Rickover succeeded in ensuring that all future US submarines would be nuclear powered.[13]

On 10 April 1963, the USS *Thresher* (SSN-593) became the first nuclear submarine lost at sea. While conducting sea trials after an overhaul in Portsmouth Naval Shipyard, *Thresher* suffered a series of events that led to its loss. While conservative

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[12] Robert W. Love, *History of the U.S. Navy, Vol. II, 1924-1991* (Harrisburg, PA: Stackpole Books, 1992), chapter 20, passim.

[13] Ibid., 404.

nuclear operating procedures contributed to the loss of *Thresher*, Rickover managed to convince Congress that the ultimate reason for the loss was that the high standards applied to the design, construction, and operation of the submarine's nuclear reactor were not used throughout the rest of the ship. The USN created the Submarine Safety program, which applied the rigorous nuclear standards to all the safety systems aboard a submarine, in response to this tragedy to ensure that it was not repeated. While Rickover, as head of Naval Reactors, already controlled all aspects of submarine reactor design and construction, after the Congressional hearings about *Thresher*, he expanded his influence to include almost all aspects of submarine design and construction.[14] Rickover essentially controlled the submarine force until his retirement in 1982.

The 1958 US-UK Mutual Defense Agreement allowed the United States to share information and technology related to nuclear weapons and materials between the two nations. This treaty greatly contributed to the advancement of the Royal Navy's submarine force during the Cold War. Because of this treaty, the Royal Navy introduced its first nuclear submarine, the HMS *Dreadnought* (S101) using the American S5W nuclear reactor. *Dreadnought* achieved criticality in November 1962 followed by sea-trials in December.[15] Because of the American influence in the reactor design, the British

[14] Joel I. Holwitt, "The Loss of the USS *Thresher*: Technological and Cultural Change and the Cold War U.S. Navy," *The Journal of Military History* 82 (July 2018): 834-872.

[15] Peter Hennessy and James Jinks, *The Silent Deep: The Royal Navy Submarine Service Since 1945* (London: Allen Lane, 2015), 194.

crew referred to the entrance to the engine room as "Checkpoint Charlie" since they were now entering the "American Sector."[16]

Nuclear Deterrence

Submarines adopted the nuclear deterrence mission during the Cold War. Nuclear power greatly contributed to the evolution of the submarine into a nuclear deterrence platform by the large endurance provided. Removing the requirement to refuel during patrols greatly increased the duration of a deterrent patrol. However, submarines began the nuclear deterrence mission prior to the implementation of nuclear-powered submarines and submarine launched ballistic missiles (SLBM). Diesel submarines employed the Regulus cruise missile to accomplish the deterrence mission.[17]

In December 1955, Admiral Arleigh A. Burke began what would become the Polaris missile program. The Polaris was the first SLBM, and the USN designed it to provide the United States with a credible second-strike deterrent. Unlike land-based missiles or nuclear bombers, nuclear submarines provided the ideal nuclear deterrent because of their capability combined with the difficulty of targeting them as they eluded detection underneath the sea. They could remain on patrol for months at a time and strike at Soviet targets from anywhere at any time. The United States commissioned the first ballistic missile submarine, the USS *George Washington* (SSBN-598), on 30 December 1959. *George Washington* contained sixteen Polaris missile tubes and launched the first

[16] Hennessy and Jinks, *The Silent Deep*, 195.

[17] Love, *History of the U.S. Navy*, 375.

submerged SLBM on 20 July 1960. It began the first nuclear deterrent patrol in October 1960.

The Polaris missile gave the USN the freedom to develop the concept of finite deterrence. Finite deterrence answers the question "how much is enough?" with respect to the number of nuclear weapons required to deter an adversary. By providing a platform that is immune to a nuclear first strike, submarines allowed policymakers to ignore the ramifications of a missile gap with the USSR. As long as there were ballistic missile submarines on patrol, the USSR was incapable of attacking the United States with impunity. The USN calculated that destroying 232 targets was enough to destroy all of the Soviet Union.[18] Therefore, the USN proposed a fleet of forty-five Polaris submarines to satisfy the finite deterrence strategy. With forty-five submarines, the USN would always have twenty-nine deployed (about 64 percent). These twenty-nine submarines carrying sixteen Polaris missiles each would give the USN 464 missiles available for the 232 targets, continuously providing a 2:1 ratio. Congress authorized forty-one Polaris submarines, giving the USN twenty-six always on patrol. This provided a total of 416 Polaris missiles continuously ready to strike the 232 targets for a 1.79:1 ratio.[19]

The USN implemented a new manning plan for ballistic missile submarines to achieve the high operational tempo required for deterrence. Traditionally, the USN maintains a 3:1 ratio of total ships to ships executing missions for combatant

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[18] C. A. Haskins, National Security Council Staff, "Polaris," 10 February 1960, National Security Archive, accessed 14 January 2019, https://nsarchive.gwu.edu.

[19] George W. Baer, *One Hundred Years of Sea Power: The US Navy, 1890-1990* (Stanford, CA: Stanford University Press, 1994), 355.

commanders. This generally works out to one-third of ships on deployment, one-third preparing to deploy, and one-third in maintenance. For ballistic missile submarines, the USN based availability on 100-day deterrent cycles with seventy days deployed on patrol and thirty days of refit and maintenance. To prevent personnel fatigue from the significantly higher operational time of ballistic missile submarines, the USN implemented a two-crew system. Under the Blue-Gold system, the Blue crew would operate the submarine on patrol while the Gold crew trained in their homeport through lectures and simulators. Once the deterrent patrol ended, the Blue crew would turnover the submarine to the Gold crew during refit, and the roles reversed for the next patrol.

Ballistic missile submarines provided a stabilizing effect to the escalation calculus of nuclear hostilities. Because of a ballistic missile submarine's ability to serve as a survivable second-strike platform, each nation had to fear and respect the adversary's ballistic missile submarines when planning for a potential first strike with nuclear weapons. The massive retaliatory capability from ballistic missile submarines made each country less likely to use nuclear weapons against one another, stabilizing the international situation. However, each country proceeded to develop a new method to gain an advantage over the other. The options considered were Anti-Ballistic Missiles (ABM) and Multiple Independent Re-entry Vehicles (MIRV).[20] ABMs were to be used to shoot down both SLBMs and intercontinental ballistic missiles to defend both cities and military centers. ABMs caused a destabilizing effect on an international scale since a

[20] Lawrence Freedman, "The First Two Generations of Nuclear Strategists," in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton, NJ: Princeton University Press, 1986), 735-778.

nation that possessed ABMs could launch a nuclear first strike with impunity from a second-strike from submarines because ABMs would shoot down the SLBMs. MIRVs were the counter to ABMs. With MIRVs, one ballistic missile launches into the atmosphere and then splits into as many as 14 separate parts, each with its own nuclear warhead. Then, each warhead takes a different trajectory towards a different target. The objective was to oversaturate an adversary's ABM defenses since ABMs had to shoot down each separate re-entry vehicle instead of just one ballistic missile. Politicians thought that this created stability since ABMs would not be able to protect a nation from a second-strike full of MIRVs. Since American intelligence believed that the Soviet Union was developing ABMs, Secretary of Defense Robert McNamara ordered the implementation of MIRVs instead.[21] McNamara wanted to maintain the strategic stability provided by ballistic missile submarines.

The Polaris Sales Agreement gave the Royal Navy access to the Polaris missile which the Royal Navy implemented on the *Resolution*-class SSBN in 1968. With the acquisition of Polaris, the United Kingdom adopted a policy of continuous at sea deterrence. Since 1969, the United Kingdom has maintained at least one ballistic missile submarine on patrol for nuclear deterrence. Unlike the United States, the United Kingdom has not deviated from a countervalue nuclear strategy for its ballistic missile submarines. Again, countervalue refers to guaranteed second strike capability that primarily targets an adversary's cities to inflict maximum casualties with minimum missiles and warheads. Whereas a counterforce strategy refers to having more nuclear

[21] Freedman, "The First Two Generations of Nuclear Strategists," 735-778.

weapons than an adversary so that a nation can initiate a nuclear first strike to eliminate an adversary's nuclear forces.

The Falklands War

Attack submarines were designed to gain command of the sea. The Falklands War provided the world a reminder of a submarine's ability to deny use of the sea to an enemy. The United Kingdom used its submarines to establish command of the sea and to deny Argentina use of the area around the islands. After the 2 April 1982 landings at Port Stanley, the United Kingdom declared a Maritime Exclusion Zone of 200 nautical miles surrounding the Falklands Islands. The government of Prime Minister Margaret Thatcher declared that Royal Navy submarines would sink any ship entering the Maritime Exclusion Zone, essentially using an open blockade to gain command of the sea. Initially, only two submarines, HMS *Splendid* and HMS *Spartan,* were available to enforce the Maritime Exclusion Zone, yet they were enough to keep merchant ships from entering the Maritime Exclusion Zone to resupply forces on the Falklands. Instead, Argentina used aircraft for logistics operations to the islands, resulting in fewer supplies delivered.[22]

The Royal Navy sent two more nuclear powered submarines, the HMS *Conqueror* and the HMS *Valiant,* to the South Atlantic with an additional two submarines on the way, one nuclear and one diesel. With the arrival of the additional submarines and its surface fleet, Britain sought to establish command of the sea the more traditional way, by sinking the enemy fleet. Rear Admiral John Woodward, the naval task force commander,

[22] Harry D. Train II, "An Analysis of the Falkland/Malvinas Islands Campaign," *Naval War College Review* 41, no. 1 (Winter 1988): 39.

sent *Splendid* and *Spartan* to sink the ARA *Veintecinco de Mayo*, Argentina's only aircraft carrier while *Conqueror* went south to eliminate the ARA *General Belgrano,* a former USN heavy cruiser now in Argentinian service.[23] While *Splendid* and *Spartan* did not find the aircraft carrier, *Conqueror* easily sank *Belgrano* undetected until its torpedoes detonated. This was the first and only time a nuclear-powered submarine destroyed a warship to the present day. Afterward, Argentina withdrew its surface fleet to its territorial waters for fear of losing more ships to British submarines. One nuclear attack submarine removed the entire Argentine surface fleet from the conflict, establishing a greater command of the sea than the larger and more heavily armed British surface fleet.

The Maritime Strategy

While the Royal Navy experienced a firsthand reminder about a navy's purpose in sea control during the Falklands War, the USN developed and coordinated a strategy with sea control at the center. Dubbed "The Maritime Strategy," it promulgated aggressive action by the navy against the Soviets in the event of war in Europe. Assuming a non-nuclear war, the Soviets were expected to seize Western Europe quickly because of their superiority of conventional land forces. However, "The Maritime Strategy" argued that the superiority of North Atlantic Treaty Organization's (NATO's) naval forces, which were predominantly American, could immediately intervene against the Soviets. American attack submarines and carrier-based aviation could destroy Soviet surface ships and attack submarines in the sea lanes to Europe. This would allow for the fleet to use

[23] Train, "An Analysis of the Falkland/Malvinas Islands Campaign," 40.

naval aircraft and Marines to project power ashore and interdict Soviet ground operations. Additionally, NATO attack submarines were then free to hunt Soviet ballistic missile submarines in their strongholds, eliminating the second-strike capability of the Soviet Union. Control of the sea also allowed NATO to expand the conflict outside Europe, by giving the freedom for NATO attacks against Soviet targets in Asia and other parts of the world. NATO's naval superiority over the Warsaw Pact enabled NATO to leverage all its diplomatic, informational, military, and economic might against a Soviet aggressor in a global conflict.[24]

Along with advancing "The Maritime Strategy," Secretary of the Navy John F. Lehman, Jr. proposed returning to a 600-ship navy to successfully implement the new strategy. With the support of the rest of the Reagan administration, the USN nearly reached its goal of a 600-ship navy, peaking at 594 ships in 1987. Of these, 102 were attack submarines while 37 were ballistic missile submarines. With the Soviet Union falling apart, ship levels throughout the navy, including all types of submarines dramatically lowered throughout the next decade.[25]

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[24] Norman Friedman, *The U.S. Maritime Strategy* (Annapolis, MD: Naval Institute Press, 1988), passim.

[25] Fredrick H. Hartmann*, Naval Renaissance: The U.S. Navy in the 1980s* (Annapolis, MD: Naval Institute Press, 1990), passim.

CHAPTER 3

BUDGET CUTS

This chapter delves into the effects of budget cuts on the submarine force after the Soviet Union dissolved. It examines the correlation of the reduction of funding for the military with the corresponding reduction in funding for the Navy and the submarine force for both the United States and the United Kingdom. This chapter then shows the effects on the reduction in funding on the number of personnel and platforms at each level.

Following the collapse of the Soviet Union, the United States and its allies celebrated their triumph over communism. After the initial euphoria of victory passed, the West did not know what to do to capitalize on this momentous event. For the past fifty years, the United States followed the policy of containment as its grand strategy.[26] For this reason, it defined all its military strategy in terms of the Soviet threat. This made budgeting and procurement relatively straight-forward since all the United States needed to do was balance the size and capabilities of its armed forces against that of the Soviet Union. The number of allied attack submarines needed to keep the sea lines of communication open to Europe was based on the opposing number of Soviet attack submarines in the Atlantic. This was the same logic for the number of tanks needed to defend the Fulda Gap and for almost all types of equipment and capabilities across the military. With the Soviet threat removed, the allies had no idea what size and capabilities

[26] Freedman, "The First Two Generations of Nuclear Strategists," 735-778.

their militaries required. There was no plan for victory. In the absence of any preordained response, the United States simply determined that the Cold War sized military was no longer required. The natural response was to cut a substantial percent across the board for all services. The Base Force did just that.[27]

Base Force and the Bottom-Up Review

The Base Force was a 25 percent cut across the Department of Defense. General Colin Powell, the Chairman of the Joint Chiefs of Staff, developed the Base Force to represent the minimum level that the United States could reduce to in the immediate aftermath of the Cold War. His goal was to prevent Congress from severely and indiscriminately gutting the military after the Cold War. "[H]e warned that reducing forces too quickly would destroy their ability to respond adequately in the new environment" like how the United States was not prepared for the Korean War because of the atrophy of its forces after World War II.[28] The Base Force directed not only budget cuts but also personnel and unit cuts. For the Navy, this meant reducing from a goal of a 600-ship navy to a 450-ship navy with personnel going from 587,000 to 400,000 over the next five years. The Base Force only specified two types of ships in its reduction, aircraft carriers and ballistic missile submarines. It reduced aircraft carriers from fifteen to twelve and ballistic missile submarines from thirty-four to between eighteen and twenty.[29]

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[27] Lorna S. Jaffe, *The Development of the Base Force 1989-1992* (Washington, DC: Joint History Office, July 1993).

[28] Ibid.

[29] Ibid.

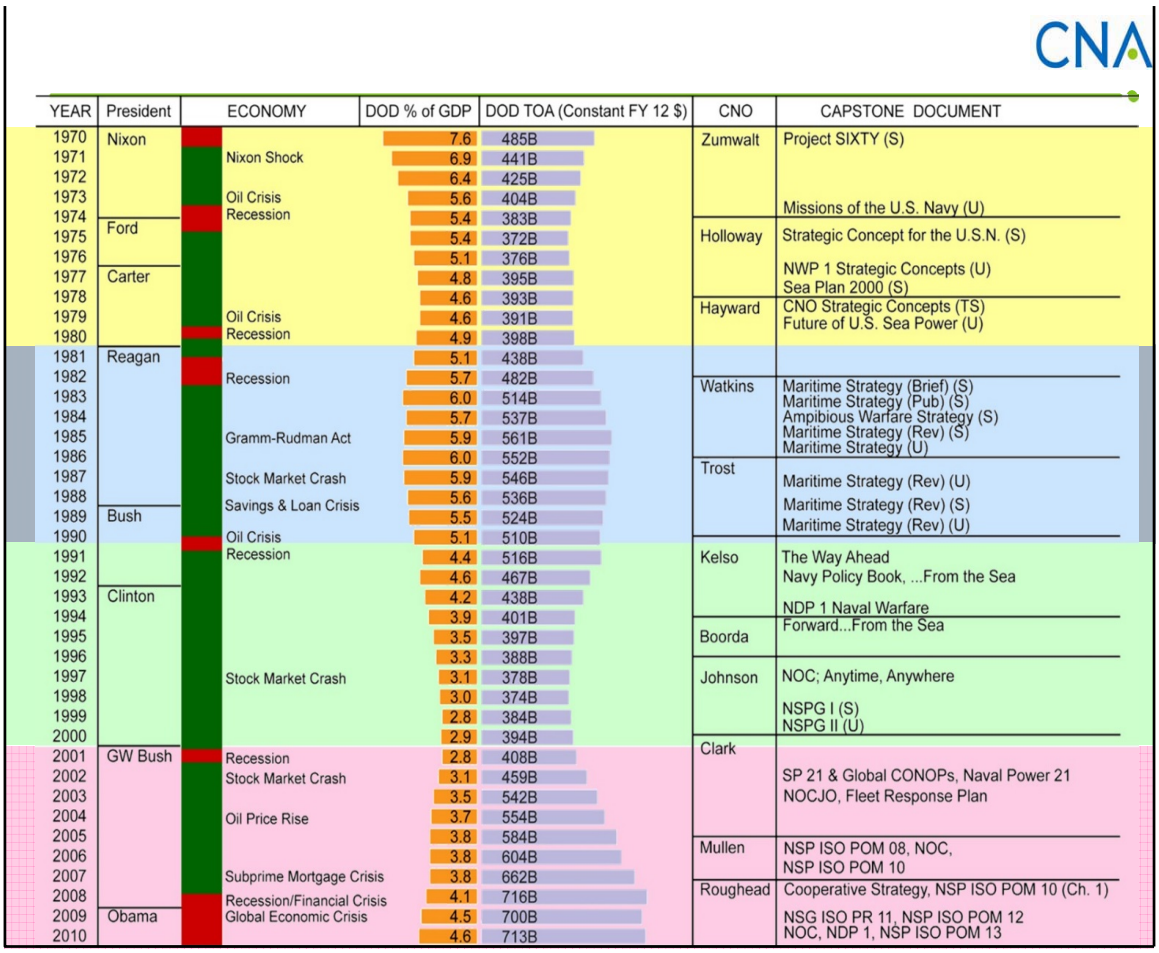

Figure 1. US Economy and Defense Spending (1970 to 2010)

Source: Peter M. Swartz with Karin Duggan, *The U.S. Navy in the World (1970-2010): Context for U.S. Navy Capstone Strategies and Concepts* (Washington, DC: Center for Naval Analyses, 2011), 5.

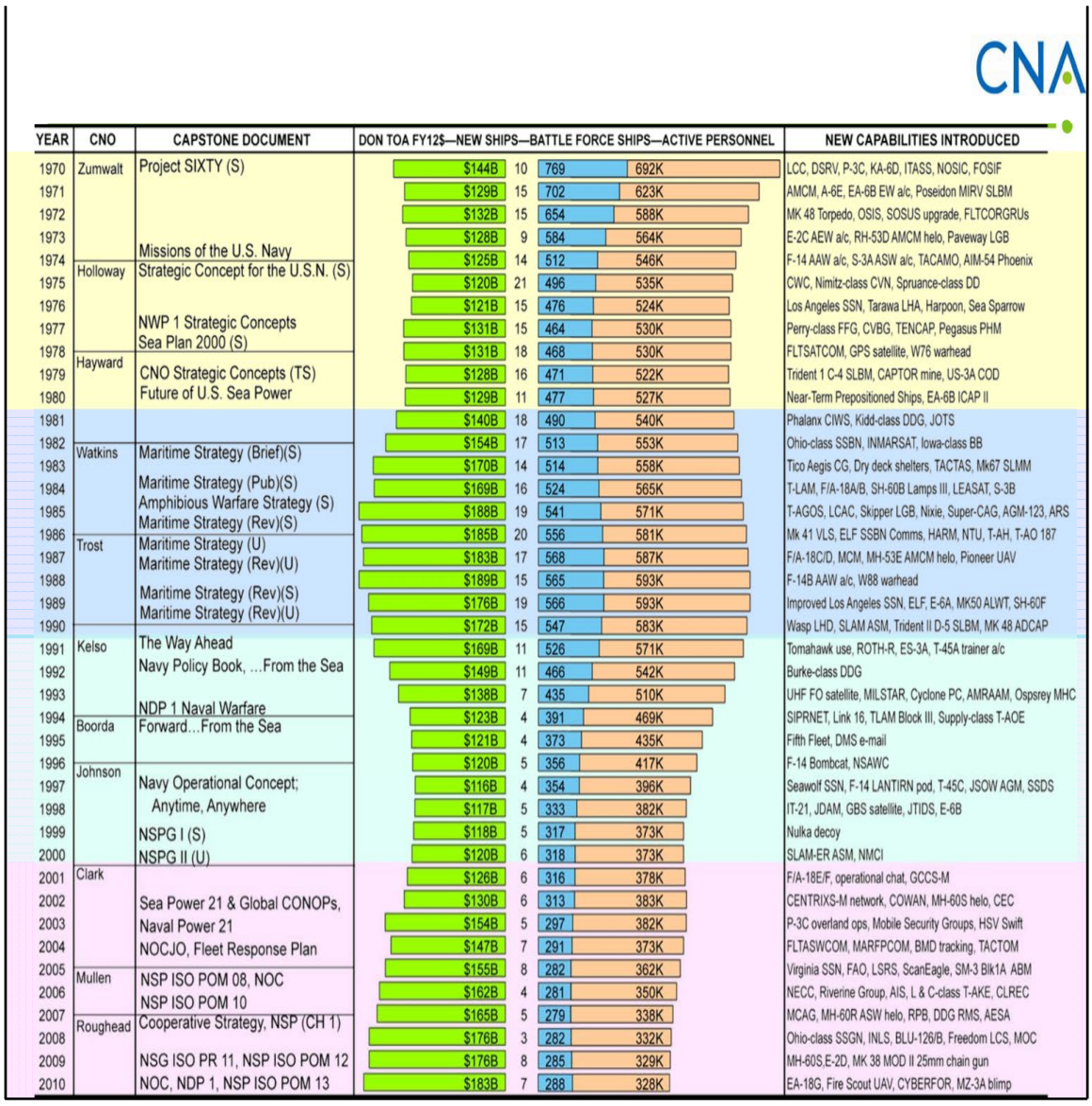

Figure 2. USN dollars, numbers, capabilities (1970 to 2010)

Source: Peter M. Swartz with Karin Duggan, *The U.S. Navy in the World (1970-2010): Context for U.S. Navy Capstone Strategies and Concepts* (Washington, DC: Center for Naval Analyses, 2011), 8.

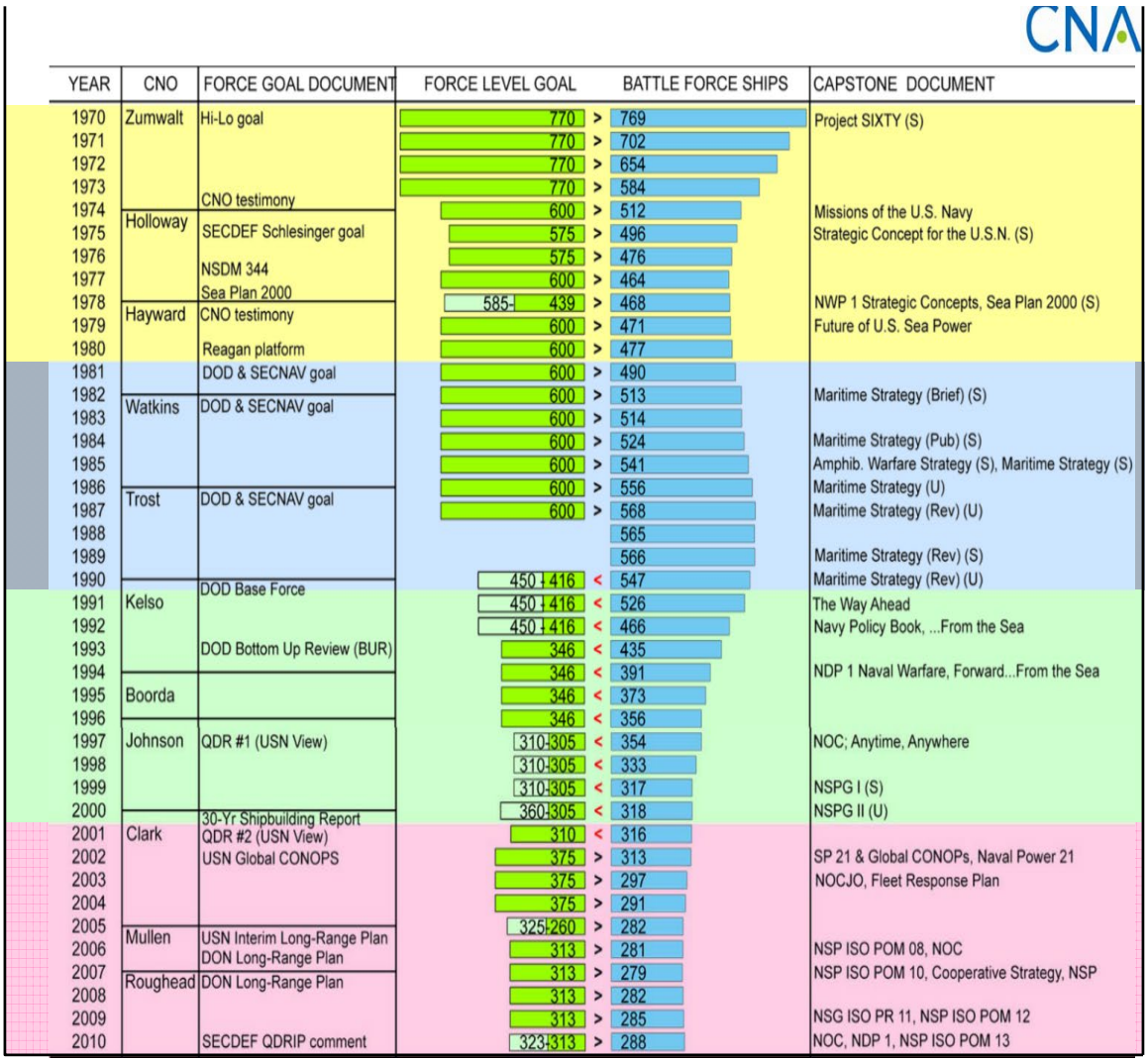

Figure 3. USN force level goals (1970 to 2010)

Source: Peter M. Swartz with Karin Duggan, *The U.S. Navy in the World (1970-2010): Context for U.S. Navy Capstone Strategies and Concepts* (Washington, DC: Center for Naval Analyses, 2011), 9.

The Base Force gave superficial treatment to nuclear deterrence. Powell cited a "reduced threat from the Soviet Union, coupled with progress in arms control" as justification to cut the number of intercontinental ballistic missiles and ballistic missile

submarines in half.[30] The Poseidon (C3) missile through MIRVs could deliver warheads to ten targets. Each Poseidon submarine carried sixteen missiles. The Trident I (C4) missile could deliver warheads to eight targets. Each Ohio-class submarine carried twenty-four Trident missiles.[31] In 1990, the USN deployed the Trident II (D5) missile which carried 8 MIRVs with its Mk 77 variant and 14 MIRVs with its Mk 88 variant. In 1990, there were thirty-four ballistic missile submarines with three *Lafayette*-class carrying Poseidon missiles, eight *James Madison*-class with two carrying Poseidon missiles and six carrying Trident I missiles, twelve *Benjamin Franklin*-class with six carrying Poseidon missiles and six carrying Trident I missiles, and eleven *Ohio*-class submarines carrying Trident I (C4) missiles. (The first eight *Ohio*-class submarines were built to carry Trident I (C4) missiles until undergoing a retrofit to carry the larger Trident II (D5) missiles. The remaining ten *Ohio*-class submarines were designed to fit the Trident II (D5) missiles.) Assuming that 64 percent (see previous chapter) of these thirty-four submarines could be deployed continuously through proper scheduling and use of the two-crew system, the resulting twenty-two submarines could have a distribution of two *Lafayette*-class, one *James Madison*-class with Poseidon missiles and four with Trident I missiles, four *Benjamin Franklin*-class with Poseidon missiles and four with Trident I missiles, and seven *Ohio*-class. This gave the USN 112 Poseidon missiles with 1120 warheads and 168 Trident I missiles with 1344 warheads for a total of 2464 warheads that were always ready. Since each warhead can have an independent target,

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[30] Jaffe, *The Development of the Base Force 1989-1992.*

[31] Baer, *One Hundred Years of Sea Power*, 434.

the USN continuously maintained a 10.6:1 ratio of warheads to targets assuming that 232 targets were the minimum to obliterate the Soviet Union. This is far greater than the 2:1 goal set by the Polaris program.

While the Base Force gave specific direction regarding the number of ballistic missile submarines, it did not direct the USN how to achieve that number. Admiral Carlisle A. H. Trost favored building newer *Ohio*-class submarines and retiring the older Poseidon submarines. Using eighteen *Ohio*-class submarines as the Base Force ballistic missile fleet, the USN could deploy eleven continuously. This provided 264 Trident missiles and 2,112 warheads. This reduced the Cold War ratio of 10.6:1 warheads to targets down to 9.1:1, still providing for significant overkill.

The Base Force succeeded in preventing an immediate gutting of the military. Congress wanted to capitalize further on exploiting a peace dividend and pressured the Department of Defense to propose more budget cuts. This process became the Bottom-Up Review. Secretary of Defense Les Aspin initiated the Bottom-Up Review in March 1993. As the new Secretary of Defense for the first Clinton administration, Aspin wanted "a comprehensive review of the nation's defense strategy, force structure, modernization, infrastructure, and foundations."[32] Since the Base Force did not specify attack submarine levels, the Navy had not decided what reductions to the number of attack submarines to implement. However, the Bottom-Up Review assumed that a reduction from 90 attack submarines to 55 attack submarines was already established. Therefore, the Bottom-Up

[32] Department of Defense, *Report on the Bottom-Up Review* (Washington, DC: Government Printing Office, October 1993), iii.

Review used 55 as the highest number of attack submarines required in its analysis. In essence, the Bottom-Up Review set new policy by limiting the Navy to 55 attack submarines.

While the Bottom-Up Review addressed attack submarines in detail, it excluded ballistic missile submarines from its scope. Ballistic missile submarines, along with the rest of the nuclear triad, were addressed two years later in the 1995 Nuclear Posture Review. It recommended a further reduction of ballistic missile submarines from the 18 *Ohio*-class submarines of the Base Force to 14 for the new international environment. Like the Base Force, the 1995 Nuclear Posture Review assumed a counterforce nuclear strategy when determining the number of nuclear weapons required to offset the reduced Russian capabilities. Once again, both the Navy and the Defense Department failed to consider implementing a countervalue nuclear strategy in the face of massive budget cuts. Since a countervalue strategy is significantly less expensive than a counterforce strategy because of lower missile, warhead, and platform numbers required, it is more suited for a fiscally constrained environment.

Royal Navy Cuts

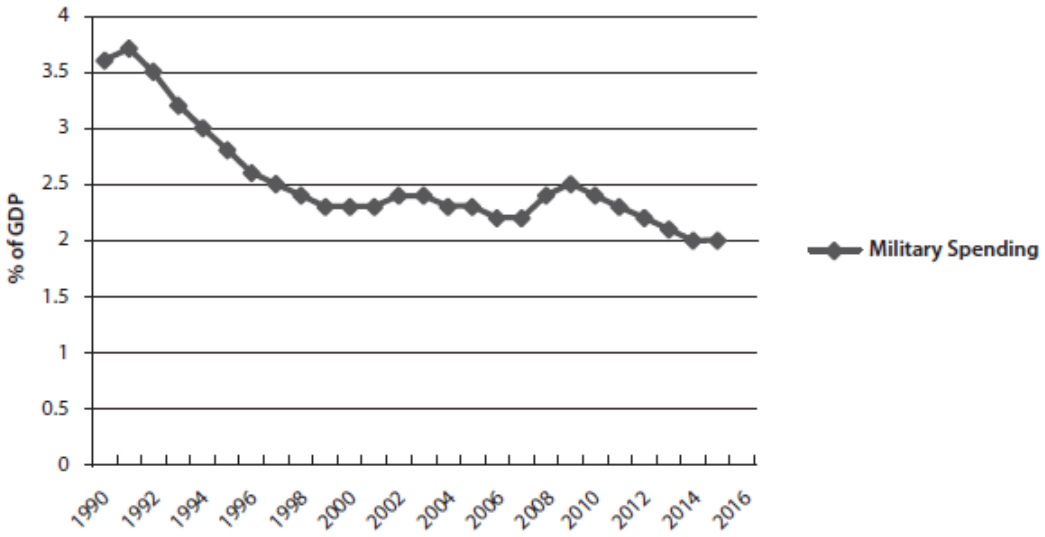
The United Kingdom responded similarly to the United States by imposing significant cuts to its defense budget. Unlike the United States, the United Kingdom did not make equal cuts across all services. The Royal Navy fared better than its sister services during these cuts. However, the Ministry of Defence proposed significant reductions to the British attack submarine fleet.[33] Secretary of State for Defence Tom

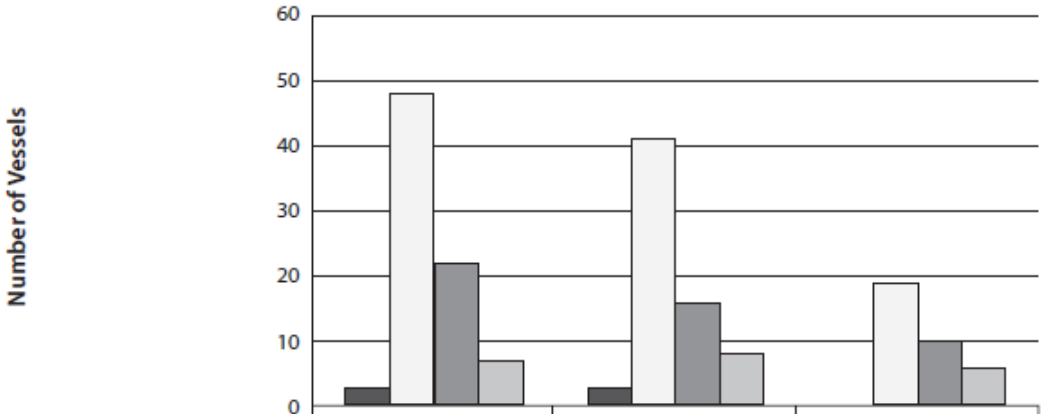
[33] Hennessy and Jinks, *The Silent Deep*, 583.

King wanted to reduce the number of nuclear-powered attack submarines from 16 to twelve and the number of conventional attack submarines from eleven to four. He cited the changing strategic environment, not budget considerations, as justification for the reductions. The argument was that the nuclear attack submarine's role during the Cold War was to engage and delay Soviet submarines until the Americans could arrive in significantly larger numbers to provide assistance. Since the Russian submarine fleet was much smaller than the Soviet one, the Royal Navy required fewer submarines to address this new threat. Additionally, the amount of warning time available prior to war with Russia expanded from an estimated few days to an expected year and a half. With the much larger advance notice prior to hostilities, a greater percentage of the submarine fleet could be available for use in war. Specifically, the Ministry of Defence assumed that of the new, smaller fleet of twelve nuclear attack submarines, ten would be available for a war with Russia, compared to only seven or eight available for short notice contingencies.[34]

[34] Hennessy and Jinks, *The Silent Deep*, 581-582.

FIGURE 1
UNITED KINGDOM DEFENSE SPENDING AND MAJOR VESSELS, 1990–2016





	1990	2000	2016
Aircraft carriers	3	3	0
Large surface combatants	48	41	19
Submarines	22	16	10
Assault/amphibious	7	8	6

Note: GDP = gross domestic product.

Sources: (above) SIPRI Military Expenditure Database; *(below)* appropriate volumes of *The Naval Institute Guide to Combat Fleets of the World, World Defence Almanac,* and *Seaforth World Naval Review.*

Figure 4. United Kingdom Defense Spending and Major Vessels, 1990 to 2016

Source: Jeremy Stohs, "Into the Abyss?: European Naval Power in the Post-Cold War Era," *Naval War College Review* 71, no. 3 (Summer 2018): 13.

The House of Commons Defence Committee disagreed with the Ministry of Defence's views. Their report, "Royal Navy Submarines," assessed that twelve SSNs were the bare minimum and were not sufficient to meet all obligations. Additionally, the Defence Committee sought to maintain six, instead of four, diesel submarines for use against the Russians in the Iceland-Faroes Gap. Instead, the Ministry of Defence decommissioned the entire conventional submarine fleet including all four of the new, state of the art *Upholder*-class. The *Upholders* were mothballed for four years until Canada bought them in 1998.[35]

Unlike the reduction to the size of the Royal Navy's attack submarine fleet, the United Kingdom maintained the size of its ballistic missile submarine fleet at four submarines. The removal of the Soviet Union as an aggressive threat to Western Europe did not affect the United Kingdom's continuation of continuous at sea deterrence. This policy required a minimum of four ballistic missile submarines to guarantee that at least one submarine could always be deployed and ready to respond. The Royal Navy actually expanded its nuclear capabilities following the Cold War because of its commitment to continuous at sea deterrence. This expansion occurred because of the Royal Navy's replacement of its older Polaris submarines with newer Trident submarines. The Royal Navy had not upgraded from single target Polaris missiles to the Poseidon missile with MIRVs. The United Kingdom negotiated an agreement with the United States during the Carter administration to use the new Trident I missile. Since the Royal Navy was satisfied with the *Resolution*-class submarines, it made no efforts to build new

[35] Hennessy and Jinks, *The Silent Deep*, 582-584.

submarines until the *Resolution*-class reached its end of life after thirty years of service. This led to renegotiations with the United States when the Reagan administration decided to implement Trident II missiles. The *Vanguard*-class launched in 1994 with sixteen tubes for Trident II missiles. While *Vanguard* had the same number of missile tubes as *Resolution*, *Vanguard* had far greater destructive capability since Trident II contained up to eight MIRVs. This gave the United Kingdom the ability to destroy 128 targets with a single submarine. Because of the nature of the Trident agreement, the United States supplied the missiles while the United Kingdom supplied the submarines and the warheads for the *Vanguard*-class.

Following the Cold War, the United Kingdom eliminated all its air-delivered and tactical nuclear weapons. This left its fleet of four ballistic missile submarines as its only response. However, the United Kingdom desired a capability of limited nuclear response to provide additional options other than a complete reliance on the countervalue destruction of cities. This caused it to implement the concept of sub-strategic nuclear weapons on its ballistic missile submarines. Sub-strategic nuclear weapons are ballistic missiles that are equipped with nuclear warheads that contained adjustable payloads. The same nuclear warhead that can destroy an entire city can be scaled down prior to launch so that it only destroys an entrenched bunker. While the United Kingdom developed sub-strategic nuclear weapons to increase its options in a crisis, they provide no additional flexibility. The international community to include potential adversaries does not distinguish between the use of a little nuclear weapon versus a big nuclear weapon. Attempting to use variable nuclear warheads to control the escalation of force only destabilizes the environment by lowering the threshold for first use of a nuclear weapon.

The United States and the United Kingdom responded similarly after the Cold War ended. Each country wanted to reap the benefits of a "peace dividend" by cutting defense spending, yet each country emphasized the changing strategic environment, mainly a weakened Russia, and not money as the basis for force reduction. Since each country's defense budget became smaller, each country's navy had fewer ships to include fewer submarines. The United States reduced its number of attack submarines by half while the United Kingdom implemented a 60 percent decrease. However, the difference in nuclear deterrent strategies between the two nations caused their ballistic missile submarines to react differently. The United States decreased its number of ballistic missile submarines by 60 percent in accordance with its counterforce strategy that corresponded with a reduction in Russian nuclear capability. However, the United Kingdom could not lower its number of ballistic missile submarines and still maintain a nuclear deterrent since it already operated with the minimum number of submarines to enforce its countervalue strategy. Instead, the United Kingdom debated the necessity of maintaining a nuclear deterrent. Having decided that a nuclear capability was still required, the United Kingdom replaced its four ageing ballistic missile submarines with four new ones. Additionally, both countries adapted the application of submarines for use in the new international setting.

CHAPTER 4

CHANGE IN SUBMARINE MISSION

This chapter examines the changes to the submarine mission because of the altering international landscape and the personnel and funding reductions previously broached. The role of the submarine force expanded from a focus on anti-submarine warfare and anti-surface warfare operations to a multi-mission platform. The introduction of the Tomahawk Land Attack Missile (TLAM) to each nation's submarine force added a power projection capability to attack submarines which became, over time, their primary mission. Special operations and ISR missions rose in number and impact. Each navy emphasized the capabilities of submarines to justify their existence considering a reduced threat from the former Soviet Union. Additionally, each navy had to balance the increased demand for submarines to execute new missions with fewer submarines available to execute those missions.

Sea control was the primary mission of the attack submarine throughout the entirety of the Cold War. How allied submarines were to control the sea lines of communication varied throughout the Cold War. Some, particularly in the Army, argued that allied submarines needed to escort convoys delivering troops to Western Europe in the case of war with the Warsaw Pact.[36] Others were more concerned with allied submarines defending carrier battle groups from the more numerous Soviet attack submarines.[37] The *Los Angeles*-class attack submarine sacrificed the deeper diving ability

[36] Love, *History of the U.S. Navy 1942-1991*.

[37] Ibid., 616.

of its predecessor, the *Sturgeon*-class, for increased speed so that it could keep up with the faster *Nimitz*-carriers and Soviet *November*-class submarines.[38] Then there were those who favored a more aggressive approach by performing search and destroy missions on Soviet attack submarines. Even this was not aggressive enough for some individuals who preferred to employ American submarines to preemptively destroy the Soviet ballistic missile submarines on patrol in the Barents Sea and the Sea of Okhotsk, bastions of Soviet naval power. This aggressive posture reached its pinnacle in Lehman's Maritime Strategy during the Reagan administration.[39]

Regardless of how NATO used attack submarines to control the sea during the Cold War, it only had to focus on two capabilities, anti-submarine warfare and anti-surface warfare. Submarines mainly carried torpedoes to execute these missions, but they also had mines and Harpoon anti-ship missiles available. With the exception of infrequent special forces operations, power projection did not exist as a submarine mission until the implementation of the Tomahawk missile at the end of the Cold War. While attack submarines performed ISR missions during the Cold War, they were not considered significant nor did they factor into submarine force levels. ISR was just something that submarines did to kill time until they were needed to sink the Soviet navy.

Tomahawk Cruise Missile

The Tomahawk traced its origins back to the Nixon administration. Secretary of Defense Melvin Laird envisioned a cruise missile as one way to circumvent limitations

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[38] Love, *History of the U.S. Navy 1942-1991*.

[39] Baer, *One Hundred Years of Sea Power*, 433-434.

imposed by the Strategic Arms Limitation Talks I treaty and give America a new advantage over the Soviet Union with respect to nuclear capabilities.[40] In 1972, Laird placed Rear Admiral Walter M. Locke in charge of the Joint Cruise Missile Program. Locke expanded the program by including conventional applications in addition to the desired nuclear capability. The Carter administration advertised the Tomahawk as a cheaper and more flexible option than the USAF's B-1 bomber program. This justification in 1978 for the planned elimination of the B-1 resulted in an accelerated development of the Tomahawk. Locke eventually created four missiles, one air-launched cruise missile for the Air Force and three Tomahawk variants for the Navy. The Navy variants were the nuclear Tomahawk (TLAM-N), the Tomahawk Anti-Ship Missile (TASM), and the conventional Tomahawk (TLAM-C). Locke designed Tomahawks for use by both surface ships and submarines. Surface ships launched the missiles either vertically from installed launchers or from Armored Box Launchers, which were primarily aboard battleships. Submarines initially launched the missiles horizontally from torpedo tubes. The first submarine launched Tomahawk was a nuclear variant in 1984.[41] Following the successful launch, the conventional and anti-ship torpedo launched variants were then placed into production. Lehman took advantage of the ambiguity offered by the Tomahawk to complement his Maritime Strategy. Since the Russians would not know if a surface ship carried a nuclear TLAM or just conventional ones, they would have to respect every submarine and surface vessel as a potential nuclear threat.

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[40] Love, *History of the U.S. Navy 1942-1991*, 715.

[41] Ibid.

This gave President Ronald Reagan more leverage when negotiating with Chairman Mikhail Gorbachev for the Intermediate-range Nuclear Forces treaty to ban land-based intermediate-range missiles. The Intermediate-range Nuclear Forces treaty makes no mention of air and sea-based missiles, allowing for continued use of nuclear TLAMs but not their ground counterparts.

Concurrent with the design of the Tomahawk, newer *Los Angeles*-class submarines were altered to house vertical launch systems (VLS) for Tomahawk use. This design change was only possible because of Rickover's spiteful control of the nuclear program. Multiple options existed to replace the *Sturgeon*-class attack submarine. Defense Department Research Directed John S. Foster, Jr. favored a design similar to the *Glenard Lipscomb*, an experimental submarine that used an electric drive instead of steam turbines for propulsion. This made the submarine much quieter but comparatively slower at 28 knots. Deputy Secretary of Defense Paul Nitze preferred a smaller submarine based on the *Narwhal* reactor. Called the Conform, this submarine would use a natural circulation reactor which made it quieter than the *Sturgeon* but not as quiet as the *Glenard Lipscomb*. Because of its smaller size and radical hull shape, the Conform would be able to maintain speeds in excess of 45 knots. Whereas the other two designs were built to maximize stealth and speed respectively, Rickover designed his version to maximize the reactor. His S6G reactor was twice as powerful as the preceding S5W reactor, but it required a longer submarine with a significantly larger displacement than *Sturgeon*. Rickover's design was the loudest option and was significantly slower than the Conform. After a Soviet *November*-class submarine outpaced the USS *Enterprise*, the first nuclear powered aircraft carrier and assumed fastest warship afloat, speed became

the preferred capability over stealth. Using his influence as the head of Naval Reactors, Rickover successfully maneuvered Congress into approving his version of the *Los Angeles*-class submarine.[42]

Ultimately, being designed by Rickover was the only factor that mattered in approving the next attack submarine. Since the *Los Angeles* required a significantly larger engine room to accommodate the new reactor, the forward portion of the submarine was shortened to keep the submarine at a reasonable length. This forward portion also contained enough free-flooding areas that allowed twelve VLS launchers to be installed on newer *Los Angeles*-class submarines.[43] While a submarine cannot reload its VLS system underway like it can for torpedo launched missiles, VLS added more firepower to the submarine than just torpedo launched missiles since it could quickly launch up to 16 missiles. Additionally, VLS gave submarines a shared missile with the surface fleet, allowing for simplification during missile procurement.

Submarines played a more significant role during strike missions over the course of the 1990s. Submarines first launched TLAMs in anger during the 1991 Gulf War (Operation Desert Storm). On 19 January 1991, USS *Louisville* fired eight TLAMs during the integrated air campaign against Iraq.[44] While the Reagan administration

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[42] Love, *History of the U.S. Navy 1942-1991*, 616.

[43] James H. Patton Jr., "The Submarine as a Case Study in Transformation: Implications for Future Investment," *Naval War College Review* 58 no. 3 (Summer 2005): 136.

[44] Richard Lardner, "USS *Louisville* Fired First Submerged TLAM while Submerged in Red Sea," *Inside the Pentagon* 7, no. 25 (June 1991): 1-3.

planned for submarines to launch TLAMs against Libya in 1986, the USN instead opted to use carrier-based aircraft because of the limited TLAM inventory of the time.[45] An additional consideration was the desire not to compromise the new system against a comparatively low profile target. While submarines only launched less than 5 percent of TLAMs during Desert Storm, their success in using TLAMs led to increased use throughout the 1990s. Thirteen TLAMs were used against air defense targets during Operation Deliberate Force in Bosnia in support of the NATO air campaign.[46] Twenty Five percent of targets used TLAMs during Allied Force in Kosovo and 30 percent during Iraqi Freedom. TLAMs were also used to attack terrorist targets in Afghanistan and Sudan as well as in 1998's Operation Desert Fox. The addition of SSGNs to the submarine force dramatically increased the role submarines perform during strike missions. During Odyssey Dawn, the USS *Florida* accounted for 93 of the 110 Tomahawks launched into Libya.

While submarines became very proficient performing strike missions using conventional TLAMs in the years following the Cold War, nuclear TLAMs were no longer a required capability in the changing international environment. The collapse of the Soviet Union removed consideration for making attack submarines a fourth member of the nuclear triad. In 1991, President George H. W. Bush unilaterally removed all nuclear Tomahawks from all surface vessels and submarines. The 1994 Nuclear Posture

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[45] Love, *History of the U.S. Navy 1942-1991*, 764.

[46] John T. Kuehn, Interview by author, 21 May 2019. Then LCDR Kuehn participated in planning and strikes for Deliberate Force as part of CTF-60 in 1995 aboard USS *Amercia* (CV 66).

Review removed the option for surface vessels to carry nuclear TLAMs but reserved it for submarines. Nuclear TLAMs were not designated as unsuitable for from submarines until the 2010 Nuclear Posture Review. In the subsequent years, the Navy quietly removed them from service.

While strike became the attack submarine's highest profile mission, ISR became its most prevalent mission. The submarine evolved into the premier surveillance platform. Unlike an aircraft, a submarine has a near indefinite loiter time off the coast collecting information. Unlike a surface ship, a submarine can collect this information covertly. This leads to the avoidance of situations such as the capture of the USS *Pueblo* by North Korea or the attack on the USS *Liberty* by Israel, both American intelligence gathering ships collecting information in international waters. It also prevents aircraft shootdowns like the EC-121 of Navy squadron VQ-1 in 1969 by North Korean MiG fighters.[47] American submarines have become so prevalent at performing ISR missions across the globe that anytime a submarine is counter detected the international community attributes the incident to the United States. One can find evidence of this by looking at a *YouTube* videos of fishermen recording submarine masts rising from the waters of the Persian Gulf.

Submarines and Special Operating Forces (SOF) have a long history of working together. The two services have a certain comradery based upon their shared reliance on stealth and secrecy to operate. Submarines are an ideal delivery as well as extraction vehicle for SEALs and other special forces because of their ability to enter and loiter in

[47] Love, *History of the U.S. Navy 1942-1991*, 578.

contested waters undetected. During World War II, a US submarine penetrated Japanese defenses undetected and landed a special team to destroy a railroad bridge.[48] While submarines performed SOF missions during the Cold War, the frequency of those missions was low. Not until the Berlin Wall fell did SOF missions rise in number and stature within the submarine force. SOF missions tend to require submarines to operate at slow speeds to enable embarkation and disembarkation of SOF personnel. This presented a new challenge to the submarine force since *Los Angeles*-class submarines have trouble operating at speeds of one to three knots, and they comprised a significant majority of the fleet following the rapid decommissioning of older submarines in the 1990s.[49]

Submarines Do More with Less

The expansion of the attack submarine's role after the Cold War created the interesting scenario where the United States needed more submarines to fulfill peacetime requirements than it needed for war. In 1999, the Navy only had 58 attack submarines available when it needed 72 attack submarines to execute all available missions.[50] Additionally, the submarine force was still on its way down to 50 attack submarines in its fleet. The Navy had to find ways to fill in the gap between number of submarines and number of missions. This would be done by implementing changes to how attack submarines operated so that fewer submarines could perform more missions. The Navy

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[48] Eugene Fluckey, *Thunder Below: The USS Barb Revolutionizes Submarine Warfare in World War II* (Chicago: University of Illinois Press, 1992).

[49] Patton, "The Submarine as a Case Study in Transformation," 136.

[50] Archie Clemins, "Interview with CINCPACFLT, Admiral Archie Clemins," *Undersea Warfare* (Summer 1999): 2-5.

would also convert four ballistic missile submarines into guided missile submarines (SSGN) so that the SSGNs could execute some of the missions that were assigned to attack submarines. Additionally, the Navy made changes to construction and maintenance of attack submarines to slow the rate of reduction of the overall number of attack submarines in use.[51]

The first change the Navy implemented to cover the gap was to raise the operational tempo of deployed attack submarines. A deployment cycle of an attack submarine typically lasts 18 months. The first six months are spent working up for the overseas deployment by performing training, maintenance, and inspections in local waters. The next six months are spent forward deployed overseas performing national security missions for the Combatant Commanders. The final six months are spent performing more extensive and intrusive maintenance, potentially involving some time in drydock, and the submarine is not available for national tasking for periods of time. During the Cold War, attack submarines had a 65 percent operational tempo, meaning that 65 percent of the time they were executing national security missions with the rest of the time spent in port performing maintenance, onloading supplies, and destressing the crew. In the 1990s, the Navy raised this operational tempo to 85 percent for deployed submarines.[52] While the higher operational tempo led to higher mission completion, it had a negative impact on retention of submariners. Additionally, the increased use of

[51] Congressional Budget Office, "Increasing the Mission Capability of the U.S. Submarine Force" (Congressional Budget Office Study, Washington, DC, March 2002).

[52] Clemins, "Interview with CINCPACFLT, Admiral Archie Clemins."

submarines lowered the material readiness of the ships and shortened the overall life cycle of them.

Another change the Navy implemented was to forward deploy attack submarines in Guam. A submarine stationed in Guam provides greater mission capacity than one stationed in the United States. Eleven attack submarines in Guam would enable a fleet of 55 attack submarines to perform the equivalent missions of 76 US-based attack submarines.[53] By 2003, the Navy had three submarines in Guam with no plans to station any more there. This changed during the Obama administration's "pivot to Asia" when the Navy stationed a fourth attack submarine in Guam to counter Chinese People's Liberation Army Navy expansion.

To meet START II limitations on the number of nuclear launchers available, the Navy scheduled four *Ohio*-class ballistic missile submarines to be retired instead of refueled at their midlife point. Since the early 1990s, officials had discussed converting the first four *Ohio*-class submarines into SSGNs. Twenty-two of the twenty-four missile tubes would be converted into Tomahawk launchers of seven per tube for a total of 154 Tomahawks onboard. The remaining two missile tubes would be converted into SOF delivery platforms. Four dual-crewed SSGNs could perform missions equivalent to those of twelve attack submarines.[54]

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[53] Congressional Budget Office, "Increasing the Mission Capability of the U.S. Submarine Force."

[54] Ibid.

The *Virginia*-class submarine was the USN's response to addressing both the change in mission for attack submarines and the fiscal constraints imposed by Congress after the Cold War. While the *Virginia*-class submarine is slower, dives shallower, and is less heavily armed in both number of torpedoes carried and number of torpedo tubes than the *Seawolf*-class submarine, *Virginia* is quieter. Since stealth is the most important capability of a submarine across its range of missions. Therefore, the USN decided for *Virginia* to keep and improve upon the stealth advances of the *Seawolf* while maintaining her "good enough" in other areas. This decision made *Virginia* more capable than *Seawolf* at performing the traditional submarine missions of anti-submarine warfare and anti-surface warfare because of the ability to remain undetected by an enemy. Also, unlike *Seawolf*, *Virginia* would be equipped with VLS to make it a more capable strike platform. To reduce operational costs over the life of the ship, *Virginia* was designed to have its reactor core last the life of the ship, a designed 30 years. Even though a core designed to last for 30 years is more expensive than one that lasts 15 years, one 30-year core is significantly cheaper than two 15-year cores. By avoiding a refuel, *Virginia* can also spend more time at sea than her predecessors since her overhaul will be significantly shorter than a refuel.[55]

The Navy also made significant changes to the design and construction of the third *Seawolf*-class submarine because of the changing submarine mission set. USS *Jimmy Carter* (SSN-23) was reconfigured to be a special projects boat for the Navy. It

[55] Anthony Wells, *A Tale of Two Navies: Geopolitics, Technology, and Strategy in the United States Navy and Royal Navy, 1940-2015* (Annapolis, MD: Naval Institute Press, 2017), 41.

contains a 100-foot extension in the middle of the submarine meant to carry SOF and other specialized mission equipment.

While *Los Angeles*-class submarines were designed to last 25 to 30 years, few of them were operated for that length of time. In some cases, the Navy skipped the midlife Engineered Refueling Overhaul and retired the submarine early to allocate the funds to other programs such as *Virginia*. While this practice saved money in the short term, it led to a higher cost per mission day of an attack submarine.[56] The Navy determined that maintaining a robust submarine building capability by building more *Virginia*-class submarines over a longer period of time was worth the extra money. In other cases, the Navy extended the hull life of newer *Los Angeles*-class submarines by three years for a total life of 33 years. In a much less publicized move, the Navy changed the Engineered Refueling Overhauls to just Engineered Overhauls for newer *Los Angeles*-class submarines. Unlike *Virginia*, these *Los Angeles*-class submarines were expected to refuel near the half to two-thirds point of their 30-year life. Instead, their hull lives were extended to 33 years, and refuels were cancelled. These combined with the greater distances travelled by submarines on deployment places a significant strain on the reactor core. The only realistic solution is to implement strict fuel conservation measures during training and other operations not related to national security tasking. Ultimately, fuel conservation and three-year hull extensions were not enough to address the gap between missions and platforms. In 2018, Naval Reactors announced plans to refuel more *Los*

[56] Congressional Budget Office, "Increasing the Mission Capability of the U.S. Submarine Force."

Angeles-class submarines beginning in 2023 and implement an additional ten-year hull extension for a total of 43 years of service. While only one submarine will be refueled initially as an experiment, Naval Reactors plans on refueling five to seven submarines to prevent the total number of platforms from falling to 42 in the mid-2020s.[57]

Refueling and extending these submarines has two advantages over raising the number of new *Virginia*-class submarines built from two to three per year. First, Electric Boat and Newport News would struggle to increase *Virginia* production as they also continued work on the new *Columbia*-class ballistic missile submarine. The rise in attack submarine production would then delay the delivery of the new ballistic missile submarine which creates problems for the nuclear deterrence mission. By updating the facilities at Portsmouth Naval Shipyard in Kittery, Maine, the Navy utilizes a location that is not involved in submarine construction to conduct the refuelings. This also creates more political support in Congress. Second, by using two reactor cores for 43 years instead of one reactor core for 33 years in five to seven attack submarines, the Naval Reactors grants an immediate increase in operational flexibility to the fleet. Those five to seven submarines can now relax their levels of fuel conservation significantly to perform various national tasking which then allows the rest of the attack submarines to slightly ease on fuel conservation restrictions. This creates a net increase in the number of missions performed by existing attack submarines.

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[57] Justin Katz, "Caldwell: Los Angeles-Class Sub Refueling Will Start with Cheyenne in 2023," *Inside Defense*, 7 November 2018, accessed 16 March 2019, https://insidedefense.com/insider/caldwell-los-angeles-class-sub-refueling-will-start-cheyenne-2023.

In summary, the submarine force began the 1990s focused on the threat that the Soviet navy represented. This threat was evident throughout American submarine design, construction, operation, and training. The events of the decade greatly changed each of these submarine aspects. Submariners adapted and innovated to meet the new challenges presented by the new world order. Adaptations and innovations include the use of TLAMs aboard submarines, the design of the *Virginia*-class for littoral operations, and the expansion of ISR and SOF missions by submarines.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

When reducing the size of the attack submarine fleet, both the United States and the United Kingdom failed to consider adequately the impact on peacetime missions for what has been called "Command of the Commons."[58] For the United States, the Base Force made no attempt to consider peacetime missions when determining budget cuts for the attack submarine fleet. The *Bottom-Up Review* addressed both wartime and peacetime requirements. It stated that 55 attack submarines were able to meet all wartime and peacetime requirements while 45 attack submarines were able to meet all wartime requirements but not all peacetime requirements. However, its recommendation of 45 to 55 attack submarines was done without reference to the importance of the peacetime missions. Since wartime requirements determined the size of the fleet and peacetime requirements were greater than wartime requirements, peacetime missions would be neglected in war.

If the peacetime missions are negligible during war, then we should not be greatly concerned that the attack submarine fleet cannot meet all requirements. Furthermore, if the peacetime missions are negligible, then the attack submarine fleet should not even attempt to cover the difference between resources and requirements.

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[58] Barry Posen, "Command of the Commons: The Military Foundation of U.S. Hegemony," *International Security* 28, no. 1 (Summer 2003): 5-46.

The United States Navy failed to consider the return to a countervalue strategy when faced with the budget cuts following the Cold War. Instead, it tried to maintain the more expensive counterforce strategy even in the face of significant budget cuts. All of these issues have come to a head recently as the United States pivoted to the Pacific as discussed in chapter 4 and were exacerbated by events since 2014 which seem to indicate a return to great power competition if not outright rivalry along the lines of the Cold War with a revisionist China and truculent Russia.[59]

Recommendations

The United States should implement a countervalue strategy for its ballistic missile submarines. The overkill provided by the twelve planned *Columbia*-class ballistic missile submarines is unnecessary today just as it was during the height of the Cold War. Of the twelve *Columbia*-class submarines, eight can be on patrol and available for use continuously. Eight submarines with sixteen Trident II (D5) missiles per submarine and eight MIRVs per missile provides the capability to destroy 1,024 city-sized targets at any time. Using the 232 targets that were enough to destroy the entire Soviet Union, even though the number is lower for the much smaller present-day Russian Federation, the *Columbia*-class provides a 4.4:1 ratio of warheads to targets, easily exceeding the initial 2:1 goal of Polaris. While deterring China is a much greater concern to American policymakers today than it was during the Cold War, additional nuclear destruction

[59] The Department of Defense, *Indo-Pacific Strategy Report Preparedness, Partnerships, and Promoting a Networked Region* (Washington, DC: Government Printing Office, June 2019).

capability is not required to deter both Russia and China. Ignoring China's longstanding policy of not using nuclear weapons in a first strike capacity, the United States should not have to plan for the simultaneous destruction of two large nuclear adversaries. Forces sufficient to deter the larger nation simultaneously deter all smaller nations from commencing a nuclear attack against the United States and its allies. Since the Soviet Union was larger than both Russia and China, the ability to destroy the Soviet Union thoroughly is enough to deter both Russia and China.

Further Research Areas

This research project raised a host of subsequent issues that time does not permit addressing in one thesis. An area that benefits from more research are the reasons for choosing the design that became the *Los Angeles*-class submarine over competing designs. The primary concern for that class was speed so that the submarines could protect nuclear-powered aircraft carriers from the faster Soviet submarines. However, *Los Angeles* was not the fastest option available to the Navy. The Concord was a smaller submarine that could go up to a maximum of 45 knots, significantly faster than *Los Angeles*. Since *Los Angeles* was projected to be slower, louder, and more expensive than Concord, more research is required to understand why Concord was not selected. Possible considerations are that Naval Reactors had already designed *Los Angeles*'s S6G propulsion plant and that *Los Angeles* was more similar to existing submarine designs than Concord. Both factors may have caused *Los Angeles* to be available for use against the Soviets much faster than Concord. This production quickness may have outweighed the other factors of speed, stealth, and cost. Additionally, more research is needed to

determine why Concord was projected to be faster, quieter, and cheaper than *Los Angeles*.

Also, more research into the evolution of the USN's position with regard to the application of nuclear deterrence theory is needed. Chief of Naval Operations Admiral Arleigh Burke's adoption of the concept of "finite deterrence", essentially a countervalue strategy regarding the use of nuclear weapons, is well documented by both Baer and Love. "Finite deterrence" became the basis for the number of Polaris submarines. However, the change of that policy into a counterforce position as held by Chief of Naval Operations Elmo Zumwalt a decade later is not well explained. Zumwalt used the concerns about a missile gap with the Soviets,[60] essentially a counterforce argument, to push for the development of Trident submarines to replace the aging and less capable Polaris submarines. However, the requirements for the number of missiles, warheads, and submarines that the Trident program needed to counter Soviet capabilities were not clearly articulated.[61]

Polaris design and development began during the Eisenhower administration with implementation finishing during the Kennedy administration. While "finite deterrence" nested with Eisenhower's policy of "massive retaliation" since both were countervalue strategies, McNamara as Kennedy's Secretary of Defense preferred his idea of "flexible response" which was a counterforce strategy for nuclear weapon use. However, neither McNamara nor his office appear to have attempted to influence or change the previous

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[60] Love, *History of the U.S. Navy 1942-1991*, 606.

[61] Ibid., 607-608.

administration's plans regarding the number of Polaris submarines under the new nuclear weapons strategy. McNamara pushed for the development of MIRVs which led to the Poseidon missile's development and implementation aboard newer Polaris submarines. However, McNamara's reasons for wanting MIRVs were to counter the perceived Soviet development of ABMs. That Poseidon increased the capability and lethality of the USN's ballistic missile submarines, which supported "flexible response" and counterforce strategies, appears to have been a coincidence.[62] These issues bear more examination, especially in today's environment where "flexible response" type options are being proposed anew.

Subsequent administrations were not consistent with nuclear strategy, this bears more examination. For example, during the Ford administration, Secretary of State Henry Kissinger thought that the excess nuclear capability required by a counterforce strategy was useless to politicians and military officials, but Secretary of Defense James Schlesinger wanted "to reduce dependence on threats of assured destruction"[63] which required a counterforce strategy. The USN, having unintentionally acquired the capability and resources to implement a counterforce strategy, decided to use a counterforce argument for the justification of the number of Trident carrying *Ohio*-class submarines. Since guidance from each presidential administration was vague and inconsistent across five different administrations, the decision appears to have been internal to the USN. Since a counterforce strategy requires more missiles, therefore more submarines, people,

[62] Freedman, "The First Two Generations of Nuclear Strategists," 757-760.

[63] Ibid., 775.

and money, to implement than a countervalue strategy, one possible reason for the USN's change was to ensure a larger portion of the defense budget. However, this view is far too simplistic and cynical to explain the USN's change in position on nuclear strategy. Understanding why the change occurred is vital to knowing how the USN's ballistic missile submarine force changed over time. What began with 41 Polaris submarines went to 18 Trident submarines which were then reduced to 14 Trident submarines after converting four into guided missile (TLAM) submarines. However, the 14 Trident submarines have the ability to deliver more than four times as many nuclear warheads to targets than the original goal of the Polaris program, with each Trident warhead being far more destructive than its Polaris predecessor.

Finally, this thesis did not have time to delve into strategic issues relating to the Royal Navy during the Cold War and its aftermath. Whereas the basis for the size and makeup of the USN was characterized by the threat of the USSR such that the USN planned to be able to fight the Soviet fleet solo, the Royal Navy was always significantly smaller than the Soviet navy. While Royal Navy attack submarines were used in tandem with American submarines in patrolling the Atlantic and Mediterranean during the Cold War, their basis was not merely to provide the Americans with additional capability. The lasting effects of the Anglo-American relationship on each countries' respective navy warrants further research.

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