

**41 FOR FREEDOM:
BALLISTIC MISSILE SUBMARINERS AND THE NUCLEAR DETERRENT
SHIELD DURING THE COLD WAR**

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ABSTRACT

Ballistic missile “boomer” submarines were developed in the 1960s as a response to the Soviet launch of the Sputnik satellite which proved the Soviet Union could launch a missile targeting anywhere on Earth. They made use of new nuclear power technology which allowed submarines to stay underwater indefinitely, limited only by the food they could carry to feed their crews. Ballistic missile submarines have served continuously since 1960, patrolling the ocean as the second-strike capability that makes nuclear deterrence possible. The men who served aboard the “41 for Freedom” ballistic missile submarines made innumerable sacrifices and contributed greatly to national security during the Cold War, and current ballistic missile submariners continue in that mission today. Despite boomers being the lesser-known side of submarine service, oral histories preserved by the Library of Congress and others conducted by this paper’s author further the claim that the contribution of ballistic missile submarines was vital during a time of heightened tensions worldwide, and, in fact, these contributions are what made nuclear deterrence possible.

As nuclear deterrent strategy existed throughout the Cold War, the second-strike capability of ballistic missile submarines became increasingly more fundamental to national security and the men who operated those submarines prevented what would have been a catastrophic conflict. These sailors experienced the Cold War in the isolation of a submarine hundreds of feet underwater with little to no knowledge of the world outside. The rare lucky few submariners who got to see the world they protected saw it through a periscope. Medical emergencies were handled aboard the ship whenever possible with

minimal equipment and supplies to ensure the ship could remain on station in support of the mission. They made sacrifices the world will never know about and braved dangers most people could not imagine in order to complete their mission, and their service requires recognition from a grateful world.

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CHAPTER 1

INTRODUCTION AND HISTORIOGRAPHY

Submariners

Submarine duty has always required the utmost fortitude to withstand the oppressive environment, the isolation, and the danger inherent in operating deep underwater. With the end of the Cold War, decades of fear and the possibility of nuclear war gave way to increasing uncertainty and new threats, while the specter of Russia, ostensibly now an ally, remained. The ballistic missile submarines that had completed their mission and kept the country safe throughout the icy conflict were aging and beginning to be retired and replaced. Collectively, they were known as the “41 for Freedom,” the first 41 nuclear-powered ballistic missile submarines built to combat the threat of Soviet intercontinental ballistic missiles after the launch of *Sputnik*. They became the *George Washington*, *Ethan Allen*, *Lafayette*, *James Madison*, and *Benjamin Franklin* classes and they were named after some of the most important men in American and Naval history.

Harnessing nuclear power was an incredible feat of engineering that allowed submarines to stay underwater indefinitely, limited only by their ability to store food to feed the crew. Continual upgrades to nuclear-capable guided ballistic missiles meant that those ships could launch devastation from further and further distances away from their targets. Early conflicts during the Cold War made the need for this technology clear to American foreign policy experts, national security experts, and each branch of the military. While these technological advances and the national security policies that made

use of them were incredibly important for the safety of the nation, none of it was possible without the service and sacrifice of the men who volunteered to crew these ships.

Submarines operate in the depths and the shadows, and they mostly do their best to avoid public glory. What glory there is tends to go to fast attack submarines because they are the boats that sneakily follow enemy ships and submarines, tap enemy communications, and just generally go where they are not supposed to be. On the other hand, because the mission of boomer submarines is to remain hidden and undetected rather than spy on the enemy, their service is often overlooked. Ballistic missile submariners go through the same isolation, and the same exhausting schedules, and they operate in some of the same dangerous waters as fast-attack submariners. This project seeks to give them well-earned recognition for their service to the safety of the country and the world during an incredibly dangerous time. National security relied on the threat of a second strike. Without the second-strike threat that ballistic missile submarines provided, nuclear deterrence would have been an empty threat. Without the men who served onboard those submarines, the world would have been in much greater danger, and the Cold War might have been lost.

This thesis is adamant that the Cold War would not have remained cold overall despite its numerous hotspots without the second-strike threat that nuclear missile submarines provided to national security decision-makers and the presidents throughout the conflict. Chapter 2 tells how submarines came into being, from the earliest, barely submersible ships to the nuclear-powered megastructures of today; the political conflict and nuclear threat that made their evolution into nuclear deterrent necessary; the Admiral

without whom the nuclear navy would not have succeeded as it did and still does; and the treaties that resulted from the anti-nuclear proliferation sentiment and protests of the later twentieth century. Nuclear ballistic missiles would have been unable to protect the nation without the men who operated the submarines that contained them. Those men made sacrifices the world will never know except by listening to their own words in Chapter 3. They missed births, deaths, holidays, and uncountable other important events to do their duty and protect the nation. They were rewarded with prestige in secret and by knowing national security secrets which will never be declassified. In Chapter 4, I make clear just how dangerous their mission could be. They were alone in the depths with little to no communication and only their own wits to survive, stay healthy, and complete their missions. For this reason, they have become the subject of isolation studies and psychiatric professional curiosity which helps train other career fields. I conclude with the recognition that these submariners deserve for their contributions to national security, the advances made since the end of the Cold War in nuclear missiles, submarines, and anti-proliferation, and the place of submarines in public attention. Every day, ballistic missile submarines are out there in the oceans, protecting the country and providing nuclear deterrence, with submariners continuing in the duty begun with the 41 for Freedom.

Historiography

Submarine stories have long fascinated those with an interest in the sea, history, and naval warfare. Submariners, as viewed from the outside, appear almost like mythical creatures, with their environment of the crushing deep and their resistance to

claustrophobia. During the Cold War, submariners became the key to nuclear deterrence and the following historiography bears that out.

Cold War

Cold War historiography is incredibly diverse and begins nearly as soon as the Cold War itself begins. Early Cold War historians fall into the Orthodox school of thought. This taught that the Soviets were to blame for the unfolding situation due to their expansionist objectives and the United States was merely reacting to their new adversaries. This school of thought is exemplified by George F. Kennan's "The Sources of Soviet Conduct," published in 1947 in *Foreign Affairs*. This article also coined the term "containment" as the goal of US foreign policy as regards the Soviets and Communism.¹ Following the Orthodox school was the Revisionist, or Wisconsin, school which connected US Cold War policy to US imperialism and asserted that economic forces were more responsible than previously thought. The United States needed new markets for its new technologies, products, and capital, and it found these in conflict with the Soviets. This school of thought, which emerged at around the same time as nuclear-powered submarines were being developed, was headed by William Appleman Williams and his *The Tragedy of American Diplomacy*.²

Toward the end of the Cold War, yet another school of thought emerged in Cold War historiography. Post-revisionist theory once again held the Soviets responsible for the conflict and asserted that Stalin was an opportunist and pragmatist, not a Communist

¹ X., "The Sources of Soviet Conduct," *Foreign Affairs* 65, no. 4 (1987): 852, <https://doi.org/10.2307/20043098>.

² William Appleman Williams, *The Tragedy of American Diplomacy*, 50th anniversary ed (New York: W.W. Norton & Co, 2009).

revolutionary trying to spread the ideology. At the same time, the Soviets were the belligerents, and the Americans were merely responding to their aggressiveness. The opening of Soviet archives allowed American scholars to test theories that they had during the years of the conflict. This school of thought gave credit for the peaceful end of the Cold War to President Reagan and Pope John Paul II and considered both internal and external American factors. They considered the Cold War an ideological rather than a geopolitical struggle. This school was led by John Lewis Gaddis and his *We Now Know*.³ Since the end of the Cold War, scholarship has evolved past these schools of thought to include areas of the world outside the superpowers to the “third world.”⁴ Francis Fukuyama claimed that the Cold War was the final victory for democracy and capitalism while Samuel Huntington advanced his “clash of civilizations” theory.⁵ Responding to both of these assertions and continuing a focus on the third world, Paul Thomas Chamberlin deftly counters the peaceful and bloodless myth of the Cold War by connecting Maoist violence in China, the Vietnam War and genocides in Southeast Asian countries, and Middle Eastern conflicts such as the Lebanese Civil War, the Soviet-

³ John Lewis Gaddis, *We Now Know: Rethinking Cold War History* (Oxford : New York: Clarendon Press ; Oxford University Press, 1997).

⁴ Penny M. Von Eschen, *Satchmo Blows up the World: Jazz Ambassadors Play the Cold War*, 1st Harvard University Press paperback edition (Cambridge, Massachusetts London, England: Harvard University Press, 2006); Fredrik Logevall, *Embers of War: The Fall of an Empire and the Making of America's Vietnam*, Pbk. ed. (New York, NY: Random House, 2013); Odd Arne Westad, *The Global Cold War: Third World Interventions and the Making of Our Times*, 12th printing (Cambridge: Cambridge University Press, 2016); Susanne Bauer and Tanja Pentz, *Tracing the Atom: Nuclear Legacies in Russia and Central Asia*, 1st ed. (London: Routledge, 2022), <https://doi.org/10.4324/9781003246893>; Jayita Sarkar, *Ploughshares and Swords: India's Nuclear Program in the Global Cold War* (Ithaca [New York]: Cornell University Press, 2022).

⁵ Francis Fukuyama, *The End of History and the Last Man: With a New Afterword*, 1. Free Press trade paperback ed., [Nachdr.] (New York, NY: Free Press, 2006); Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, 1. Simon & Schuster paperback ed, The New York Times Bestseller (New York: Simon & Schuster, 2003).

Afghan War, and subsequent conflicts as a result of the superpowers taking sides and fighting proxy wars in these areas of the world. Especially by training and equipping Muslim forces in the Middle East, the United States helped give rise to violence that it continues to fight today. Chamberlin argues that the devastation brought by American military action gives space for the rise of violent organizations such as ISIS and the Khmer Rouge.⁶ Just because the violence and death happened far away from either the Soviet Union or the United States, that does not absolve these powers from the deaths that they helped to cause and the instability which continues to affect our world today.

Nuclear Deterrence

Nuclear deterrence was a key strategy for both sides during the Cold War and since. With nuclear weapons added to the arsenals of the superpowers, the goal was to not use these weapons, a change of the strategy from winning wars to deterring wars from beginning in the first place. As General Russell Dougherty put it, deterrence was the product of capability and will; if either factor was zero, then the product was zero.⁷ This strategy depended on having the weapons, being willing to use them, and, importantly, the enemy's perception that you would be willing to use them if pressed.⁸ It also relied on the man at the tip of the spear being able to trust the system of which he was a part. When the order came to launch, he had to be sure of it. Nuclear deterrence was the defining feature of the Cold War and remains a key strategy in national security today. As a field

⁶ Paul Thomas Chamberlin, *The Cold War's Killing Fields: Rethinking the Long Peace*, First edition (New York, NY: Harper, an imprint of HarperCollins Publishers, 2018).

⁷ Chris Adams, *Inside the Cold War: A Cold Warrior's Reflections* (Maxwell Air Force Base, Ala: Air University Press, 1999).

⁸ David Fisher, *Morality and the Bomb: An Ethical Assessment of Nuclear Deterrence* (S.l.: ROUTLEDGE, 2022).

of study, nuclear deterrence has its own rich and varied historiography and schools of debate.⁹

One theory by preeminent Cold War historian John Lewis Gaddis is that nuclear weapons' deterrent capabilities worked, but they caused the conflict to increase in duration. One of the effects of this longer duration was that nuclear weapons increased in magnitude as destructiveness became the goal when the number of weapons began to be regulated.¹⁰ Strategy also evolved from an inflexible overwhelming response during the Eisenhower Administration to minimum deterrence with a controlled response under Kennedy, thanks to a recommendation of his Defense Secretary, Robert McNamara. Submarines were a vital part of this nuclear deterrence program starting with the Regulus missile submarines and continuing with the improvement of the Polaris missile and the 41 for Freedom. Second strike capability was the lynchpin requirement for deterrence policy to be effective, and submarines were the key to that capability.¹¹

⁹ Thomas C. Schelling, *Arms and Influence* (New Haven: Yale University Press, 1966); Benoît Péloupidas et al., eds., *The War That Must Never Be Fought: Dilemmas of Nuclear Deterrence* (Stanford/Cal: Hoover Institution Press, 2015); Lawrence Freedman, *Deterrence*, Reprinted (Cambridge: Polity Press, 2009); Scott Douglas Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate*, 1st ed (New York: W.W. Norton, 1995); Scott D. Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed* (New York: Norton, 2003); Scott Douglas Sagan and Kenneth Neal Waltz, *The Spread of Nuclear Weapons: An Enduring Debate: With New Chapters on Iran, Iraq, and North Korea, and on the Prospects for Global Nuclear Disarmament*, Third edition (New York London: W.W.Norton & Company, 2013); Bernard Brodie, ed., *The Absolute Weapon: Atomic Power and World Order* (New York: Harcourt, Brace, and Company, 1946); Vipin Narang and Scott Douglas Sagan, eds., *The Fragile Balance of Terror: Deterrence in the New Nuclear Age*, Cornell Studies in Security Affairs (Ithaca [New York] London: Cornell University Press, 2022); Paul Huth and Bruce Russett, "What Makes Deterrence Work? Cases from 1900 to 1980," *World Politics* 36, no. 4 (July 1984): 496–526, <https://doi.org/10.2307/2010184>; Do Young Lee, "Strategies of Extended Deterrence: How States Provide the Security Umbrella," *Security Studies* 30, no. 5 (October 20, 2021): 761–96, <https://doi.org/10.1080/09636412.2021.2010887>.

¹⁰ David Kunsman and Douglas Lawson, "A Primer on U.S. Strategic Nuclear Policy," January 1, 2001, <https://doi.org/10.2172/776355>, 13.

¹¹ Todd S. Sechser and Matthew Fuhrmann, "Crisis Bargaining and Nuclear Blackmail," *International Organization* 67, no. 1 (January 2013): 173–95, <https://doi.org/10.1017/S0020818312000392>; Todd S. Sechser and Matthew Fuhrmann, *Nuclear Weapons and Coercive Diplomacy*, 1st ed. (Cambridge

A key underpinning assumption of nuclear deterrence theory was that the powers who controlled nuclear weapons would act rationally, that is, they would perform predictably and understandably, and they would be deterred by the rational consequences of their actions.¹² This assumption of rational action could and did create surprises based on differing values between actors. Once rational action was defined, then the value of nuclear weapons on deterrence and deterrence itself could be debated. Robert Jervis theorized that the threat of nuclear weapons meant that the kind of security that was available in the past before the nuclear era was no longer possible in *The Illogic of American Nuclear Strategy*.¹³ Matthew Kroenig responded thirty years later in *The Logic of American Nuclear Strategy* that nuclear superiority is key. Rather than toeing the conventional line that second strike capability is the minimum necessary and anything over that is too much, he says that nuclear superiority gives the chance to destroy the enemy's stockpile and enhances the country's security, whereas others believe that once second strike capability has been achieved, that should be plenty to guarantee security.¹⁴ Other historians have argued that nuclear weapons increased tensions and provoked conventional action that deterrence theory suggested they should prevent.¹⁵ Additionally, brinkmanship theory says that nuclear weapons caused leaders to take risks they

University Press, 2016), <https://doi.org/10.1017/9781316227305>; Isaac Jenkins et al., "Producing Second Strike," Project on Nuclear Issues (Center for Strategic and International Studies (CSIS), 2018), JSTOR, <http://www.jstor.org/stable/resrep22425.14>.

¹² Stephen Maxwell, "Rationality in Deterrence," *The Adelphi Papers* 8, no. 50 (August 1968): 1–19, <https://doi.org/10.1080/05679326808448106>.

¹³ Robert Jervis, *The Illogic of American Nuclear Strategy*, 2. pr, Cornell Studies in Security Affairs (Ithaca, N.Y. u.a: Cornell Univ. Pr, 1986).

¹⁴ Matthew Kroenig, *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters* (New York: Oxford university press, 2018).

¹⁵ Kenneth L. Schwab, *After the Cold War: Questioning the Morality of Nuclear Deterrence*, ed. Charles W. Kegley (Place of publication not identified: Routledge, 2021).

otherwise would not have to achieve political ends.¹⁶ Some examples of this are the Berlin Airlift followed by the Berlin Crisis of 1961, the Korean War, and the Cuban Missile Crisis.

Big Navy

World War II, especially the Pacific Theater, showed that the Navy had a much bigger role to play in national defense than it previously did. The Navy added air war to its capabilities and submarines took on a much bigger responsibility than they had had in the past. World War II American submarines sank 52% of all Japanese shipping. The Battle of the Coral Sea was fought completely by aircraft launched from ships who remained out of sight of one another. The dawn of the Cold War brought new technologies which would drastically increase the Navy's combat responsibilities. The Navy took on a significant role in the Korean War, the Cuban Missile Crisis, the Vietnam War, and, at the end of the Cold War, Operations Desert Shield and Desert Storm.¹⁷ Nuclear power advances allowed for fossil fuel near independence in submarines, aircraft carriers, and guided missile cruisers.¹⁸ Aircraft carriers and their support battle groups became the new standard in threat presence around the world. Submarines combined the new technologies of nuclear power and nuclear guided missiles to take on their new role in nuclear deterrence where they could reach far into the interior of continents.

¹⁶ David M. Watry, *Diplomacy at the Brink: Eisenhower, Churchill, and Eden in the Cold War* (Baton Rouge: Louisiana State University Press, 2014).

¹⁷ Daniel Carrison, "The Role of the Navy in the Cold War," *USNI* 85, no. 6 (June 1959).

¹⁸ Nuclear-powered ships and submarines have an emergency diesel generator as a backup for the reactor which requires fossil fuels to run. The fuel also serves extra duty as secondary shielding protecting the crew areas from radiation.

Submarines

The nuclear triad consists of land-based intercontinental ballistic missiles hidden deep in silos across the Great Plains states, nuclear-capable alert bombers ready to be airborne in minutes before any enemy-launched missile would land, and submarine-launched ballistic missiles hidden in the depths of the ocean. Each of these can provide second strike abilities to the nation, but submarines are by far the most secure side of the triad for second strike due to the unpredictable and expansive nature of the oceans where submarines hide. The connection between submarines and second-strike nuclear deterrence became so obvious that very little interrogation of them as the best choice to fill that role has happened since they were developed.¹⁹ The United States developed the SOSUS underwater sound array to detect enemy submarines, and it worked.²⁰ American submarines remained quiet with new sound silencing developments so they could be an effective nuclear deterrent while Russian submarines were much more easily tracked.²¹

When it comes to books about submariners, many of them are written by submariners about their own experiences.²² Submarine books also tend to be written

¹⁹ Kevin P. Chilton, “Defending the Record on US Nuclear Deterrence,” *Strategic Studies Quarterly* 12, no. Spring (January 1, 2018), <https://www.jstor.org/stable/26333874>; Owen R. Cote, “Invisible Nuclear-Armed Submarines, or Transparent Oceans? Are Ballistic Missile Submarines Still the Best Deterrent for the United States?,” *Bulletin of the Atomic Scientists* 75, no. 1 (January 2, 2019): 30–35, <https://doi.org/10.1080/00963402.2019.1555998>; Rose Gottemoeller, “The Standstill Conundrum: The Advent of Second-Strike Vulnerability and Options to Address It (Fall 2021),” 2021, <https://doi.org/10.26153/TSW/17496>.

²⁰ William Beecher, “New Soviet Subs Relatively Noisy, Easy to Detect,” *New York Times*, October 8, 1969.

²¹ Cote, “Invisible Nuclear-Armed Submarines, or Transparent Oceans?”

²² Alfred Scott McLaren, *Emergency Deep: Cold War Missions of a Submarine Commander*, Maritime Currents: History and Archaeology (Tuscaloosa: The University of Alabama Press, 2021); Alfred Scott McLaren, *Silent and Unseen: On Patrol in Three Cold War Attack Submarines* (Annapolis, Maryland: Naval Institute Press, 2015); CHARLES A. LOCKWOOD, *SINK 'EM ALL: Submarine Warfare in the Pacific* (Place of publication not identified: LULU COM, 2017); Richard H. O’Kane, *Clear the Bridge!: The War Patrols of the U.S.S. Tang*, 1st Ballantine books ed (New York, NY: Ballantine Books, 2003);

about fast attack submarines rather than ballistic missile submarines, because fast attack submarines get the more interesting missions.²³ One of the most well-known books written about fast-attack Cold War submarines and their incredibly dangerous missions was *Blind Man's Bluff*, by journalists Sherry Sontag, Christopher Drew, and Annette Lawrence Drew, about submarine special operations during the Cold War.²⁴ This was among the first times the public learned about a small percentage of these special operations which included tapping communications cables, salvaging a sunken Soviet submarine, and numerous collisions between submarines. The book was like something out of a Cold War spy novel, and the stories seemed surreal in their excitement.

Just after the end of the Cold War, naval historian Dan van der Vat wrote *Stealth at Sea*, an updated history of the submarine, from the earliest submersibles to his present-day nuclear-powered and nuclear-armed ships.²⁵ Submarines began the century barely submersible and ended it as the most dangerous of war machines, and van der Vat did an excellent job sharing that unique story. Historian Thomas Parrish did much the same in 2005 with *The Submarine*.²⁶ He focused on the role of the submarine in World War I, World War II, and the Cold War, respectively; the people who developed submarines; and the heroes who sailed them. These submarine heroes are a popular theme for books about submarines. Lawrence Goldstone wrote in *Going Deep: John Philip Holland and the Invention of the Attack Submarine* about the man who sold the US Navy its first

Dan Summitt, *Tales of a Cold War Submariner*, 1st ed, Texas A & M University Military History Series 95 (College Station: Texas A&M University Press, 2004).

²³ Sherry Sontag, Christopher Drew, and Annette Lawrence Drew, *Blind Man's Bluff: The Untold Story of American Submarine Espionage* (New York: Public Affairs, 1998).

²⁴ Ibid.

²⁵ Dan Van der Vat, *Stealth at Sea: The History of the Submarine* (Boston: Houghton Mifflin, 1995).

²⁶ Thomas Parrish, *The Submarine: A History* (New York, N.Y.: Penguin, 2005).

submarine, his competition for the builder's contracts, Simon Lake, and the race for early submarine technological development, innovation, and genius.²⁷

The Bravest Man by William Touhy covers the story of Medal of Honor recipient Richard O'Kane, who was the most highly decorated Naval Officer of World War II, the Captain of the *USS Tang* (SS-306) which was the submarine with both the highest tonnage sunk in the war and most ships sunk, and he was one of only five survivors of the *Tang's* final patrol when it sank due to its own torpedo.²⁸ Investigative reporter James Scott wrote about *Tang*, *Silversides*, and *Drum* in *The War Below: The Story of Three Submarines That Battled Japan* using oral histories of sailors who were stationed on the boats and their written materials, including letters and diaries.²⁹ These personal stories put the reader right into the submarine for battles against the enemy.

Unique amongst submarine books is *Eminent Americans: Namesakes of the Polaris Submarine Fleet* by Admiral Hyman G Rickover.³⁰ Rickover rode each boat during sea trials, so he began the work while he was still underway on those trials, writing a letter to Congress about each of the 41 for Freedom's namesakes. Later, desiring to turn these short letters into a full book, he had the time and resources to complete these essays about the men after whom these ships were named, so the admiral expanded each essay into a couple of thorough pages about each of his subjects.

²⁷ Lawrence Goldstone, *Going Deep: John Philip Holland and the Invention of the Attack Submarine*, First Pegasus books edition (New York London: Pegasus Books, 2017).

²⁸ William Tuohy, *The Bravest Man: The Story of Richard O'Kane & U.S. Submariners in the Pacific War* (Stroud: Sutton, 2001).

²⁹ James Scott, *The War below: The Story of Three Submarines That Battled Japan*, First Simon&Schuster paperback edition (New York London Toronto: Simon & Schuster paperbacks, 2014).

³⁰ Hyman Rickover, *Eminent Americans: Namesakes of Polaris Submarine Fleet*, 1st ed. (Government Printing Office, 1972).

Rickover, himself, is a figurative giant in submarine and atomic energy history, although literally, he was a “wisp of a man at barely five and a half feet tall and 125 pounds.”³¹ Rickover has been the subject of at least nine biographies including one published as recently as 2023 thanks to the availability of his papers and remains the longest-serving officer in US Navy history at 63 years of service.³² Rickover maintained unprecedented control over the men who served on his ships and ran his reactors throughout his tenure.

Personal submarine histories are important to the historiography of submarines as so much of their work is classified and necessarily shrouded in mystery that remains unavailable to those outside the community. Alfred Scott McLaren wrote two books about his time on Cold War submarines, *Emergency Deep* about his time commanding the *USS Queenfish* (SSN-651), and *Silent and Unseen* about serving on *USS Greenfish* (SS-351), *USS Seadragon* (SSN-584), and *USS Skipjack* (SSN-585).³³ Similarly, Dan Summitt wrote *Tales of a Cold War Submariner* about his time commanding *Seadragon* and *USS Alexander Hamilton*, along with serving at the Pentagon in Naval Reactors under Admiral Rickover.³⁴ After serving aboard submarines and then a full civilian career as an engineer, Gene Masters began to write fiction books about submarines based on

³¹ Marc Wortman, *Admiral Hyman Rickover: Engineer of Power*, Jewish Lives (New Haven: Yale University Press, 2022), 4.

³² Hewlett, Richard G., and Francis Duncan. *Nuclear Navy, 1946-1962*. Chicago: University of Chicago Press, 1974; Polmar, Norman, and Thomas B. Allen. *Rickover*. New York: Simon and Schuster, 1982; Polmar, Norman, and Thomas B. Allen. *Rickover: Controversy and Genius; a Biography*. New York: Simon and Schuster, 1984; Rockwell, Theodore. *The Rickover Effect: How One Man Made a Difference*. Annapolis (Md.): Naval institute press, 1992; Duncan, Francis. *Rickover and the Nuclear Navy: The Discipline of Technology*. Annapolis, Md: Naval Institute Press, 1990; Wortman, Marc. *Admiral Hyman Rickover: Engineer of Power*. Jewish Lives. New Haven: Yale University Press, 2022.

³³ McLaren, *Emergency Deep*; McLaren, *Silent and Unseen*.

³⁴ Summitt, *Tales of a Cold War Submariner*.

stories he heard or experienced during his time serving. He has written three of these books so far.³⁵

This is far from a complete submarine historiography, but instead reveals examples of the types of submarine books that have been written in recent decades and their varying purposes. Many are by submariners about their own experiences to share their life and excitement with the wider public.³⁶ They do not necessarily have a historical argument to make but are there to inform and even entertain. Other books tell the history of submarines for academics or hobbyists to understand their development.³⁷ Still others are written about important figures in submarine history and their achievements.³⁸ There are also a few novels that fictionalize real-life submarine events.³⁹ The majority of all these previous types of submarine books are written by submariners,

³⁵ Eugene Masters, Interview with the Author, February 1, 2024.

³⁶ Edward L. Beach, *Submarine!* (New York: Pocket Star Books, 2004); Edward L. Beach, *Around the World Submerged: The Voyage of the Triton* (Annapolis, MD: Naval Institute Press, 2001); Edward L. Beach, *Salt and Steel: Reflections of a Submariner* (Annapolis, Md: Naval Institute Press, 1999); Ted E. Dubai, *Three Knots to Nowhere: A Cold War Submariner on the Undersea Frontline* (Jefferson, North Carolina: McFarland & Company, Inc., Publishers, 2014); Eugene B. Fluckey, *Thunder below!: The USS Barb Revolutionizes Submarine Warfare in World War II*, 1st pbk. ed (Urbana: University of Illinois Press, 1997); Richard H. O’Kane, *Wahoo: The Patrols of America’s Most Famous World War II Submarine*, Paperback ed (Novato, Calif: Presidio Press, 1996); William J. Ruhe, *War in the Boats: My World War II Submarine Battles* (Washington: Brassey’s, 1994).

³⁷ John Parker and Francis Crosby, *The World Encyclopedia of Submarines: A Complete History of over 150 Underwater Vessels from the Hunley and Nautilus to Today’s Nuclear-Powered Submarines* (London: Lorenz Books, 2023); David Ross, *Submarines: The World’s Greatest Submarines from the 18th Century to the Present*, Amber edition (London: Amber Books, 2022); Edward L. Beach, *The United States Navy: 200 Years*, 1. ed (New York: Holt, 1986); Norman Polmar and Kenneth J. Moore, *Cold War Submarines: The Design and Construction of U.S. and Soviet Submarines*, 1. ed (Dulles, Va.: Potomac Books, 2005).

³⁸ Norman Polmar, *The Death of the USS Thresher: The Story behind History’s Deadliest Submarine Disaster*, Second Lyons Press paperback edition (Guilford, Connecticut: Lyons Press, an imprint of Globe Pequot, 2017); Tuohy, *The Bravest Man*; Fran Hawk and Monica Wyrick, *The H.L. Hunley Submarine: History and Mystery from the Civil War*, Young Palmetto Books (Columbia, South Carolina: The University of South Carolina Press, 2017); Rachel Lance, *In the Waves: My Quest to Solve the Mystery of a Civil War Submarine* (New York: Dutton, an imprint of Penguin Random House LLC, 2020); Claude Berube and Samuel Limneos, eds., *Rickover Uncensored* (Focsle Up, 2023).

³⁹ Edward L. Beach, *Run Silent, Run Deep* (London: Cassell, 2003); Gene Masters, *Silent Warriors: Submarine Warfare in the Pacific*, First edition (Hendersonville, NC.: Escarpment Press, 2018); Irving A. Greenfield, *Depth Force* (Ilkley: Sapere Books, 2023).

or at least by naval historians. Occasionally, writers, especially journalists, from outside the submarine community will find a story and share new details about submarine life with the public.⁴⁰ My own ship was the subject of a CNN segment about Ice Exercise 2011.⁴¹ ICEX is an excellent opportunity to make submarine operations public because it is a combined scientific and military exercise in an important newly available area of operations, and again this year it attracted wide attention and good publicity.⁴² The public remains fascinated with the Silent Service and these stories are always popular.⁴³

Submarine books are often regarded by scholars as belonging to the unfortunate category of popular history rather than the subject of serious academic historical study. Part of this has to do with their biographical or autobiographical nature, part has to do with the classified nature of their operations, and part has to do with criticisms of traditional military history in general. Regardless of academic biases, submarines and the submariners who sail them are deserving of serious scholarship. Their stories, their sacrifices, and their steadfast devotion to duty deserve historical study worthy of their efforts. The men who operated the 41 for Freedom deserve to have their lives

⁴⁰ David Schultz, *Peril in the Deep: Adventures of the WWII Submarine USS Burrfish*, 2022; George J. Billy, *The USS Swordfish: The World War II Patrols of the First American Submarine to Sink a Japanese Ship* (Jefferson, North Carolina: McFarland & Company, Inc., Publishers, 2019); Scott, *The War Below*; W. Craig Reed, *Red November: Inside the Secret U.S.-Soviet Submarine War*, 1st ed (New York: William Morrow, 2010); Stephen L. Moore, *Strike of the Sailfish: Two Sister Submarines and the Sinking of a Japanese Aircraft Carrier* (New York: Caliber, 2023); Douglas A. Campbell, *Eight Survived: The Harrowing Story of the USS Flier and the Only Downed World War II Submariners to Survive and Evade Capture*, Second Lyons paperback edition (Guilford, Connecticut: Lyons Press, 2018); Josh Dean, *The Taking of K-129: How the CIA Used Howard Hughes to Steal a Russian Sub in the Most Daring Covert Operation in History* (New York, New York: Dutton, 2017).

⁴¹ *CNN Ice Wars - USS Connecticut ICEX 2011* (CNN, 2014), <https://youtu.be/4PhvRf1HWMg?si=HpdaT5yQcYpLoGIn>.

⁴² Michaela White, "Navy Launches Operation Ice Camp 2024 in the Arctic Ocean," *SUBLANT*, March 8, 2024, Online edition.

⁴³ *How I Boarded a US NAVY NUCLEAR SUBMARINE in the Arctic (ICEX 2020) - Smarter Every Day 237* (Smarter Every Day, 2020).

remembered for the isolation, the missed family time, and the hardship they endured. Not only did they make those sacrifices, but they also served and protected the country for decades during a tumultuous time.

Medical Considerations

In addition to the challenges that submariners must face coping with the stress and psychological difficulties associated with isolation, they must also be prepared to deal with illness and injury while remaining on station as much as necessary for their missions in support of national security. Navy Lieutenant Dr. Luke Beardsley compiled a recent review study on the status of submarine medicine, its progress over the decades, and gaps in the body of research that need to be filled. In 2019, he published *Submarine Medicine: An Overview of the Unique Challenges, Medical Concerns, and Gaps* as the first comprehensive overview of submarine medical practice since the 1950s. Beardsley includes some key concerns regarding submarine medicine, including major medical concerns, illness and injury, long-term health effects, submarine atmospheres, fatigue, reproductive health, radiation health, and cardiovascular health associated with long hours at sea and minimal exercise equipment. The gaps he identifies in submarine knowledge include mental health screening and support, escape and rescue, atmospheric monitoring, long-term health effects, fatigue, and prolonged field care, especially for things like acute abdominal issues such as appendicitis or kidney stones or control of hemorrhages.⁴⁴ Closing these gaps would allow medical practitioners to help ensure the

⁴⁴ Luke A. Beardslee, Ben D. Lawson, and David P. Regis, “An Overview of the Unique Field of Submarine Medicine,” Technical Report (Groton, CT: Naval Submarine Medical Research Laboratory, March 10, 2019), 22.

health and readiness of our submarine sailors while underway and can be applied to other isolated populations.

These same concerns have been the subject of other studies by scientists interested in the health of submariners while deployed. *Psychological Considerations in Submarine Escape Training: Brief Overview and Future Directions* by Charles H. Van Wijk is concerned with both the mental and physical aspects of training to be in a disabled submarine at sea and attempting to escape, something that weighs on the mind of every submariner who goes to sea.⁴⁵ In *Changes in Body Composition of Submarine Crew During Prolonged Submarine Deployment*, Indian scientists considered weight and body fat percentage change in a submarine crew over a 26-day underway. They found that both weight and body fat percentage changed by half of a percent, which was contrary to a study of American submariners in which more than half the crew lost weight while nearly a third gained.⁴⁶ The authors attribute the difference to more of the crew actively dieting, but a contributing factor they ignored is that the underway period was nearly three times as long for the Americans as for the Indian submarine crew. Submariners as a research subject continue to interest physicians and psychologists and their history of contributing to medicine is important to be considered.⁴⁷

⁴⁵ Charles H. Van Wijk, “Psychological Considerations in Submarine Escape Training: Brief Overview and Future Directions,” *International Maritime Health* 68, no. 3 (September 27, 2017): 168–73, <https://doi.org/10.5603/IMH.2017.0030>, 168.

⁴⁶ Sourabh Bhutani et al., “Changes in Body Composition of Submarine Crew during Prolonged Submarine Deployment,” *Journal of Marine Medical Society* 17, no. 2 (2015): 101, <https://doi.org/10.4103/0975-3605.203695>, 103.

⁴⁷ Mia Edgar, “COVID-19 on Board a Submarine; a Retrospective Review,” *Military Medicine* 187, no. 11–12 (October 29, 2022): 325–325, <https://doi.org/10.1093/milmed/usac270>; Mia Edgar, Michael A Franco, and Hugh M Dainer, “Case Series of Arterial Gas Embolism Incidents in U.S. Navy Pressurized Submarine Escape Training From 2018 to 2019,” *Military Medicine* 186, no. 5–6 (May 3, 2021): e613–18,

<https://doi.org/10.1093/milmed/usaa233>; Carl Edmonds et al., *Diving and Subaquatic Medicine*, Fifth edition (Boca Raton: CRC Press, Taylor & Francis Group, 2016); V Lloro et al., “The Incidence of Dental Needs During Isolated Missions Compared to Non-Isolated Missions: A Systematic Review and Implications for Future Prevention Strategies,” *Military Medicine* 184, no. 3–4 (March 1, 2019): e148–55, <https://doi.org/10.1093/milmed/usy364>.

CHAPTER 2

SUBMARINE DEVELOPMENT AND COLD WAR BACKGROUND

For heroism and devotion to duty while serving on board the U.S. submarine 0-5 at the time of the sinking of that vessel. On the morning of 28 October 1923, the 0-5 collided with the steamship *Abangarez* and sank in less than a minute. When the collision occurred, Breault was in the torpedo room. Upon reaching the hatch, he saw that the boat was rapidly sinking. Instead of jumping overboard to save his own life, he returned to the torpedo room to the rescue of a shipmate who he knew was trapped in the boat, closing the torpedo room hatch on himself. Breault and Brown remained trapped in this compartment until rescued by the salvage party 31 hours later.

- Medal of Honor citation for Torpedoman Second Class Henry Breault⁴⁸

The United States Submarine Force was born on April 11, 1900, with the purchase of *USS Holland* (SS-1), designed by Irish immigrant John Phillip Holland. Prior to his design, submarines were extremely unreliable, barely submersible, and killed far more of their own crew than the enemy.⁴⁹ Even with his new design, early submarines were tiny, had almost no capability, and were still extremely dangerous. During this era, the only enlisted submariner to earn the Medal of Honor, Torpedoman's Mate Henry Breault, earned this highest distinction by going back into his ship, the *USS O-5* (SS-66), while it was sinking, securing the watertight hatch to the torpedo room, and saving the lives of him and his shipmate who was sleeping in there. They were rescued after thirty-one hours on the bottom of the Panama Canal. Submarines were continually slightly

⁴⁸ "Medal of Honor Citation" (Congressional Medal of Honor Society, October 28, 1923), <https://www.cmohs.org/recipients/henry-breault>.

⁴⁹ Lance, Rachel. *In the Waves: My Quest to Solve the Mystery of a Civil War Submarine*. New York: Dutton, an imprint of Penguin Random House LLC, 2020.

Three notable submarines prior to 1900 were David Bushnell's Revolutionary War-era *Turtle*, which failed to sink *HMS Eagle*; the Civil War-era *USS Alligator*, which was lost and sank without achieving anything, and the Civil War ship *CSS H L Hunley*, which lost 20 crew in testing and which was the first submarine to sink an enemy, the *USS Housatonic*, while again sinking with all five crew lost.

improved over the next decades and adopted by other navies until World War II showed their true capabilities. The biggest improvement during this period was made by the Dutch navy; the snorkel allowed a submarine to run its diesel engine and charge the battery while only exposing a small mast above the surface. Running the diesel meant that they were still easily detectable by SONAR when it was used. When the Japanese attack on Pearl Harbor destroyed a large percentage of the Pacific Fleet, it left untouched the submarine fleet. Submarines took to the seas in vengeance and sank over five million tons of Japanese ships, just over half of merchant shipping, and one train, although they took heavy losses to do so. They also performed rescues of ship crews and downed airmen, including future President George H.W. Bush.

After World War II, both the Americans, British, French, and Soviets were stealing design advancements made by the Germans in their Type XXI submarines to improve their own ships' range, speed, and hydrodynamic profiles, despite the Type XXI being overall a mess due to its short development cycle. These include Greater Underwater Propulsion Power Program (GUPPY) ship improvements in three classes of American ships and other influences in three classes of Russian ships.⁵⁰ Before the outbreak of war in the Korean Peninsula, the military was being reduced in size and the services were competing for funding in this new peacetime footing. On the other hand, the Russians were believed to be working to drastically increase the size of their submarine fleet. The biggest prize was the atom bomb, and both the brand-new Air Force and the Navy had deep desires for it. Additionally, designs were being developed for a

⁵⁰ Norman Friedman, *Submarine Design and Development* (Annapolis, Md: Naval Institute Press, 1984), 57.

nuclear power plant and new ships to contain it. Aircraft carriers had proven their use during the war in the Pacific and were a natural choice for a fuel-independent design. Thanks in large part to Commander Robert “Swede” Olsen at Naval Research Laboratory in Oak Ridge, Tennessee, submarines were also a focus for this new power source. New power and an ability to stay underwater indefinitely also resulted in a design change from resembling surface ships as they had done in the past to the hydrodynamic teardrop shape starting with the research submarine *USS Albacore* (AGSS-569) which made submarines quieter and faster. These developments made it possible for the *USS Nautilus* to report “Under way on nuclear power.”⁵¹ Submarines were forever changed.

The Threat of *Sputnik*

Starting with the commissioning of the *USS George Washington* (SSBN-598) and ending with the *USS Will Rogers* (SSBN-659), the 41 ships of the classes *George Washington*, *Ethan Allen*, *Lafayette*, *James Madison*, and *Benjamin Franklin* were the United States’ answer to the increasing threat of nuclear annihilation presented by Russia’s *Sputnik* launch. On October 4th, 1957, the first artificial satellite was launched into space. After the USSR successfully tested an atomic weapon in 1949, *Sputnik* gave them the capability to detonate that weapon anywhere around the world, and the United States was vulnerable to Soviet missile technology; a perceived “missile gap” had developed between the two superpowers.⁵² In an analysis of the missile gap myth, Dr. Jonathan Renshon noted that President Eisenhower never believed the existence of the

⁵¹ Parrish, *The Submarine*, 433-435, 471.

⁵² “Navy Tells of Grounding Of Submarine Off Scotland,” *New York Times*, April 6, 1968; “Undersea Threat to US Stressed: Admiral Burke Says Soviet Plans Submarine Missiles and Atom Torpedoes,” *New York Times*, November 13, 1955.

missile gap while Kennedy made it a central pillar of his election platform. Only after he was elected did Kennedy have his Secretary of Defense Robert McNamara examine the truth of the missile gap more closely, wherein he determined that it was not true. Neither Eisenhower nor McNamara had actual evidence for their conclusions but were using the best intelligence available to make their determinations.⁵³ The existence of the missile gap was based on faulty assumptions of Soviet capability and intent and then the denial of it was based on the feeling that those assumptions were wrong. As the intelligence became more accurate, the missile gap was determined to be nonexistent, and in fact, the United States had the advantage in the missile gap for at least the next few years.

One of the earliest defense strategies of the nuclear era was the Assured Vulnerability theory of deterrence which assumed that the superpowers would act rationally and understand that any extreme provocation could result in nuclear retaliation. The two uses of nuclear weapons were as a means of punishment or denial: punishing an enemy for acting or denying him the achievement of his objectives. Most national security theorists subscribe to the Assured Vulnerability (punishment) rather than denial. Assured Vulnerability morphed into Mutually Assured Destruction (MAD) during the Kennedy Administration wherein, if the two sides continued to act rationally and predictably, then neither would need to use their nuclear arsenals. This required a nuclear arsenal that was effective, invulnerable, and reliable, something achieved with the advent of submarine-launched ballistic Regulus and then Polaris missiles. This became the third

⁵³ Jonathan Renshon, "Assessing Capabilities in International Politics: Biased Overestimation and the Case of the Imaginary 'Missile Gap,'" *Journal of Strategic Studies* 32, no. 1 (February 2009): 115–47, <https://doi.org/10.1080/01402390802407475>.

leg of the nuclear deterrence triad, with the other two legs belonging to land-based intercontinental ballistic Minuteman missiles stationed in silos across the Great Plains and intercontinental strategic bombers which remained on alert status ready to launch at a moment's notice.

To respond to the missile gap and improve nuclear capability, then Secretary of the Navy, Thomas S. Gates, put forward a plan to have a nuclear-powered submarine capable of launching a Polaris missile with a range of 1,200 nautical miles at sea by the end of 1960. The Soviets were also believed to be developing ballistic missile submarines.⁵⁴ This was a big step up from the Regulus guided missile program where a missile was mounted to the top of a submarine and could only be launched from the surface, creating a vulnerability to detection and, therefore, destruction. Regulus also established the nuclear deterrent patrol standard, always keeping one missile at sea in each ocean aboard the five ships.

Steel Boats

To meet this requirement, a submarine already under construction would have to be reallocated to the new SSBN program. Luckily, there was just such a ship available. The third ship of the *Skipjack* class, the *USS Scorpion*, was cut in half and a 130-foot section was added for navigation and missile control equipment, auxiliary machinery, and two rows of eight missile tubes. This hull was renamed and gave the soon-to-be christened *USS George Washington* a final length of just over 380 feet and a displacement of 6,700 tons while the name *Scorpion* would still be used on a ship to be

⁵⁴ "Undersea Threat to US Stressed: Admiral Burke Says Soviet Plans Submarine Missiles and Atom Torpedoes."

built later which would go on to its own infamy as the last American submarine lost with all hands in 1968.⁵⁵ *George Washington* departed on her first deterrent patrol on November 15th, 1960 with sixteen missiles, ahead of the schedule put forward by Secretary Gates. It had test-launched two missiles earlier that summer to prove the concept. The message sent by Admiral Raborn, Director of Special Projects at the Bureau of Weapons, upon completion of the test launch, was “POLARIS-FROM OUT OF THE DEEP TO TARGET. PERFECT.”⁵⁶

41 for Freedom

At the christening ceremony for *USS George Washington*, Assistant Secretary of Defense Wilfred J McNeil said of the ship, it “incorporates into a single weapon system most of the great scientific developments which have so revolutionized warfare.”⁵⁷ The race to build enough of these fleet ballistic missile submarines had begun, and their demonstrations advanced their cause so that finally, with the full support of Congress and the administrations of both President Eisenhower and then President Kennedy after him, these boats and their missiles would be the national security priority.

Patrick Henry joined *George Washington* on patrol before the end of 1960. By 1967, all forty-one ballistic submarines had been commissioned and were built with improved characteristics, including deeper operating depths, while the weapons bureau improved the Polaris missile with a longer range, giving the Navy 656 missiles on 41 boats.⁵⁸ Each of the 41 submarines was equipped with 16 Polaris missiles with a warhead

⁵⁵ Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982), 544.

⁵⁶ *Ibid*, 546.

⁵⁷ *Ibid*, 546.

⁵⁸ *Ibid*, 547.

yielding hundreds of kilotons which could be launched from underwater with a range of 1,200 nautical miles for the earliest Polaris and a range of 2,500 for the later, upgraded versions. When reporting on the commissioning of the *George Washington*, reporter Hanson Baldwin told the public that “there is no known defense against a ballistic missile once launched.”⁵⁹ The nature of submarines meant that they could launch these missiles from anywhere in any ocean, including the Arctic, after the *USS Nautilus* (SSN-571) proved it could be navigated in 1958. After watching a missile launch from the *USS Andrew Jackson*, and mere days before his assassination, President John F. Kennedy said, “It is still incredible to me that a missile can be successfully and accurately fired from beneath the sea. Once one has seen a Polaris firing, the efficacy of this weapons system as a deterrent is not debatable.”⁶⁰ With this new, reliable leg of nuclear deterrence available, the country’s strategic defense was now described by the Nuclear Triad of submarine-launched ballistic missiles (SLBM), land-based intercontinental ballistic missiles (ICBM), and US Air Force nuclear-capable bombers.⁶¹ The scope of this project can be seen in Table 2.1, with all 41 hulls and their commissioning dates listed. Each of these submarines needed two trained crews, expanding the number of submariners recruited by the Navy, trained to operate these reactors, and approved by Admiral Rickover by a significant amount during peacetime.

⁵⁹ Hanson W. Baldwin, “A New Era in Sea Power: First US Ballistic Missile Submarine May Revolutionize Strategic Concepts,” *New York Times*, December 30, 1959.

⁶⁰ Polmar and Allen, *Rickover*, 1982, 533.

⁶¹ *Ibid*, 547.

Submarine Training

Submarine sailors are among some of the most well-trained, best-equipped, best-fed, and psychologically scrutinized in the entire military force. This unique environment and situation caused incredible isolation for the crew and required the ultimate resilience in these men who were on the front lines of the Cold War deterring the Soviet Union from considering nuclear war. Expanding the time spent underwater and on patrol from 72 hours on diesel-electric submarines to indefinite using nuclear power increased the potential for psychological damage and the necessity of increased psychological screening. Despite the advancing technology and more demanding conditions, the one thing that has still never changed for submarines are the men that sail them, men who somehow adapt to the adverse conditions underwater and overcome them. Submarine service is and has always been an all-volunteer force. Every man who dives with the ship chooses to be there, which helps account for their great success through the decades and in each conflict in which they have taken part.

Nuke School

Nuclear training, as designed by Admiral Hyman G. Rickover, was meant to make the best and safest possible power plant operators. Rickover took the cream of the Naval Academy crop, the best Reserve Officer Training Corps (ROTC) graduates, and the smartest enlisted men he could find and sent them through his rigorous nuclear power training so that an inexperienced man never stood watch aboard one of his nuclear submarines, thus preventing any possible accidents. The nuclear navy has operated since *Nautilus* without an accident, proving Rickover's methods. To say this training was extensive would be quite an understatement. Nuclear-trained sailors, known as Nucs or

Nukes, were trained first at Navy basic training, then at their respective “A” schools to learn the technical aspects of their jobs. Following this, they transferred to Rickover’s nuclear power school, where he wrote all the technical manuals, and the instructors followed his program. In his own words, Rickover described his school as such, “The course at the nuclear power school lasts for six months and consists of approximately 700 hours of classroom instruction. The operational phase of training takes another six months and is conducted at one of the six land-based naval reactor prototypes.”⁶² His method worked. “In the school of the Nuc, there was no questioning of authority, no emphasis on educating the professional man. The nuclear power schools turned out technicians, whether they were officers or enlisted men.”⁶³ Their professional development should have come before, for officers, or later, for the enlisted men who would begin quickly climbing the ranks.

Rickover personally interviewed his submarine officers before they were allowed to attend nuclear power training, including the only US President to also have been a submarine officer, Jimmy Carter. President Carter recalled that during the interview, he was “saturated with cold sweat” as Rickover proved he knew more about every topic of discussion, which he let Carter choose.⁶⁴ The submarine force would come full circle in 2004 when the *USS Jimmy Carter* (SSN-23) was commissioned in a ceremony attended by the former President and sponsored by the former First Lady, Rosalynn. For decades, Rickover interviewed candidates, looking for some quality that would determine an

⁶² Ibid, 295.

⁶³ Ibid, 307.

⁶⁴ Ibid, 267.

acceptable candidate for nuclear training, the exact quality only existing “in his own mind.”⁶⁵ This interview system, despite being completely opaque to anyone else, seems to have worked long past when it made sense anymore. Representative Craig Hosmer said the following at the commissioning of the *USS Gato* (SSN-615) in 1968,

“The ship and her sisters are the finest products of the naval shipbuilding art ever fabricated. The officers and men who run her are the most carefully selected, the best-trained and educated, and the most highly motivated naval seamen the world has ever know [sic]. Crew and ship together represent the furthest advance of naval power in all history.”⁶⁶

Rickover looms large over the nuclear navy to this day, his training, and principles still in place. His legacy as the “Father of the Nuclear Navy” was cemented long ago, and he continues to be honored as such. The first submarine named after him was a *Los Angeles*-class that served from 1984 to 2006, and the newest submarine at the time of writing, commissioned just last year, is the *USS Hyman G. Rickover* (SSN-795).

Boomer Service

Submarine duty, especially onboard these new ballistic missile submarines, affectionately known as “Boomers”, was long, tiring, and isolated from any communication from home.⁶⁷ SSBNs have two separate crews, designated the Blue Crew

⁶⁵ Ibid, 291.

⁶⁶ Ibid, 351.

⁶⁷ A quick note here about submarine designators. In the abbreviation SSBN, the SS stands for subsurface ship, B is for ballistic missile, and N is for nuclear-powered, and the ship’s hull number follows that designation. Before nuclear power, submarines were simply SS, and SSNs are nuclear-powered fast-attack submarines. *USS Triton* was a unique radar picket submarine designated SSRN. Submarine tenders are designated AS, for Auxiliary ship, Submarines. Ballistic missile submarines and newer guided missile submarines carry missiles for land attack while fast attack submarines are the hunter-killers who are meant for combat against other submarines or surface ships, known to submariners as “targets.” Russian submarine classes receive a NATO phonetic alphabet designation which is how we know them, even though the Russians have their own class naming or numbering system.

and the Gold Crew, after the Naval Academy's colors. Each crew would typically take the boat for a three-week refit in port where anything that broke under the previous crew could be fixed and more extensive maintenance could be completed before embarking on patrol, which was typically around 70 days. For that entire patrol, the ship would remain submerged and alone unless an emergency forced them to surface. In addition, to maintain stealth, the ship would not transmit communications on any frequency, receiving only those communications from the supervising command that were necessary. Due to the necessity of keeping the fleet ballistic missile submarines on patrol as much as possible, some were forward deployed closer to the areas of interest. On the Pacific side, they were home-ported in Pearl Harbor, Hawaii, and forward deployed out of Guam; the Atlantic Fleet was home-ported up and down the coast in Connecticut, Virginia, South Carolina, and eventually Georgia, with some ships forward deployed out of Rota, Spain or Holy Loch, Scotland.

The first group of ballistic missile submarines commissioned between 1960 and 1967 was known as the "41 for Freedom" and became the blueprint for the fleet ballistic missile submarines to follow. These ships were spread between five classes with slight differences between them. Each class, as with all ship classes in the US Navy, was named after the lead ship of the class, and each ship was named after a notable person or people from US history. Lt. Carl Pilj served as the communications officer onboard the *USS George Bancroft*, named after the Secretary of the Navy during the James K. Polk administration, whom another of the 41 was named after.⁶⁸ Before Bancroft's

⁶⁸ Carl Pilj, Interview with the Author, March 16, 2023.

appointment, the US Navy officer corps was not formally educated like they are today, a development that Bancroft was responsible for. Congress at the time was against establishing any sort of formal Naval Academy, a proposal for which had been denied more than twenty times in forty-five years, a program which Bancroft thought necessary to attaining the discipline, professionalism, and academic standards required of the officer's corps of the navy of a world power. It sounds ludicrous now, but various Congressmen throughout the early 1800s believed that a Naval Academy could have no educational value for a career as a naval officer, that the United States would never have to fight another war, that it would give the President too much additional power, and their dislike of West Point as a military educational institution made them against the idea of a Naval Academy.⁶⁹ Bancroft found an abandoned army post, established his school there with funding just enough to last a semester, and ordered his midshipmen there as they returned to port. His school was so successful in this one semester that he was able to convince Congress to establish a formal Naval Academy. Bancroft is at least as well-known as a historian thanks to his 10-volume *History of the United States* and as an Ambassador to Germany wherein he worked at obtaining a path to American citizenship for German immigrants as he is the founder of the Naval Academy.⁷⁰

Nuclear Power

Nuclear power is, at the same time, both extremely simple and extremely complicated and dangerous. Radioactive materials create heat, which turns water into

⁶⁹ FM Brown, "A Half Century of Frustration: A Study of the Failure of Naval Academy Legislation Between 1800 and 1845," *Proceedings* 80, no. 6 (June 1954).

⁷⁰ Rickover, *Eminent Americans: Namesakes of Polaris Submarine Fleet*, 259-260.

steam, which turns turbine generators for movement and electricity. Simple, right? But lessons learned from nuclear disasters such as Chernobyl and Three-Mile Island make it clear to the operators and nearby populace that nuclear power plants require the utmost safety, professionalism, and training for their operators. For this reason, the Atomic Energy Commission (AEC) was established and maintained responsibility for the safe operation of all nuclear reactors. As nuclear power plants were being installed aboard ships, the AEC created a requirement that one of their personnel must be aboard each ship while underway to maintain safe control of the power plant and even have the authority to override the Captain on matters of nuclear power.

This requirement was, naturally, unacceptable to Admiral Rickover, who made the following deal with the AEC and the Navy: he would personally be held responsible for any nuclear power accidents, and, in exchange, he would also have final authorization over selection, training, and assignment of nuclear officers.⁷¹ This explains why he was so strict in his training system and why he required the freedom to personally interview every officer who served on submarines. As officers, Captain France and Lt Ferguson had personal interviews with the Admiral as part of their commissioning to nuclear officers, something required of all submarine officers with the sole exception of the Supply Officer, affectionately known as the Chop. Lt Pilj joined after the Admiral had retired and so avoided that ordeal.

Rickover, as usually described, was a hard man to work with. His interviews as mentioned earlier were notoriously legendary in their hostility and difficulty. He had a

⁷¹ Summitt, *Tales of a Cold War Submariner*, 189.

habit of yelling at anyone who crossed his path, whether they were above or below him in the chain of command. On one occasion, he “picked up the phone and proceeded to chew out the service’s senior civilian official [the Chief of Naval Operations (CNO)] up one side and down the other, just on general principle.”⁷² But when it came to being a leader, he was unmatched. Upon learning of the death of the wife of one of the earliest nuclear submariners of cancer, Commander Dan Summit typed up a condolence letter for the Admiral to sign and send to the widower. Rickover refused, later handing him a handwritten letter and envelope, saying, “A letter of condolence should have a more personal touch than a typewritten letter.”⁷³

Petty Officer Armbrust had the unusual experience of having Rickover sit in on one of his prototype classes. He was disappointed by the Admiral, the “living legend” whose reputation was chewing up other Admirals but was barely over five feet tall. He was, on the other hand, impressed by the entourage of brass that followed the Admiral in his suit. The Admiral was a genius who began a physics conversation with the instructor that nobody but the two of them could follow. Armbrust was later stationed on the *USS L. Y. Spear* (AS-36) submarine tender where Admiral Rickover had a designated stateroom with a flowered bedspread.⁷⁴

Submarine Life Cycle

Ballistic Missile submarines needed a lot of repair work after a certain number of patrols, eventually requiring a dry dock overhaul to improve the technology onboard to

⁷² Ibid, 191.

⁷³ Ibid, 198.

⁷⁴ Andy Armbrust, Interview with the Author, January 4, 2024.

keep up with advances made in missiles, torpedoes, SONAR, the nuclear reactor, or any other systems. These repairs and improvements could be extensive, sometimes lasting years. Because these submarines stayed on patrol as much as possible, boomer boat reactors were operated critically much more than fast attack submarines. In addition to this, these earlier reactors consumed their fuel more quickly than present-day reactors. This meant that their nuclear cores had to be renewed more often than they do today, requiring a dry-docking overhaul to refuel. Petty Officer Mike Gorham served on the *USS Sunfish* (SSN-649) when it entered the shipyard just for one of these overhauls.⁷⁵ On the *USS Hammerhead* (SSN-663), Petty Officer Andy Armbrust took the ship into the shipyard for a refueling overhaul while Petty Officer Marlin Helms brought the ship back out of the shipyard. The original core for the *Hammerhead* was only good for 7 years, but the new core lasted 15 years.⁷⁶ Both sailors were Engineering Laboratory Technicians (ELT) whose job onboard was to test the nuclear reactor for radiation, among other things, giving them an intimate understanding of the nature of such operations. Understanding that American nuclear power technology is classified, some information regarding their core lifespans has become available. Early versions of the reactor used in the 41 for Freedom had a core life of around 5,500 equivalent full power hours (EFPH) with advances allowing for refueled reactors to last 10,000 or 18,000 EFPH.⁷⁷ The new

⁷⁵ Mike Gorham, Interview with the Author, February 8, 2024.

⁷⁶ Marlin Helms, Interview with the Author, January 5, 2024.

⁷⁷ John Pike, "S5W Advanced Submarine Fleet Reactor (ASFR)," accessed February 13, 2024, <https://www.globalsecurity.org/military/systems/ship/systems/s5w.htm#:~:text=The%20early%20S5W%20reactor%20on,life%20of%20about%2018%2C000%20EFPH.>

Columbia-class ballistic missile submarines are expected to have a nuclear reactor core that lasts their full 40-year life.

SALT and Other Nonproliferation Agreements

At the same time as nuclear policy evolved from an overwhelming response to a secure second strike and more controlled response, the nuclear nonproliferation movement began to become more focused and vocal. Grassroots antinuclear organizations made their voices heard and the popular movement to ban the bomb gained steam. Additionally, Cold War standoffs over Berlin and the Cuban Missile Crisis brought the world to its closest danger of the use of nuclear weapons since the start of the conflict, causing the US and USSR to begin to recognize the need to reduce nuclear stockpiles and avert the danger of nuclear weapons' use. Arms control became a new priority of both superpowers. They also realized that continued nuclear proliferation had the potential to spread to countries thus far without the bomb, creating a threat of new nuclear powers, some of which might be unstable. This included countries such as India, Israel, and China, nations which could destabilize the delicate peace.

This new nonproliferation strategy required difficult negotiations between the two superpowers, who remained enemies in conflict around the world. In 1972, the countries signed a treaty with a mouthful of a name: the Interim Agreement Between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms (SALT I). This treaty had many stipulations, among them that the current levels of SLBMs and ballistic missile submarines would be maintained at 710 launchers spread among 44 submarines. The

Soviet Union was allowed to maintain 950 launchers spread among 62 submarines.⁷⁸

Even with these limitations, the two countries were able to continue making technological advances, improving through three generations of the Polaris missile to the Poseidon to the Trident missile, which would lend its name to the new *Ohio*-class ballistic missile submarine that replaced the 41 for Freedom starting in 1981.

SALT I was followed by SALT II in 1979 which was never ratified due to the Soviet invasion of Afghanistan. In 1991, an agreement was reached by the United States and the Soviet Union called Strategic Arms Reduction Treaties (START) which was followed in 1993 by START II which was again never ratified. Finally, New START was ratified in 2011 and set new limits for the nuclear powers. This resulted in the reduction of all three sides of the nuclear triad: fewer nuclear-capable bombers, missile silos, and fewer tubes on each of the ballistic submarines. It also requires inspection of weapons and facilities and communication between the powers regarding the production of new weapons.⁷⁹ Even though the Cold War is over, nuclear deterrence remains a vital component of international relations and the ultimate reduction of the number of nuclear weapons remains the goal.

⁷⁸ “INTERIM AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON CERTAIN MEASURES WITH RESPECT TO THE LIMITATION OF STRATEGIC OFFENSIVE ARMS (SALT I)” (Center for Nonproliferation Studies, May 26, 1972).

⁷⁹ “TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE RUSSIAN FEDERATION ON MEASURES FOR THE FURTHER REDUCTION AND LIMITATION OF STRATEGIC OFFENSIVE ARMS” (State Department, February 5, 2011).

CHAPTER 3

SUBMARINERS IN THEIR OWN WORDS

For distinguished gallantry and valor above and beyond the call of duty as commanding officer of the *U.S.S. Growler* during her Fourth War Patrol in the Southwest Pacific from 10 January to 7 February 1943. Boldly striking at the enemy in spite of continuous hostile air and antisubmarine patrols, Comdr. Gilmore sank one Japanese freighter and damaged another by torpedo fire, successfully evading severe depth charges following each attack. In the darkness of night on 7 February, an enemy gunboat closed range and prepared to ram the *Growler*. Comdr. Gilmore daringly maneuvered to avoid the crash and rammed the attacker instead, ripping into her port side at 11 knots and bursting wide her plates. In the terrific fire of the sinking gunboat's heavy machine guns, Comdr. Gilmore calmly gave the order to clear the bridge, and refusing safety for himself, remained on deck while his men preceded him below. Struck down by the fusillade of bullets and having done his utmost against the enemy, in his final living moments, Comdr. Gilmore gave his last order to the officer of the deck, "Take her down". The *Growler* dived; seriously damaged but under control, she was brought safely to port by her well-trained crew inspired by the courageous fighting spirit of their dead captain.

-Medal of Honor citation for Commander Howard W. Gilmore⁸⁰

A New Era of Submarines

Crash dives were common in the diesel-electric submarine era when they spotted enemies in the distance due to spending much of their time on the surface. However, this maneuver became much less common with the advent of nuclear power where submarines could stay underwater indefinitely. The only time a submarine might have to crash dive in the nuclear era was in the rare event that they were on the surface and

⁸⁰ "Medal of Honor Citation" (Congressional Medal of Honor Society, July 13, 1943), <https://www.cmohs.org/recipients/howard-w-gilmore>.

spotted a possible enemy they needed to avoid quickly. Just this rare combination of events happened one day to Lieutenant Carl Pilj when he was on the bridge of the *USS George Bancroft* (SSBN-643). The boat had just surfaced and was approaching home port in Charleston, South Carolina when the frantic order came from the control room that the ship needed to submerge again. Lt. Pilj acknowledged the order and, like Commander Gilmore, sent the more junior sailors ahead of him to safety inside the boat. Lt. Pilj ensured the diving officer of the watch understood the words “crash dive,” which he did, and then gave the order to dive the boat, leaving him just enough time to shut and seal the hatch behind him. When he made his way into the control room, he learned that a Russian Victor-class submarine had been detected and they had been ordered to obtain a sound signature, a recording of the unique sound of that submarine that could be used in the future to help identify and track it.⁸¹

Diesel Boats Forever

Some submariners serve only on boomers, like Lt. Pilj did. Others, like me, serve only on fast attack submarines. Those who serve longer are likely to serve on both types throughout their careers. With the advent of nuclear power, those who served only on the diesel-electric boats proclaimed their service to be “diesel boats forever.” One of these sailors was Lt. Eugene Masters who joined through the ROTC program at Notre Dame as a surface officer. His first command was the *USS Paul Revere* (APA-248), an attack transport ship full of landing craft and the Marines who operated them. After a short period of time with little to do onboard, and with the Cold War heating up causing the

⁸¹ Pilj, Interview with the Author.

President to extend all service members' terms of service, he volunteered for submarines, something in which he had always been interested. This got him sent to Groton, Connecticut for Officer Submarine School where he graduated 75th out of 76 because he enjoyed his off time in town too much to concentrate sufficiently on his studies. This also meant he would stay in Groton for his command, something he very much favored because it also meant he was likely to get a Mediterranean cruise. His submarine time helped him learn more practical engineering than he had learned in college or sub school. Lt. Masters also served at a time when nuclear submarines were very new and he served instead on *USS Angler* (SS-240), a World War II *Gato*-class submarine with 6 battle stars and 3 ships sunk during the conflict, and which was one of the last diesel boats in the fleet. He had no interest in serving aboard a nuclear-powered submarine or with the interview with Rickover which would be required, so he got out at the earliest opportunity after serving his time.⁸² During training, he had the privilege of riding the *USS Nautilus* and using the *Skipjack* trainer, both of which were incredibly more advanced than the ship he ended up on.

Months of Boredom Punctuated by Moments of Extreme Terror⁸³

Despite the danger involved with submarining during the Cold War, most times at sea were boring, and that is how the sailors preferred it. Long months at sea staying

⁸² Masters, Interview with the Author. Ship assignments were made by class rank and Groton was an unpopular duty station, so being at the bottom of the class worked out well for him.

⁸³ "New York Times Current History; a Monthly Magazine," *New York Times*, 1914.

One of the earliest recorded versions of this saying comes from early in the First World War in a monthly magazine compiled and published as a book by the New York Times. On page 979, a story recounted what an anonymous cavalry soldier wrote in his diary; "The best definition I have heard of modern warfare is, 'Months of boredom punctuated by moments of extreme terror.'" There is a chance that versions of this saying extend even further back in time. Thanks to USAF Major Jordan Bolster for the background work on this quote and footnote.

hidden needed to be occupied with productive activities, even while standing watch.⁸⁴ Ronald Gibson Strickland, enlisted reactor operator on the *USS Stonewall Jackson* (SSBN-634) during the Vietnam era, shared some of his stories with the Library of Congress Veterans History Project the ways in which he stayed busy on watch. One way he stayed busy as a machinist was to take a spare copper-nickel bolt and machine it down by hand into a ring, one each for himself and his wife. He also shared about how he improved his ship's sound silencing by removing the paint that shipyard workers carelessly applied to pipe-holding rubber-insulated grommets which caused sound shorts, or connections between vibrating equipment and the hull.⁸⁵ Every bit of sound silencing mattered when it came to staying quieter than the Russians.

Many submariners had near contact with the Russian submarines that also prowled the depths of the ocean throughout the decades of the Cold War. Ronald Gibson Strickland had a Russian submarine drive directly over the top of his submarine with no apparent clue he and the rest of his crew were right there in the depths below.⁸⁶ Following the crash dive story told earlier, Lt. Pilj and the *Bancroft* followed the Victor-class submarine undetected, although he did not know if they succeeded in obtaining the

⁸⁴ Until recently, submarines operated on an 18-hour day. With only a couple crewmember exceptions, such as the cooks or the XO, submarine watches were 6 hours, followed by 6 hours of off time in which a sailor studied for qualifications, cleaned, or conducted maintenance, or when senior enough, watched movies. The final six hours was his time to sleep. The submarine force transitioned to 8-hour watches beginning in 2014, which has been a massive success.

⁸⁵ Ronald Gibson Strickland, Ronald Gibson Strickland Collection, interview by Lawrence Merrill, 1968, AFC/2001/001/76210, Library of Congress, <https://www.loc.gov/item/afc2001001.76210/>.

Vibrating equipment on submarines, including pipes, are not mounted directly to the hull to prevent vibrations from leaving the ship and giving away its position. Instead, they have rubber insulation as a vibration dampener between the equipment and the hull which is rendered useless when it is painted.

⁸⁶ Ibid.

sound signature, and probably could not have told me even if he did know.⁸⁷ Onboard the *USS Will Rogers*, Interior Communications Technician (IC) Petty Officer Kenneth Keegler explained he was not involved with navigating the ship so he had no idea where the boat was. The most specific he could be in his story was to tell the interviewer that they patrolled in the North Atlantic.⁸⁸

The two different types of submarines have completely different missions. As described by Petty Officer Helms, a boomer's job was to run away from any danger and stay hidden while a fast attack submarine goes toward danger also while staying hidden.⁸⁹ A world event that easily illustrates the difference between the types is the Iran Hostage Crisis in 1979. Radioman Petty Officer Keehan was getting ready for deployment in San Diego on the *USS Flasher* when the crisis happened. Deployment was moved up and the crew did three weeks' worth of work in ten days so they could leave earlier. The ship went straight to the Middle East with little news of the progress of the crisis, one page of news for the entire world every three or four days. Once *Flasher* arrived in the area, they spent 98 straight days underwater waiting in support of the crisis.⁹⁰ After they were relieved, the crew finally got a well-deserved reward of a port call. They pulled into Guam the day after the Miracle on Ice when the United States beat the USSR in Olympic hockey. Later they got to go to The Philippines, Yokosuka, Japan, and Busan, South

⁸⁷ Pilj, Interview with the Author.

⁸⁸ Kenneth R. Keegler, Kenneth R. Keegler Collection, interview by Paul Roselli, 1965, Library of Congress, <https://www.loc.gov/item/afc2001001.21114/>.

⁸⁹ Helms, Interview with the Author.

⁹⁰ Jim Keehan, Interview with the Author, February 6, 2024.

Korea in between conducting another mission vital to national security, the details of which are still classified.

Going Deep

Even the most boring and routine operations onboard a submarine sound exciting to those who have never been underway. One common evolution after returning to sea after a period in port is what is known as a deep dive. To recertify any work that the shipyard or tender has done on a hull opening, the ship must dive to its test depth and each hull opening that was worked on would be inspected for any sort of leakage. This opening could be anywhere from a quarter-inch pipe to a hatch or torpedo tube breach door.⁹¹ As it goes deeper, the ship changes shape, something that helps to maintain depth. To see this, sailors would tie a string across a compartment while surfaced so that it was tight across a level from one side of the hull to the other. When the ship dives deep, the hull compresses, which increases its relative density and helps with depth keeping, and this would cause the string to loosen, giving easy visual evidence of the fact.⁹²

Petty Officer Jim Keehan went through one of these deep dives to recertify a system that most people probably would not think about when considering submarines, but which has an incredibly important function in keeping seawater out of the ship while underway. The shaft seals are a system of gaskets and seals that prevent seawater from leaking into the boat where the shaft, which is connected to the rotating propeller, transits

⁹¹ Torpedo tubes have a muzzle door on the sea end and a breech door on the torpedo room end. Modern torpedo tubes are twenty-one inches in diameter.

⁹² Robert Michael Arsenault, Robert Michael Arsenault Collection, interview by Lynn Corbeil and Paula Hinger, 1967, AFC/2001/001/97804, Library of Congress, <https://www.loc.gov/item/afc2001001.97804>.

from inside the boat to the outside.⁹³ A portion of the seal system also includes pumping water through the moving surface toward the outside to combat the pressure of the seawater trying to come into the boat. During a maintenance period, the *USS Flasher* (SSN-613) had its shaft seals replaced and they had to be recertified on the following underway. This required a full 24 hours at test depth, a classified depth which is the deepest a submarine dives, to recertify, knowing that the seals could fail at any time and cause flooding.⁹⁴

Ups and Downs of Submarines

Drydock maintenance periods were a common occurrence for submariners and continue to be one of the important parts of a submarine's life cycle. Drydocks are a concrete basin that can be flooded to allow a ship in, then the water is pumped out, allowing maintenance access to areas of the ship normally under the waterline and allowing holes to be cut into the hull for replacing equipment without sinking the ship. There are also floating drydocks that work similarly. They flood and allow the ship in, then pump out the water, leaving the ship dry. Their floating nature allows them to sometimes go to the ship rather than having to bring the ship to the dry dock. Captain Tim France served on five submarines and reached Commanding Officer of *USS Francis Scott Key* (SSBN-657). In just one example of the uniqueness of his career, each of the ships he served on went through a drydock overhaul while he was aboard; most were in drydock when he arrived which gave him the repeated experience of taking a ship out of

⁹³ A light hazing that may or may not occur on submarines is to send a newly reported submariner to the engine room to "feed the shaft seals."

⁹⁴ Keehan, Interview with the Author.

drydock. After his second time bringing a ship out of the shipyard, Captain France threatened to leave the Navy if he was sent to the shipyard again. His next command was the *USS Memphis* (SSN-691), which was pre-commissioning in the shipyard. He was convinced to stay in because a pre-commissioning drydock was different from an overhaul, which it was, and his threat turned out to be empty.⁹⁵

Technology advances constantly and submarines are not exempt from the progress of time, requiring their equipment to be constantly updated. Quartermaster Robert Marple discussed one of these such improvements on the *USS Will Rogers*, “all the missile tubes came out; new missile tubes were put in. Everything was upgraded. It was a fairly large overhaul. So, that was about 15 months.”⁹⁶ Captain France, when he was still a junior officer, reported to his first command, the *USS Haddo* (SSN-604), which was only four years old when he reported onboard. At the time, the SUBSAFE (Submarine Safety) program was new, only being in operation for about five years as a result of the loss of the *USS Thresher* (SSN-593). The program was meant to assure the safety of submarines in any system involved in hull integrity, flooding, or control surfaces.⁹⁷ Ships that were new construction or already commissioned at the time had to be retrofitted to be in compliance with SUBSAFE so that they could operate to their full capacity. One of those such ships was the *Haddo*, which was limited in depth to half of test depth before the overhaul was completed. The overhaul to upgrade *Haddo* to be in

⁹⁵ Tim France, Interview with the Author, February 6, 2024.

⁹⁶ Robert A. Marple, Robert A. Marple Collection, interview by Dudley Dudley and Carol Shea-Porter, 1964, afc2001001.96214, Library of Congress, <https://www.loc.gov/item/afc2001001.96214>.

⁹⁷ “Joint Fleet Maintenance Manual (JFMM) COMUSFLTFORCOMINST 4790.3” (Department of the Navy SUBMEPP, n.d.).

compliance with SUBSAFE took 18 months. The last American submarine lost with all hands was the *USS Scorpion* (SSN-589) which never received the SUBSAFE overhaul. Coming out of overhaul required a shakedown cruise to verify the seaworthiness of the many systems that had to be torn apart and rebuilt. Captain France participated in a shakedown on every ship he was attached to. Part of the shakedown cruise for a boomer was to test launch a missile, something Captain France got to do twice. His wife also got to see it from a surface observation ship.⁹⁸ The last of the 41 for Freedom, *USS Will Rogers* (SSBN-659), test-launched a Polaris A-3 which had a range of 2,500 nautical miles from under the surface, a major milestone in second strike deterrent capability, to bookend the missile launch of the *George Washington* 7 years previously.⁹⁹

A Unique Way of Life

Keeping the 41 for Freedom forward deployed created some unique situations for the crews. Commander Dan Summit took command of the *USS Alexander Hamilton* (SSBN-617) Blue Crew while the boat was at sea and his crew was at home in Charleston, South Carolina. He was the commander of a Polaris missile submarine without ever having laid eyes on one.¹⁰⁰ He took the time in port to get to know the crew and the material issues he might have to contend with when he made it to the ship. To get to the ship for crew changeover, the entire Blue Crew with their luggage were loaded on a plane in Charleston and flown to Scotland to meet the boat in Holy Loch. Commander

⁹⁸ France, Interview with the Author.

⁹⁹ Hanson W. Baldwin, "Nuclear Submarine Missile Program Shows Gains: Fired Below Surface Submerged Patrols Building New Silos Advantage of Mobility Evaluation and Decision," *New York Times*, August 6, 1967; Hanson W. Baldwin, "A Perfect Polaris Shot Ends a Missile Chapter: Rocket Is Fired by Submarine on 1,500-Mile Test Flight Craft Is Last of 41 Slated to Hold 16 Ballistic Weapons," *New York Times*, August 1, 1967.

¹⁰⁰ Summitt, *Tales of a Cold War Submariner*, 203.

Summit seemed to recall mostly the size of things as he was introduced to his new command. The *Alexander Hamilton* was nearly 150 feet longer than his previous ship, and each of the sixteen missiles was thirty-five feet long and seven feet across, “monsters!” in his words.¹⁰¹ Commander Summit spent five days turning over the boat from the Gold Crew, learning his way around the boat, and learning his way around Holy Loch and the nearby towns while getting to know the locals. A simple deck log entry notes the occasion on January 27th, 1965: “Commanding Officer, *USS Alexander Hamilton* Blue, and crew relieved Commanding Officer, *USS Alexander Hamilton* Gold and crew in whole.”¹⁰²

Ronald Strickland described Scotland, “[it] was a very rainy place, it’s very green. I don’t ever remember being in Scotland for a full day without it raining.”¹⁰³ This was lucky for the crew of the *USS James K. Polk* (SSBN-645) and the tender they were moored to, the *USS Canopus* (AS-34), when a fire broke out on *Canopus* Thanksgiving weekend. According to the *Polk*’s deck logs, the fire was reported just 15 minutes before midnight on Saturday, November 28th, 1970. The ship’s crew who were aboard assisted *Canopus* in fighting the fire while more of the crew stationed the maneuvering watch in preparation to get underway to get away from the fire. During the fire, the ship lost the shore power that would have been run through *Canopus* and was forced to snorkel, which is to run its emergency diesel generator. The fire was put out after a little more than six hours with 3 men aboard the *Canopus* unfortunately lost.¹⁰⁴

¹⁰¹ Ibid, 206.

¹⁰² “Deck Log Book of the *USS Alexander Hamilton* (SSBN-617)” (USN, November 1965), 79786460.

¹⁰³ Strickland, Ronald Gibson Strickland Collection.

¹⁰⁴ “Deck Log Book of the *USS James K Polk* (SSBN-645)” (USN, November 1966), 215842558.

Learning on the Job

The *Alexander Hamilton* was far more advanced than Commander Summit's previous command, the *USS Seadragon*. *Alexander Hamilton* was part of the earliest classes of nuclear-powered submarines, was built more cheaply than the *USS Nautilus*, and required some new technology solely because of its larger size. One example of this technology that was new to Commander Summit was the outboard. The outboard is located at the aft, or back, of the boat and down low on one side of the ship. Normally, it is hidden inside the free flood area of the ship, an area within the submarine but outside the pressure hull where the people stay dry, and when needed, it could be hydraulically lowered into place. The outboard could be turned in any direction and started and stopped at will. This gave the ship greater maneuverability in close quarters, especially when docking, where fine adjustments were needed.¹⁰⁵

Another new evolution that Commander Summit was introduced to when he took command of a nuclear-powered ship was the fast cruise. A fast cruise allows a submarine to be run as if underway while still tied to the pier. The reactor is critical, the equipment is run, and watches are stood as if underway, but the ship goes nowhere. Following this first fast cruise, Commander Summit took his new command underway for the first time, in a raging storm. "The night could not have been any darker. The wind was whistling down Holy Loch from the northwest, funneled between the mountainous hills on either side, blowing very close to hurricane force. It was raining hard. The raindrops stung your face."¹⁰⁶ Discussing the small Russian surface ship that was stationed off the coast to

¹⁰⁵ Summitt, *Tales of a Cold War Submariner*, 210.

¹⁰⁶ *Ibid*, 215.

track submarine comings and goings; on this occasion, Commander Summit said, “I felt a little sorry for him, knowing he would have to ride out this storm for its duration, while I would soon be submerged and free from its fury.”¹⁰⁷ That same kind of terrible weather might have contributed to the Theodore Roosevelt grounding off Holy Loch in March of 1968. Luckily, no crewmembers were injured, although the bow was slightly damaged and the ship had to return to Groton, Connecticut for repairs.¹⁰⁸

Like during fast cruise, occasionally testing equipment was required to ensure proper operation, including the missile launch systems. One occasion of such a test was related to Commander Summit from a friend of his who was the Executive Officer on an unnamed SSBN shortly after they were first commissioned. On the day of the missile launching system test, the Joint Chiefs of Staff, the senior civilian officials of each military service, were visiting to see how this awesome new weapons system worked. While there was no missile in the tube to be launched, the tube was full of 35,000 pounds of water, known as a sabot [say-boh] round. The Joint Chiefs were stationed up the pier from the ship but ventured closer, over the objections of the Marine sentry who tried to keep them at a safe distance. Too late they realized their mistake, as a swimming pool’s worth of water was launched from the missile tube and dumped on their heads, soaking them through. The group of Admirals and Generals got to spend an exciting couple of hours onboard while they waited for their uniforms to dry.¹⁰⁹

¹⁰⁷ Ibid, 216.

¹⁰⁸ “Navy Tells of Grounding Of Submarine Off Scotland,” *New York Times*, April 6, 1968.

¹⁰⁹ Summitt, *Tales of a Cold War Submariner*, 221.

Lt. Pilj served toward the end of the Cold War, in the late 1980s. He was fortunate that the technology of his day allowed some very small amount of the outside world into the boat while underway. They could, at times, receive radio broadcasts from BBC while underway. The downside was that the radio receiver could not play the sound through the rest of the boat but only in the Radio Room, where all transmissions are sent and received and where some of the most classified work happens on board a submarine. Because of the classified nature of the room, it was of limited size, and only the people with the highest security clearances could be in there, so not many people got the benefit of listening to these news broadcasts. In addition, any printed news also came through the Radio Room and was censored both before being sent to the ship and before being shared with the crew, much like the Family Grams mentioned below in the section on Family Life.

One of the most important pieces of paperwork for boomer submarines was their portion of the single integrated operating plan (SIOP). The SIOP was, as the name indicates, an integrated plan for the use of nuclear weapons, updated periodically, with targets for each of the country's nuclear missiles. At the start of one patrol, Captain France was given a SIOP that had been misprinted but still was ordered to head out on patrol without it. Before settling into the ship's designated patrol box, they had to return to port to retrieve the correct document in New London, Connecticut, where they had close contact with a Russian observer, known as an auxiliary general intelligence (AGI) ship. These ships stayed stationed near ports where submarines were known to transit, like the one Commander Summit saw on his first transit with the *Alexander Hamilton*.

For Petty Officer Keegler, to his recollection, when he was underway, time stopped and then restarted again once he returned to the surface. He could only focus on being underway, with no thought of the world outside, including the Vietnam War that was happening at the time. “Every workday was pretty much like every other workday...when you’re back after 60 days it was like you were gone one big, long day.”¹¹⁰ He did, however, note that each of the ships he was on had a fire, which is about the worst thing a person could imagine onboard a submerged submarine. He also related a story where the Officer of the Deck, upon raising the periscope, happened to point it directly at the moon, causing him to think that he was looking at another ship. The officer sounded the collision alarm and the crew reacted as they were trained, only realizing later what happened and joking about it. Despite being on board, he said the crew never talked about the war or the missiles they were deployed to possibly launch. He attributed that to the maturity of the crew.¹¹¹

Less common, but common enough for submariners, was duty aboard a submarine tender, a ship whose sole job is to provide support facilities to submarines. Some tenders remained in stateside bases to support the ships in homeport while others were forward deployed to support ships closer to their mission areas. Tender duty requires mostly supporting submarines with maintenance and parts and anything else the ship might need. Petty Officer Armbrust was assigned to the radiological division aboard *USS L. Y. Spear* (AS-36) where his ELT duties continued in support of the submarines

¹¹⁰ Keegler, Kenneth R. Keegler Collection.

¹¹¹ Ibid.

nearby on the pier. Those included radiological testing, sampling, and waste disposal for the nuclear power plants of his neighbor submarines.¹¹²

Advancement

Submariners receive several bonuses which acknowledge the difficulty of their service. Periodically, the Navy establishes enlistment and reenlistment bonuses to entice sailors to enlist or stay in undermanned fields, which submarines is almost always a part. Submariners receive sea pay and submarine pay when serving on seagoing commands. In the height of the Vietnam War, and just after the completion of the 41 for Freedom, the Navy increased bonuses for submarine nuclear officers during a reenlistment crisis. Some of the reasons that were given by sailors who were exiting the service after one enlistment were stagnation in rank, not using the skills they had learned in specialty schools, and the general anti-military sentiment of the day.¹¹³ These types of bonuses continue today, with the hope of attracting the best and the brightest to the submarine force.

Submarine sailors have a variety of options for advancing their careers and becoming one of the vaunted officer's corps. Both Lt. Pilj and Captain Steven Mutz took advantage of the Navy's Nuclear Power Officer Candidate program, a program that found current college students and offered them a scholarship to become Naval nuclear officers in exchange for a tour of duty after graduation and training. By contrast, Commander Robert Michael Arsenault used the Limited Duty Officer program to go from enlisted

¹¹² Armbrust, Interview with the Author.

¹¹³ "\$15,000 Bonus to Re-Enlist," *Boston Globe*, December 15, 1969, <https://utk.idm.oclc.org/login?url=https://www.proquest.com/historical-newspapers/15-000-bonus-re-enlist/docview/850490118/se-2>.

Chief Missile Technician to Submarine Weapons Officer before retiring as a Commander. As an experienced weapons technician, Chief Arsenault was an easy choice for conversion to officer, where he served at a variety of commands, including the *USS Lewis and Clark* (SSBN-644), named for the famous explorers who searched for a waterway to the Pacific Ocean, the so-called Northwest Passage.

Captain France had a unique career. This may have been a side effect of the Cold War and its varying personnel needs, or it might have been completely coincidental. Like many other officers, he started his Naval career in college as a member of the Reserve Officer Training Corps (ROTC) where he had minor military obligations during school and the military paid for his tuition in exchange for an obligated term of service after he graduated with his bachelor's degree in physics. After graduation, he commissioned and attended nuclear power school in Maryland, nuclear prototype school in New York, and then Submarine Officer's school in Groton, Connecticut. The first ten years of his career were spent moving from boat to boat and staying at sea rather than the typical alternating of sea and shore tours. During this early part of his career, he served on the *Haddo*, *Sam Houston*, and *Memphis*, each of which required time in the shipyards. *Haddo* got a SUBSAFE overhaul, *Sam Houston* got an upgrade from A2 to A3 Polaris missiles, and *Memphis* was new commissioning. When he finally got to go to shore duty, one of his duties as the Assistant Operations Officer and Submarine Watch Officer for the Atlantic Fleet required riding submarines for 48 hours every month to maintain his submarine pay.

During his time “on shore,” he rode 25 more submarines.¹¹⁴ This was just the beginning of Captain France’s unusual career.

Eventually, he advanced to Executive Officer (XO), or second in charge, and then Commanding Officer (CO) of submarines, each of which required a school before he was sent to relieve in his new position. He was the prospective XO of the *Von Steuben* for 13 months before he relieved the prior XO and he was the prospective CO of the *Francis Scott Key* for 10 months before relieving the previous CO. This was an extremely unusual delay, as most prospective XOs and COs only take about 3 weeks to relieve, and it resulted in him being promoted to Commander at the start of his XO tour, something that usually happens near the end of the tour. This also affected his promotion to Captain, which he only achieved on his fifth time eligible, something unheard of as he did not know of anyone being promoted after being passed over even twice. When he finally got promoted, an old shipmate who was the Chief of Staff of Squadron 2 in New London, Connecticut, was the one who gave him the news, while his Commodore was the one who gave the news to his wife. During his last shore tour, he served as the acting Commander of Charleston Naval Base for 3 months, a position typically occupied by a two-star rear admiral.¹¹⁵ Submariners live by the needs of the Navy, but Captain France embodied that saying.

Family Life

Family life for submariners and their families was less than easy, on both sides of the ocean. For submariners on patrol, their only communication came in the form of

¹¹⁴ France, Interview with the Author.

¹¹⁵ Ibid.

“Family Grams.” Similar to telegrams, they were of limited length, but unlike telegrams, they only went in one direction. During the patrol, family members could send their Family Gram through the ship’s squadron and the sailor would receive the message underway. Messages were received by the radio room, screened for any information that could be disruptive for the sailor, and then handed out for a glimpse of life at home. Occasionally, a spouse might be unsure about the process or not in contact with the squadron ombudsman. This would mean they might not know how to send the message, leaving the sailor without any contact for the duration of the patrol, and leaving him to wonder or worry about life at home, which happened to Commander Arsenault and his newlywed wife on one of his early patrols.¹¹⁶ Since they could not send messages back home during the underway, sailors would plan ahead, leaving cards or gifts for their spouse with a friend on the other crew to be sent throughout the patrol.

As the Captain of *Francis Scott Key*, Captain Francis got the privilege of hand-delivering baby grams from the Red Cross when sailors had newborns waiting for them on land. On one occasion, a sailor was waiting on news of his baby’s birth from his wife but a different sailor got news of the birth from his wife before the new father, so, since family grams were private, Captain France had to get permission to share the news of the new child with the sailor who was still waiting to hear the news.¹¹⁷ He also got any messages with bad news that were marked “CO eyes only,” including family deaths or hospitalizations. As a Radioman, receiving and distributing messages was part of the job for Petty Officer Gorham, but when “CO eyes only” messages came through, he had to

¹¹⁶ Arsenault, Robert Michael Arsenault Collection.

¹¹⁷ France, Interview with the Author.

go get the Captain before he let the message come through.¹¹⁸ Something that families were not supposed to know about Family Grams, but Captain France leaked once to his wife, was that Family Grams for the whole squadron were electronically packaged together, allowing the radiomen from other boats to read mail not meant for them.

Home Sweet Home

Being gone for such a long length of time, family events were bound to be missed. Commander Arsenault missed the birth of his first son, but he was able to take his family with him to most of his assignments throughout his Navy career. This had its ups and downs, as his son had to switch schools and start over his final year of high school.¹¹⁹ Lt. Pilj had a slightly more interesting event that he was forced to miss: his wedding. His wedding at the consulate in Japan was scheduled for when he was needed to go underway at no notice, so Chiefs from his boat stayed behind to stand up for him and as his witnesses. He later figured out that in the first three years of his marriage, he and his wife spent only two and a half months together in total.¹²⁰ Commander Dan Summit, as the Captain of the *USS Alexander Hamilton*, was on both sides of the bad news message to his crew. Once, he received a message that an officer's father died while they were underway. Commander Summit gathered the Executive Officer and the Engineer so they could break the news as gently as possible. During another patrol, Commander Summit received the awful news that his own house burned down while he was gone, but that nobody had been injured, his homeowners' insurance covered the loss,

¹¹⁸ Gorham, Interview with the Author.

¹¹⁹ Arsenault, Robert Michael Arsenault Collection.

¹²⁰ Pilj, Interview with the Author.

and members of the other crew helped salvage what they could and moved his household goods as necessary.

The sailors could not be distracted by thoughts of home, as Chief Marple pointed out, and they had to have complete faith in the shoreside system that gave them their orders. For Lt. Pilj, his job was to make sure either that his missile launching system or his fire control targeting system was ready for the captain to launch the missile, and he "had to trust that the system was in place, and they wouldn't willy-nilly launch, just because someone had a wild hair."¹²¹ As one of the few men onboard actually responsible for launching a missile should the need arise, he compartmentalized that his job was to be ready, and he made sure to be ready to do his job. He was the embodiment of will, the will to use these horrible weapons if pressed.

Being underway on a submarine was an isolating experience, with little to no communication with home or from the news. With, at most, only a few dozen words from loved ones at home during a patrol, and news that was censored by their squadron, the isolation was even more than one might envision. Lt. Pilj talked about missing whole years of current events while underway, only learning much later about events he never knew about at the time. For Robert Marple, choosing to not receive any bad news through the Family Gram system meant that those patrols with no communication could have weighed on his mind more. Instead, he learned to compartmentalize his emotions so that being on watch got his complete focus. "When you're coming up to periscope depth, you have to have a clear head...If things go bad, you can't get emotional."¹²²

¹²¹ Ibid.

¹²² Marple, Robert A. Marple Collection.

Captain France had a family through nearly his whole career and a wife who supported him. Spending time in the shipyard on every one of his commands meant that he typically got to go home every night but when it came to shakedown cruise, the pace was breakneck, keeping him and his sailors from home. Toward the end of his career, he was doing his best to stay in Charleston, South Carolina, and succeeded in the effort, giving both of his children the opportunity to attend only one high school and graduate without moving again, something his wife considered a miracle.¹²³ Lt Masters chose to exit the Navy rather than stay in because he expected to have a family sometime soon, and he knew that submarine life would interfere with family life to an unacceptable extent. He married his wife, Ruth, just a few years later and had two daughters, one of whom followed him into the Navy.¹²⁴

Life After Submarines

After all that training, it only makes sense for a submariner to continue doing work that relates to his job on submarines, if he enjoyed it. Civilian power plants love nuclear-trained officers and enlisted reactor operators because it saves them a lot of money training them. Government agencies and contractors also love submariners for the same reason. Depending on their specific job, a submariner might have been trained as a diesel mechanic, an HVAC technician, an electrician, an electronics technician, a network administrator, a logistics expert, a cook, a weapons expert, a radio operator, or a reactor operator. Their schooling and experience are extremely attractive for potential employers, whether they are involved in government work or not. In addition, every

¹²³ France, Interview with the Author.

¹²⁴ Masters, Interview with the Author.

submariner is required to obtain and maintain a security clearance, something else that can be time-consuming and expensive for an employer.

Most of my interview subjects also used the skills they learned in the silent service and made careers out of them. Gene Masters took his practical mechanical experience, got degrees in mechanical engineering, and spent a career as an engineer in various firms, including one which he owned.¹²⁵ Andy Armbrust and Marlin Helms both took their radiation training and made excellent careers in radiation safety.¹²⁶ Jim Keehan also made use of his nuclear training in his civilian career.¹²⁷ After I left the Navy, my first job was working on large-scale model submarines used to make advances in SONAR for full-sized submarines. Many of my shipmates have put their mechanical or nuclear training to good use by continuing to use their training in civilian employment. Besides their technical training, many submariners also make good leaders and managers in their new employment. We bring a lot to the table for potential employers, and they often recognize that.

¹²⁵ Ibid.

¹²⁶ Armbrust, Interview with the Author; Helms, Interview with the Author.

¹²⁷ Keehan, Interview with the Author.

CHAPTER 4

MEDICAL CONCERNS

Somewhere in Australia—"They are giving him ether now," was what they said back in the aft torpedo rooms.

"He's gone under, and they're ready to cut him open," the crew whispered, sitting on their pipe bunks cramped between torpedoes.

One man went forward and put his arm quietly around the shoulder of another man who was handling the bow diving planes.

"Keep her steady, Jake," he said. "They've just made the first cut. They're feeling around for it now."

"They" were a little group of anxious-faced men with their arms thrust into reversed white pajama coats. Gauze bandages hid all their expressions except the tensivity in their eyes.

"It" was an acute appendix inside Dean Rector of Chautauqua, Kansas. The stabbing pains had become unendurable the day before, which was Rector's first birthday at sea. He was nineteen years old.

The big depth gauge that looks like a factory clock and stands beside the "Christmas tree" of red and green gauges regulating the flooding chambers showed where they were. They were below the surface. And above them were enemy waters crossed and recrossed by whirring propellers of Japanese destroyers and transports.

The nearest naval surgeon competent to operate on the nineteen-year-old seaman was thousands of miles and many days away. There was just one way to prevent the appendix from bursting, and that was for the crew to operate upon their shipmate themselves.

And that's what they did; they operated upon him. It was probably one of the largest operations in number of participants that ever occurred.

"He says he's ready to take his chance," the gobs whispered from bulkhead to bulkhead.

"That guy's regular"—the word traveled from bow planes to propeller and back again.

They "kept her steady."

The chief surgeon was a twenty-three-year-old pharmacist's mate wearing a blue blouse with white-taped collar and squashy white duck cap. His name was Wheeler B. Lipes.

- George Weller, *Chicago Daily News* ¹²⁸

The isolation onboard submarines due to no communication with the outside world and the lack of news regarding important events in a man's life created a necessary condition of complete trust in the system that controls the missile launch orders.

Submariners had to know and trust that the system that gave them orders was intact and operating as intended if they had to do the unthinkable and launch their weapons. Their concern was to be in their designated box in the ocean and to ensure the readiness of their

¹²⁸ George Weller, "'Doc' Lipes Commandeers a Submarine Officers' Wardroom," *Chicago Daily News*, 1942, https://en.wikisource.org/wiki/%22Doc%22_Lipes_Commandeers_a_Submarine_Officers%27_Wardroom.

Weller won a Pulitzer Prize for this piece.

equipment and themselves when the time came, and they had to leave it to others that mistakes were not being made which would possibly end civilization. For this reason, submariners underwent extensive psychological screening to determine their fitness for service aboard submarines.

Submarine Screening

Before the launch of nuclear-powered submarines, there was not much research or thought put into the psychological aspects of serving underwater. The men who served on World War II submarines earned with blood, sweat, tears, and sacrifice the descriptor that has since been expanded to include their nuclear brethren, “Steel Boats, Iron Men”. They served under the ultimate stressful conditions, as Captain Edward L. Beach describes, “ready instantly to dive out from under an attacking aircraft, or slam into battle stations without preparatory notice and go on the attack-or, conversely, to gird for depth charging, go deep, lie silent, and pray the explosions don’t get too close.” He also noted, “surprisingly, there were few crack-ups.”¹²⁹ Because of the overwhelming stress that was the hallmark of submarine life, submariners undergo extensive psychiatric testing before and during their training and, as a result of their unique living conditions at work, they have been the subject of psychiatric observation and testing in the nuclear era.

Submarine sailor assessment and screening was developed following Kurt Lewin’s stress equation that states an individual’s behavior is dependent upon the interaction of that individual’s characteristics and selected aspects of their

¹²⁹ Benjamin B. Weybrew, *The ABC’s of Stress: A Submarine Psychologist’s Perspective* (Westport, Conn: Praeger, 1992), xi.

environment.¹³⁰ Submarine medical officers use a Navy-modified version of the thematic apperception test (TAT), a test that assumes that important personality traits can be inferred from a person's diction, grammar, and syntax when telling a story, along with a Personal History Form which details the candidate's sociological and family history, followed by a final interview with a medical officer to determine likely fitness for duty aboard submarines.¹³¹ The final portion of the Personal History Form tells the candidate to

“Give a brief picture of the kind of person you feel you are basically, together with your plans for becoming the kind of person you want to be. You may repeat any of the foregoing personal information in this connection. Where does achievement of your present objective fit into your plans? You may use additional sheets if you desire.”¹³²

After reviewing the Personal History Form and the TAT, a submarine medical officer interviews the candidates and rates them in a variety of categories to determine their likely suitability for submarine service. The categories include personal adjustment, adjustment to navy life, maturity, intelligence, drive, interest in submarines, and aptitude for submarines. Each of these categories is given a definition and a rating system so that each of the various evaluators has a standard grading system upon which to base their evaluation. With the completion of the assessments and the interview, the medical officer rates the candidate in two categories: first, whether the candidate is likely to be able to

¹³⁰ Ibid, 3.

{ $B = f(P \bullet E)$ } where B is the behavior, P is the submariner's personality, and E is the environment. Since the environment is unchangeable, and psychologists know the desired behavior, it becomes their job to determine the personality traits that best serve submarine life.

¹³¹ Ibid, 65.

¹³² US Navy and Bureau of Medicine and Surgery, *Submarine Medicine Practice, NAVMED-P 5054*, 1956th ed. (Department of the Navy, n.d.), 289.

adjust to duty on a submarine, and last, what the candidate's likely class standing will be in Basic Enlisted Submarine School.¹³³

Iron Men

Despite the difficulty facing World War II submariners as described by Captain Beach, there were relatively few psychiatric casualties, which is supported by the Navy's records. Given the circumstances, submariners expected some base level of anxiety or psychological disturbance, so the following numbers only consider those situations where the ability to perform their duty was interrupted.¹³⁴ In all, the submarine force conducted 126,160 man-patrols throughout World War II and there were only 56 cases of psychiatric casualties, a minuscule number especially considering the conditions under which these men were operating. This has been attributed to candidate selection, training, morale, psychological and medical examinations between patrols, generous rest policies for submariners between patrols, and confidence in the submarines, their officers, and their shipmates.¹³⁵ These last two points, especially, are important for the psychological health of the 41 for Freedom and subsequent ballistic missile submarines.

The first study of stress and stress responses in ballistic missile submariners started in 1960 with both crews of the *USS Patrick Henry* (SSBN-599) and utilized the Submariner Attitude Questionnaire (SAQ), a test where subjects either approach or avoid situations, persons, concepts, ideas, doctrines, or principles.¹³⁶ The SAQ was administered first to both crews before they departed on patrol, about halfway through a

¹³³ Ibid, 295.

¹³⁴ I usually tell people, "You have to have a certain amount of dysfunction to function on a submarine."

¹³⁵ US Navy and Bureau of Medicine and Surgery, *Submarine Medicine Practice, NAVMED-P 5054*, 309.

¹³⁶ Weybrew, *The ABC's of Stress*, 72.

55-day patrol, then at the end of a patrol in which the Blue Crew went underway and the Gold Crew was on shore, then it was repeated when the crews switched places and the Gold Crew was underway while the Blue Crew was on shore. This way each group was tested while resting and while under stress. Probably not surprisingly, for both crews, being underway was stressful and the subjects displayed negative attitudes when tested, while being on shore restored their attitudes after patrol. The study discovered that the objects of attitudes that were overall most negative, that became most negative while underway, and recovered least while on shore were those that had to do with the long-term incentives and prestige that came with being a ballistic missile submariner.¹³⁷

Psychologist Daniel Katz called these ego-defensive attitudes: those which protect a person from threats by concealing the true self and socially undesirable feelings.¹³⁸ The study authors do not examine these attitude changes in depth, but I have a belief based on my own experience. When underway, submariners have trouble with most long-term planning. They are more focused on getting from watch to watch and one day closer to home. The long-term incentives of being a fleet ballistic submariner become ethereal, so those negative attitudes have the chance to take hold until the ship surfaces again and the sailor returns to the rest of the world.¹³⁹ This explains how those incentives are the ones most easily forgotten and allowed to be overtaken by negative attitudes.

¹³⁷ Ibid, 75.

¹³⁸ Daniel Katz, "The Functional Approach to the Study of Attitudes," *Public Opinion Quarterly* 24, no. 2, Special Issue: Attitude Change (1960): 163, <https://doi.org/10.1086/266945>.

¹³⁹ One of the biggest incentives for becoming a submariner, and especially nuke submariners, are the bonus pay and reenlistment bonuses that submariners receive for joining and remaining in the submarine force. There is nowhere to spend that money underway, so it becomes a less tangible reminder of their status.

Another conclusion of the study was that more experienced submariners were less likely to have attitude changes and the attitude changes they did have were less severe than their neophyte submariner brethren.¹⁴⁰ It turns out that experience under high-stress situations helps acclimate submariners to more high-stress situations. Given their unique personalities, working conditions, and experiences, nuclear-powered submarine crews have been a valuable group for psychiatric research into stress and isolation. Some of this research has found for individual submariners that the more his actual role onboard is consistent with his expectations, the more likely he is to adjust to submarine duty.¹⁴¹ This helps make submarine training more realistic which helps with the adjustment to submarine life for new sailors. Submariners are trained in fighting fires, stopping flooding, and even escaping from a disabled submarine, while getting a basic overview of the systems they will be operating when they report to their first commands.

It has also been found that leadership styles during emergencies that are more rigid, authoritarian, and task-oriented work better while leadership styles day-to-day should be more participative and supportive for crew cohesiveness. Submarine officers and senior enlisted learn when to be decisive and strict, and when to be more lenient and empathetic. This also relates to submarine leadership maintaining open communication, feedback, and clearly delineated methods for achieving individual and group goals in support of creating an effective crew.¹⁴² Submarines conduct an annual command climate

¹⁴⁰ Weybrew, *The ABC's of Stress*, 75.

¹⁴¹ Albert A. Harrison, Yvonne A. Clearwater, and Christopher P. McKay, eds., *From Antarctica to Outer Space: Life in Isolation and Confinement* (New York, NY: Springer New York, 1991), <https://doi.org/10.1007/978-1-4612-3012-0>, 265.

¹⁴² *Ibid*, 266.

survey which allows submariners to anonymously submit feedback to their senior leadership and above on the state of morale aboard. Submariners drill constantly to be ready for emergencies and each man is expected to know his own actions as well as many of the actions of his shipmates so he can be assured of the safety of the ship. Each watch station has actions to be completed and reports to be made to a central authority which controls the actions of the entire ship and maintains the big picture of what is happening onboard.

Periscope Liberty

Psychiatrist Dr. Ben Weybrew accompanied the *USS Triton* (SSRN-586) on her 84-day submerged circumnavigation of the globe in 1960 to conduct new studies on the crew for understanding stress and stress responses. This was a new record set for time spent underwater and, as such, a great opportunity for observation of the crew. One thing he found was that a way to improve crewmembers' moods and attitudes was with "periscope liberty" where crewmembers were allowed to look through the periscope at interesting places in the outside world as they passed by, such as Tierra del Fuego or an iceberg off Cape Horn. When they spend endless days looking at the same interior, a simple look outside could have a great effect on morale. The study called this "stimulus invariance," the sameness of environment, and it matched earlier studies on confinement and isolation.¹⁴³ Newer submarines have a system called Periviz which allows them to route the picture from the periscope to the big screen television in the crew's mess so more of the crew gets this periscope liberty. Jim Keehan was able to get some of this

¹⁴³ Weybrew, *The ABC's of Stress*.

periscope liberty as the man designated to develop photography taken by the periscope back when he had to develop pictures in a dark room aboard.¹⁴⁴

Sailors aboard the *USS Spinax* (SSR-489) in 1961 built and flew a kite just to watch it from the periscope for entertainment.¹⁴⁵ Relating to the feeling of never-endingness of submarine life underway, sailors also had errors in time perception where they tended to overestimate time intervals.¹⁴⁶ If time flies when you're having fun, what does it do when you're locked underwater in a submarine? These studies have helped researchers understand stress and isolation, and they have been used in other career fields where stress and isolation are primary characteristics, such as astronauts and Antarctic researchers.

Radiation

If you asked the average American even today what their first concern with nuclear power was, one of the common answers would be radiation poisoning. This would be only more likely during the Cold War with the threat of annihilation by nuclear weapons always in the public consciousness. Dr. Ann Stouffer Bisconti has dedicated her life to studying public opinion regarding nuclear power and the dangers of radiation. She has found that even today, according to a 2022 survey, 64 percent of participants believed that living near nuclear power plants exposes people to harmful levels of radiation. After this misperception was corrected by the survey, 51 percent of participants still believed

¹⁴⁴ Keehan, Interview with the Author.

¹⁴⁵ U.S. Naval Institute, "In 1961, USS Spinax (SSR-489) Became the First Submarine to Fly a Kite While Submerged. The 5' x 7' Kite Was Fashioned from Bamboo Sticks, a Garment Bag, Cellophane Tape, and 1500 Feet of Nylon Line. It Served No Purpose Other than to Entertain the Crew Who Watched It through the Periscope during a Pacific Crossing. #SubSunday," February 11, 2024, <https://x.com/naulinstitute/status/1756889905198932314?s=42&t=f0eR3boDmJFO1BL8X1zx8A>.

¹⁴⁶ Harrison, Clearwater, and McKay, *From Antarctica to Outer Space*, 274.

it.¹⁴⁷ Despite this disheartening result, the same survey found that 77% of people supported nuclear energy in the United States and that those residents who live closest to nuclear power plants tend to have the most favorable view of the plants.

Submarine nuke school teaches a person everything they need to know to understand and operate a nuclear reactor in less than two years. One of those things is radiation safety which helps them to understand the dangers of nuclear power. Those who work the most with the reactor are those who understand it best, and they also understand the dangers completely. None of the power plant operators interviewed for this thesis ever worried about the dangers of working and living around a nuclear power plant, including those whose job it was to sample the reactor coolant and be around radiation the most. Some of them even had to undergo reactor core changes in the shipyard and this never caused them any concern.

Probably shocking to people without any experience in the matter, submariners receive less radiation underway than the people remaining on land do over the same duration.¹⁴⁸ When underwater, the crew receives no radiation from cosmic rays or radon, the most common natural radiation sources on land. The reactor compartment is shielded by lead, water, and other materials which prevents contamination for most of the crew. Engineering watchstanders, and especially the Engineering Laboratory Technicians who sampled the primary and secondary coolant for the reactor plant, would receive some exposure related to their job duties, but Admiral Rickover ensured that exposure was kept

¹⁴⁷ Ann S. Bisconti, "Record High Public Support for Nuclear Energy, 2022 National Nuclear Energy Public Opinion Survey Finds," *Bisconti Research, Inc.* (blog), 2022, <https://www.bisconti.com/blog/public-opinion-survey-finds>.

¹⁴⁸ Helms, Interview with the Author.

to an extreme minimum. His designs and his safety requirements prevented unnecessary exposure for submarine crews.

Medical Emergencies

Navy Hospital corpsmen had served and continue to serve with deployed Marines and on submarines, where their actions save lives still today. During World War II on submarines, three appendectomies were performed, with the first one completed by Pharmacist's Mate First Class Wheeler Lipes, who saved his patient's life and then narrowly avoided a Court Martial for angering the Navy's medical establishment by his actions. Instead, he was eventually awarded a long overdue Navy Commendation Medal, his story earned a Pulitzer Prize for the reporter who wrote it in the *Chicago Daily News*, and his exploits were dramatized in the film *Destination Tokyo*. In an unfortunate connection, his patient, Seaman Dean Rector, recovered but later died in the sinking of the *Tang* and is still on patrol.¹⁴⁹ Petty Officer Lipes was not a surgeon, but instead an enlisted hospital corpsman, and served like so many who had gone before him as an Independent Duty Corpsman (IDC), the only trained medical person on a submarine. He was one among a brotherhood of medical professionals who have been trusted to care for submarine crews with complete independence.

There are numerous challenges to practicing medicine aboard a submarine, particularly the consideration that submarines are staffed with IDC, enlisted men with medical training roughly equivalent to a physician assistant or nurse practitioner who are

¹⁴⁹ Adam Bernstein, "Wheeler Lipes Dies; Did Emergency Surgery While on Sub," *Washington Post*, April 19, 2005, sec. B; Weller, "'Doc' Lipes Commandeers a Submarine Officers' Wardroom."

affectionately known to their crews as Doc. He, or just recently, she, is expected to care for and treat the crew of around 130 independently of any outside resources or advice, although sometimes an undersea medical officer might be available for consultation, with communication turnaround times of 24 hours or more.¹⁵⁰ The Doc is responsible for treating those casualties onboard which he can treat or arranging for a Medevac for those which he cannot.

Captain France had to arrange for an evacuation for a sailor whose mother died while he was on patrol. This required pulling in close to the Azores, transferring his sailor to a small boat, and then flying that sailor back to homeport. He was proud that he was able to do that for the sailor since it would not have always been possible based on mission and patrol parameters.¹⁵¹ Lt Ferguson had experiences onboard the *Haddo* where medical emergencies interrupted missions. Since *Haddo* was a fast attack, its mission was to follow Russian submarines around the ocean while staying as quiet as possible and undetected. One sailor had a severe case of appendicitis while tracking a Russian boat and so the ship had to break off trailing and send the sailor home via helicopter to Bermuda and he was able to rejoin the crew when they returned home.¹⁵²

When I reported to my boat, there had been an accident only a couple of days before. During field day, when the whole ship's crew spends a dedicated couple of hours cleaning the boat, the Chief of the Boat (COB), the senior enlisted man onboard, slipped

¹⁵⁰ Luke A. Beardslee, Ben D. Lawson, and David P. Regis, "An Overview of the Unique Field of Submarine Medicine," Technical Report (Groton, CT: Naval Submarine Medical Research Laboratory, March 10, 2019), 6.

¹⁵¹ France, Interview with the Author.

¹⁵² Donald Roger Ferguson, Donald Roger Ferguson Collection, interview by Carol Adrienne Baughman, 1962, <https://www.loc.gov/resource/afc2001001.117017.pm0001001/?sp=3&st=image&r=-0.622,0,2.244,1.302,0>.

down a ladder and tore his Achilles tendon. I arrived on a small boat transfer with a few others who were reporting or returning to the ship while he was evacuated for medical treatment. Before long, he was back and as grumpy as ever. Medical emergencies are a part of submarine life, and the Doc does his best with his training and equipment. When a condition is too much for him, and the ship's operating condition can support evacuating a sailor, then will they send a man to shore. In the incredibly rare and horrible event that there is a death onboard, the former shipmate is stored in the ship's freezer along with, but hopefully not too close to, the food the crew is still eating on a daily basis.

CHAPTER 5

CONCLUSION

Submarines are known as the Silent Service. Each side of the submarine force, fast attacks, and boomers, have their own special reasons for staying silent. Fast attack boats stay silent when they sneak into enemy territory, spying and gathering intelligence or tracking enemy submarines or surface ships. They are known as hunter-killers for this probably obvious reason. Boomers, on the other hand, stay silent while they patrol their own special square of the ocean, not visiting ports or even very often having their existence acknowledged. This lack of acknowledgment, however, does not mean that their job is not at least as important as being a hunter-killer. In the theater of nuclear deterrence, their job just might be even more important. On balance, is it more important for national security to know where the enemy's ballistic missile submarines are or for our own to stay hidden? Nuclear deterrence relies on boomer submarines' ability to stay undetected and underway.

As discussed, without a secure, invulnerable, reliable second-strike capability, there is no nuclear deterrence. Ballistic missile submarines are that very second-strike threat. Since *George Washington* made her first patrol in 1960, the United States has maintained a deterrent presence at sea and the world has managed to not destroy itself in a nuclear hellfire. Deterrent theory says those things are related by cause and effect. Despite the secrecy surrounding both nuclear power and nuclear weapons, occasionally milestones and special events are announced. In 2014, the submarine force completed its

four thousandth deterrent patrol, which was noted by Congress.¹⁵³ The mission begun by the 41 for Freedom continues today and might even be more important in this turbulent post-Cold War world than it was back then.

Polaris missiles could reach Moscow from the North Atlantic with their 2,500 nautical mile range. That puts them launching from safety in the ocean somewhere between Portugal and the Azores. Trident missiles can go at least three times as far as that. From anywhere in the North Atlantic, their range reaches nearly as far as Singapore and easily covers the entirety of Russia. Having submarines stationed on each coast means that nowhere in the world is exempt from the threat of American second-strike capability. Nuclear deterrence has not prevented all conventional wars since World War II but any peer adversary has had to take the threat into account. Nonnuclear powers continue to seek to join the exclusive group of nuclear-capable nations and be considered equal in strength.

The SALT treaties of the Cold War have given way to the New Strategic Arms Reduction Treaty (New START), the agreement between the United States and Russia that governs the production, deployment, and proliferation of nuclear weapons. According to this treaty, the submarine-launched ballistic missile fleet is responsible for 70% of the country's available nuclear arsenal. Much of this arsenal is from the late Cold War, is operating well past its service life, and is due to be upgraded in the next decades, as recognized by the 2022 Nuclear Posture Review. The *Ohio*-class Trident submarines

¹⁵³ Derek Kilmer, "Actions - H.Con.Res.116 - 113th Congress (2013-2014): Congratulating the Sailors of the United States Submarine Force upon the Completion of 4,000 Ballistic Missile Submarine (SSBN) Deterrent Patrols.," September 18, 2014, <https://www.congress.gov/bill/113th-congress/house-concurrent-resolution/116/actions>.

which replaced the 41 for Freedom are in turn being replaced by the *Columbia*-class, and B-1 and B-2 nuclear bombers are being replaced by the B-21 Raider. The weapons themselves are also being upgraded with advanced capabilities.¹⁵⁴ Their role in national and world security has never been more important.

Submarines have even been in the news over the last few years getting attention they never wanted during the Cold War. The AUKUS agreement, named after member countries Australia, the United Kingdom, and the United States, is an agreement to help Australia obtain nuclear-powered submarines over the objections of others in the international community with nuclear proliferation concerns. Nuclear reactors use highly enriched uranium which can also be used in nuclear weapons, causing concern about nuclear proliferation.¹⁵⁵ The British Royal Navy recently brought their ballistic missile submarine *HMS Vanguard* out of an extensive shipyard upgrade period, and, like Captain France did on his ships, had to recertify the ship by test launching a Trident missile. The missile failed to ignite its first-stage boosters and failed the test, putting the reliability of the UK's nuclear deterrent in question.¹⁵⁶

Recently, a reporter from Vanity Fair was given the privilege of riding a ballistic missile submarine, the *USS Wyoming* (SSBN-742), for a couple of days where he got to

¹⁵⁴ Johnny Wolfe, "Statement of Vice Admiral Johnny Wolfe, USN, Director, Strategic Systems Programs before the Subcommittee on Strategic Forces of the House Armed Services Committee on FY 2024 Budget Request for Nuclear Forces and Atomic Energy Defense Activities" (House Armed Services Committee Strategic Forces Subcommittee, March 28, 2023).

¹⁵⁵ Sébastien Philippe, "The New Australia, UK, and US Nuclear Submarine Announcement: A Terrible Decision for the Nonproliferation Regime," *Bulletin of the Atomic Scientists*, September 17, 2021, <https://thebulletin.org/2021/09/the-new-australia-uk-and-us-nuclear-submarine-announcement-a-terrible-decision-for-the-nonproliferation-regime/>.

¹⁵⁶ "A Credible Deterrent? Trident Missile Fails during Test Launch from HMS Vanguard," *Navy Lookout*, February 21, 2024, <https://www.navylookout.com/a-credible-deterrent-trident-missile-fails-during-test-launch-from-hms-vanguard/>.

experience first-hand the awesome power contained under the seas and interview the crew responsible for hopefully never using that power. He also interviewed Admiral William Houston, former Commander of Submarine Forces, Atlantic Fleet, and current director of the Naval Nuclear Propulsion Program, the post once held by Admiral Rickover. Speaking about *Wyoming*, the Admiral told him, “It is the ultimate guarantor of our strategic deterrence.”¹⁵⁷ It and the other thirteen *Ohio*-class boats live up to the legacy established by *George Washington* and the rest of the 41 for Freedom.

Submarines have never been more interesting to those who have never served on them, and ballistic missile submarines, especially, have maintained their secrecy and their mystique. Their mission requires that they do so for their own protection and for the protection of the nation. They have spent over 50 years patrolling, deterring our enemies from using nuclear weapons, and they will continue to do so as long as the threat remains. Nuclear deterrence only works with a reliable, invulnerable nuclear arsenal on standby and our ballistic missile submarines fulfill that capability every day year after year no matter the sacrifices required by their crews.

¹⁵⁷ Adam Ciralsky, “Exclusive: Life Aboard a Nuclear Submarine as the US Responds to Threats Around the Globe,” *Vanity Fair*, February 15, 2024, <https://www.vanityfair.com/news/life-aboard-a-nuclear-submarine>.

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APPENDIX

Table 2.1. The 41 for Freedom

Ship	Hull Number	Commissioning Date
George Washington	SSBN-598	30 December 1959
Patrick Henry	SSBN-599	11 April 1960
Theodore Roosevelt	SSBN-600	13 February 1961
Robert E. Lee	SSBN-601	15 September 1960
Abraham Lincoln	SSBN-602	8 March 1961
Ethan Allen	SSBN-608	8 August 1961
Sam Houston	SSBN-609	6 March 1962
Thomas A. Edison	SSBN-610	10 March 1962
John Marshall	SSBN-611	21 May 1962
Lafayette	SSBN-616	23 April 1963
Alexander Hamilton	SSBN-617	27 June 1963
Thomas Jefferson	SSBN-618	4 January 1963
Andrew Jackson	SSBN-619	3 July 1963
John Adams	SSBN-620	12 May 1964
James Monroe	SSBN-622	7 December 1963
Nathan Hale	SSBN-623	23 November 1963
Woodrow Wilson	SSBN-624	27 December 1963
Henry Clay	SSBN-625	20 February 1964
Daniel Webster	SSBN-626	9 April 1964
James Madison	SSBN-627	28 July 1964
Tecumseh	SSBN-628	29 May 1964
Daniel Boone	SSBN-629	23 April 1964
John C. Calhoun	SSBN-630	15 September 1964
Ulysses S. Grant	SSBN-631	17 July 1964
Von Steuben	SSBN-632	30 September 1964

Table 2.1 Continued

Ship	Hull Number	Commissioning Date
Casimir Pulaski	SSBN-633	14 August 1964
Stonewall Jackson	SSBN-634	26 August 1964
Sam Rayburn	SSBN-635	2 December 1964
Nathanael Greene	SSBN-636	19 December 1964
Benjamin Franklin	SSBN-640	22 October 1965
Simon Bolivar	SSBN-641	29 October 1965
Kamehameha	SSBN-642	10 December 1965
George Bancroft	SSBN-643	22 January 1966
Lewis and Clark	SSBN-644	22 December 1965
James K. Polk	SSBN-645	16 April 1966
George C. Marshall	SSBN-654	29 April 1966
Henry L. Stimson	SSBN-655	20 August 1966
George Washington Carver	SSBN-656	15 June 1966
Francis Scott Key	SSBN-657	3 December 1966
Mariano G. Vallejo	SSBN-658	16 December 1966
Will Rogers	SSBN-659	1 April 1967

VITA

Jeremy Long served on the submarine *USS Connecticut* (SSN-22) from 2008 through 2013 where he had many interesting experiences, some of which he cannot talk about, before attending the University of Tennessee in Knoxville for his bachelor's in history and master's in American history.