Abstract

Title of Dissertation: COMMANDING MEN AND MACHINES: ADMIRALSHIP, TECHNOLOGY, AND IDEOLOGY IN THE 20th CENTURY U.S. NAVY

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This dissertation engages the important historical and sociological question: how do organizations develop leaders? As technological complexity increased, the military struggled to produce leaders who could understand technology and yet integrate the operations of disparate parts of large organizations. In the late 20th century, the senior leader model in the U.S. military shifted from a 'generalist' to what can be described as a 'technical specialist' model. The commanding elite that resulted have been criticized as overly technical in orientation, and the system of leader development has been subject to several reform efforts. Missing from the reform debates is an historical understanding of how and why the officer system changed. This study contributes to the history by exploring the shift in U.S. Navy leader models from 'generalist' to 'technical specialist'.

It is widely believed in military circles that the shift in leadership models from 'generalist' to 'specialist' was natural, an inevitable consequence of technological change. Among scholars, the shift in the U.S. Navy from 'generalist' to 'specialist' is typically associated with aviation, circa 1935-47. This dissertation challenges these notions. The shift in leader models was not fated by technology, but was the result of highly contingent bureaucratic battles fought between general line officers (generalists) and

nuclear reactor specialists for control of the development of young officers. Chance events-- in particular, the sinking of USS THRESHER-- also shaped officer policy.

This study argues that for four decades—from 1919 to 1963-- navy leadership affirmed the 'generalist' as the preferred model for commander. But in the 1960s the Navy abandoned the 'generalist' model. Admiral H.G. Rickover was largely responsible for the change. In the space of a decade, Rickover restructured assignment and education processes to produce technically expert officers for his nuclear machines. Naval Academy admissions criteria and curricula were changed such that specialized technical majors replaced general degrees and universal language education. The restructured processes encouraged officers to value specialized technical expertise over general knowledge, that is, integrated operational, strategic, and cultural knowledge. Aviators and surface officers followed Rickover's cue and by the 1970s adopted more specialized models of development for their respective officers.

COMMANDING MEN AND MACHINES:

ADMIRALSHIP, TECHNOLOGY, AND IDEOLOGY IN THE 20TH CENTURY

U.S. NAVY

by

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The views expressed in this dissertation are those of the author. They do not reflect the official policy or position of the United States Navy, Department of Defense, or the U.S. Government

Dedication

To Ann

ACKNOWLEDGEMENTS

After several years of work, it is difficult to remember and recognize here all those who contributed to the successful completion of this dissertation. While I did the writing and the research that are found within these pages, both were built upon the work of many scholars and career officers who took the time to think and write about the officer corps. I am particularly indebted to the many retired naval officers who enthusiastically consented to a multitude of interviews. In almost every interview, the admirals and captains provided not only their recollections of officer policy in the Second World War and Cold War, but in many cases offered a deeper analysis of what was changing and why. I am also appreciative of the almost two thousand former Navy and Marine Corps officers who responded to a survey regarding their career experiences. Though the surveys came too late to be included in this paper, they will inform future work on this subject.

I am particularly appreciative of my advisor, Jon T. Sumida, who spent many hours reading and advising me on my work. His scholarship regarding the development of navies and naval education has been an inspiration to my work. Similarly, special thanks go to Robert Friedel, my advisor during the first phase of my doctoral work. I must credit him for pushing me early to challenge the implicit notions of technology that many officers carry around in their everyday lives. To Dr. David Rosenberg I am deeply indebted, for though he faced life-threatening health challenges during the course of my work, he spent numerous hours reading and commenting on my arguments. I am honored that he, one of the Navy's leading U.S. naval historians, gave so generously of his precious time. Though this is a history dissertation, it includes a significant sociological component. Dr. David Segal encouraged me to step beyond the bounds of history and employ some of the tools of the sociologist in order to understand better the navy's process of social change. To the other dissertation committee member, John Lampe, thank you for seeing me through this lengthy process.

This work would not have been possible without the many years of painstaking, and sometimes unappreciated, labors of the archival staffs at the Naval Historical Center, Naval Academy, Naval War College, and the National Archives. In addition, the cooperation of the Naval Institute and Naval Academy Alumni Association is sincerely appreciated. In particular, I want to thank Dr. Ed Marolda and his staff at the Naval Historical Center.

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Finally, I want to attempt to express the debt of gratitude I owe to my family. In my interviews with senior naval officers, I frequently heard them tell of their profound appreciation for their family, and of the sacrifices made by spouse and child in the course of the officer's career. I was also blessed with one of those "navy" families. Long before I started this project, my wife Ann, and my children James, Jillane, and Virginia, made innumerable sacrifices in support of their husband's and father's work aboard the ships of the U.S. Navy. They frequently gave up friendships and the comforts of familiar surroundings to 'follow dad'. For their loving support and willing sacrifice I am truly thankful.

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Terms, Abbreviations, Acronyms

AEC	Atomic Energy Commission
AEGIS	Advanced Radar system/type of new ship
BUAER	Bureau of Aeronautics (aviation)
BUNAV	Bureau of Navigation (actually, personnel)
BUPERS	Bureau of Personnel
CAG	Carrier Air Group (senior aviator captain)
CGN	Cruiser, guided missile, nuclear (surface ship)
CINC	Command in Chief (various fleets)
CNO	Chief of Naval Operations
CNP	Chief of Naval Personnel
COMSUBLANT	Commander, Submarine Force Atlantic
COMINCH	Commander in Chief Fleet (a WWII-era position held by ADM Ernest King)
CV	Non-nuclear aircraft carrier
CVN	Nuclear-powered aircraft carrier
EDO	Engineering Duty Only/Officer
FBM	Fleet Ballistic Missile submarine (see SSBN)
flag	Short hand reference for admiral (RADM to ADM)
GLC	General Line Course (King's course of 1920-1962)
GLS	General Line School (sometimes used interchangeably with GLC)
GURL	General Unrestricted Line Officer (used interchangeably with URL until approx 1980)
JCAE	Joint Committee on Atomic Energy
LDO	Limited Duty Officer (an officer promoted by experience from the ranks, not through college program)
Line/Line officer	Officers eligible to command at sea (as used in this text, does *not* include EDOs who were considered restricted line officers (RL))
NPGS	Naval Post Graduate School (the navy's graduate school)
NR	Naval Reactors (Rickover's headquarters)
NROTC	Navy Reserve Officers Training Corps
NUKE/NUC	Nuclear trained officer
NWC	Naval War College
NWC	National War College (will typically refer to as National War College)
OCS	Officer's Candidate School
RL	Restricted Line (otherwise known as Staff Corps)
URL	Unrestricted Line Officer (command eligible 'line')
Sub-specialty	A secondary specialty (this is not to be confused to mean a specialist in submarines)

SS	Non-nuclear submarine (typically diesel)
SSN	Nuclear submarine (attack boat)
SSBN	Nuclear submarine (ballistic missile)
SWO/S	Surface Warfare Officer/School

Introduction

"We have been made captive of our technology." [1]

Admiral Harry D. Train, USN (retired)

Looking out at a Norfolk harbor crowded with billion-dollar ships and submarines, Admiral Train pondered the question: how had the relationship between technology and naval officers changed during his career? Train, who served on active duty from the 1940s to the 1980s, answered: "We have been made captive of our technology." [2] Train went on to explain that this condition was new; it had not always been this way. Something had happened during his career that changed the priorities and values of senior officers. High command--the senior 'line' officers-- had been molded by technology like never before. The naval commander had become focused on his favored technologies, his 'means' of war. In the process, naval command was losing sight of the 'ends': operational command and victory in war. How had this happened-- was it inevitable or could things have been different?-- the admiral was not sure. However, his suspicion was that the seeds for the changed thinking were planted long ago, and involved the system by which the Navy educated and professionalized the 'line' officer who would command.

[1] Harry Depue Train, ADM USN, Interview with the Author, 2 November 2007.
[2] Ibid. Interview held at the Town Point Club, Norfolk, Virginia, home of the largest naval base in the world. The windows of the club looked out at the shipyards where navy ships are repaired. The author's own ship was moored across the Elizabeth River. The author is particularly appreciative of the admiral's frank and illuminating comments.

This is the story of how engineers, in an effort to control a dangerous technology, transformed the professional development of officers who would become the admirals of the 'line'. The elevated influence of engineers and technology in shaping the high command of the U.S. Navy was not, however, preordained. The making of the modern commander was the product of the confluence of personalities, contingent events, tragedy at sea, and the latent power of a long forgotten, elitist ideology that originated in New York City in the 1920s. The transformation occurred over a two decade period from 1953-75 at the peak of the arms race with the Soviet Union. The changes to the system of officer education and professional development have remained largely in place, a legacy of the Cold War.

The captivity Admiral Train described is known today as techno-centrism. For our purposes, techno-centrism, and its close relative, platform-centrism, are loosely defined as the condition wherein technology becomes a defining influence in an officer's professional thinking and value system. Platform-centrism is the more specific condition wherein the technology is the platform: the ship, submarine, or aircraft.[3] Techno-

[3] 'Techno-centrism' may have been derivative of an earlier term, 'technicism'. 'Technicism' was used to describe the condition in the Navy's early history wherein the material bureaus and their priorities took precedence over the operational forces. See Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge: Belknap Press of Harvard University Press, 1957), 247; Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 356. The phrase 'techno-centrism' came into wider use beginning in the 1980s and appears to be a synthesis of the ideas of technology, egocentrism and ethnocentrism. As best can be determined, 'techno-centrism' in the approximate form used in this dissertation, first appeared in a publication in 1987 by Seymour Papert. Papert explains his choice of terminology: “I coined the word techno-centrism from Piaget's use of the word egocentrism. This does not imply that children are selfish, but simply means that when a child thinks, all questions are referred to the self, to the ego. Techno-centrism is the fallacy of referring all questions to the technology.” Seymour Papert, *A Critique of Technocentrism in Thinking about the School of the Future.* (MIT, 2005, accessed 11 November 2007); available from http://www.papert.org/articles/ACritiqueofTechnocentrism.html. Other definitional versions of techno-centrism that came later are similar, but not identical, to Papert's. These other usages of the term often equate ‘techno-centrism’ to a form of ethnocentrism, wherein one group believes its technology is superior to other technologies, or its technical experts are better than experts of other kinds. A subset of techno-centrism is 'platform-centrism', a condition wherein the platform

centrism and platform-centrism as phenomena in the US military are widely recognized. Depending on the context, it is sometimes considered entirely appropriate for an officer to be 'techno-centric' or 'platform-centric'. An 'Engineering Duty Officer' working at the Naval Research Lab should be 'techno-centric'; a shipyard officer working in the dry-dock should be 'platform-centric'. However, when technology and the platform become over-riding considerations in the thinking and values of leaders at the higher levels of operational command, the drawbacks become apparent.

Scholars of military and security policy in the later 20th century not infrequently criticized senior American military commanders as ‘techno-centric’.[4] Popular culture has portrayed American military commanders as narrow-minded technicians who measured success in strictly technical terms and sought technical solutions to problems better addressed by non-technical strategies.[5] Military commanders have been described within their own services as ‘platform-centric’. Platform-centric thinking has been criticized as resistant to new technological innovations that may threaten or divert support away from the favored platform.[6]

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technology of ship, submarine, or aircraft become defining of an officer's professional thinking and professional value system.

[4] Critiques of U.S. military 'techno-centrism' have become increasingly common in contemporary literature. Martin Van Creveld has been a long-time critic, and most recently revisited the theme. See Martin L. Van Creveld, "War and Technology," *Foreign Policy Research Institute Newsletter,* 12, no. 25, November 2007. Similarly, historian, Alex Roland, and sociologist, Morris Janowitz, critiqued the rising influence of engineers and technologists in the military, a phenomenon associated with techno-centrism.

[5] Stanley Kubrick’s *Dr. Strangelove* offers perhaps the best known portrayal of a technocratic and techno-centric military. The leading military officer, Air Force General Buck Turgidson, which in Kubrick’s film is played by George C. Scott, appears to think only in terms of megatons and kill-rates. The bomber squadron commander, played by Slim Pickens, rides a hydrogen bomb to 'ground zero' as if he is riding his horse to the rodeo. Both character portrayals give the exaggerated impression of military officers so focused on their machines that they are oblivious or indifferent to the larger social and human costs of the nuclear war they are about to unleash.

[6] Critiques of a 'platform-centric' military were central to VADM Arthur K. Cebrowski's ideas of the primacy of the network and "network-centric warfare." See David S. Alberts, John Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*, 2nd ed. (Washington, D.C.: Dept. of Defense, 1999).

In the later 20th century, defense reformers acted to counter what they saw as this troubling trend of officers to focus too narrowly on technology or a particular platform.[7] To counteract the tendency of officers to over-emphasize technology in their education, political leaders urged the military to expand cultural and linguistic studies.[8] Political leaders have been so bold as to locate this problem in the officer development system. Senior civilians have passed laws to promote more integrative education and then made such education a pre-requisite for promotion to flag rank (e.g. the Goldwater-Nichols legislation in the 1980s).[9]

After more than two decades of reforms, however, a puzzling inertia or momentum sustains the condition of techno-centrism. The military services remain closely identified with platform systems, and many military educational institutions continue to produce mostly engineering and technical officers despite the urgent demand for linguistically and culturally educated officers.[10] While many have criticized this

[7] A Chief of Naval Operations in the middle 1970s saw intra-service parochialism, centered on the platform, as a serious threat to unified effort in the Navy. See Elmo R. Zumwalt, *On Watch: a Memoir* (New York: Quadrangle/New York Times Book Co., 1976). But Zumwalt was not alone: Admirals John McCain, James Stockdale, Stansfield Turner, Arthur Cebrowski, as well as Harry Train, voiced similar concerns. In the early 1990s the Navy staff was reorganized to reduce the power and influence of the platform advocates, advocates known at the time as the 'barons'.

[8] Since 1991, following the first Iraq war, civilian leadership has encouraged the military services to expand Arabic language training programs. In spite of the civilian suggestions, Arabic was not taught at the US Naval Academy until 2002. The Navy in 2007 approved an expanded program to enhance cultural and regional studies, though it is too early to judge the success or failure of the program.

[9] The failure known as "Desert One" in 1980 and a lack of military integration demonstrated in Grenada in 1983 contributed to the most dramatic reform attempts, the Goldwater-Nichols legislation in the mid-80s. Until 2007 officers could, however, seek waivers from the legislated joint education and assignment requirements. The typical reason given for a waiver request was the competing demands levied on officers as a consequence of their advanced technology, in particular, nuclear reactors.

[10] Rick Atkinson, "Left of Boom: The Struggle to Defeat Roadside Bombs," *Washington Post*, 30 September 2007. Atkinson interviewed several senior officers who complained of the military's tendency to seek technical solutions to problems that may have been more appropriately addressed with non-technical, social, or cultural strategies. Further indicative of techno-centric type of thinking and value system is the debate over curricular reform at some service academies. As late as 2008, the Navy directed the Naval Academy to re-emphasize technically specialized degrees at the expense of studies in language and culture. Specifically, the Navy required approximately 65% of all midshipmen to graduate with a technical degree.

condition and called for officer corps reforms, what is absent in the debate is a comprehensive understanding of the historical origin of these phenomena.

This dissertation will examine the history of the educational and professional development system that produced the senior commanders who became the admirals in the naval officer corps in the 20^{th} century U. S. Navy. This dissertation's thesis is that since the emergence of steam engines, naval 'line' officers have been concerned about the tendency of technology and technologists to shape the thinking and values of operational commanders. 'Line' officers acted on their concerns and in the early 20^{th} century developed a 'generalist' model of officer education that mitigated the influence of technology and technologist in the 'line'. But during the Cold War, an activist group of technical specialists successfully challenged the 'generalist' model and replaced it with their own model: the technical expert or specialist in command. The specialists' Cold War-vintage model inculcated the values of techno-centrism and platform-centrism in officers who then rose to the highest levels of command.

In the months following the end of the First World War, Navy leaders created the 'generalist' system of officer development. The 'generalist' model reigned for almost five decades. It was designed to develop young officers into operational commanders and emphasized the utmost importance of 'unity of effort' in what was becoming a three-dimensional navy. The system defined the needs of the Navy in terms of the service as a whole and not in terms of a particular platform community. For a 'line' officer, specialized knowledge of a technology was important but was nonetheless of secondary importance when compared to integrated knowledge required of those who would command. Non-technical education was, moreover, highly valued in the 'generalist' model, in particular, language and cultural knowledge. The model commander in this system was called the 'generalist', or the 'general line officer'.

Navy policy from 1920 to the middle 1960s actively encouraged the best officers to strive to become a 'generalist' in command.[11] The cultivation of the capacity for broad, operational command in the Navy-- rather than cultivation of technical expertise in a single specialty--was a 'line' officer's ultimate goal.[12] Over time, however, the label of ‘generalist’ took on an almost pejorative connotation that obscured the fundamental qualities of officer-ship it intended to convey. To better capture the positive qualities of such a leader, the naval profession created new labels for the same officer model. The label of 'generalist' or ‘general line officer’ was used interchangeably with "broad-minded", “well rounded” or "versatile" officer, terms that may connote a particularly positive view. A less normative term that accurately captures the 'generalist' qualities would be "integrative" or "integrative officer", labels which this study will use interchangeably with the historical labels.[13]

This model of the 'integrative' commander passed the ultimate test--the crucible of combat in the Second World War--but did not survive the Cold War. It is important, however, to understand the demise of this model was not an indictment of the old model. The old model was not discarded because it 'failed' in combat, nor did the Navy reject the old model after a deliberative assessment. Rather, the old 'generalist' model was eclipsed

[11] Morris Janowitz, *The Professional Soldier: a Social and Political Portrait* (Glencoe, Ill.,: Free Press, 1960), 69. Janowitz does acknowledge that the Navy was last among the services to embrace a technical specialist model of command, though he provides little to no explanation of how the Navy model finally did change.
[12] Paolo E. Coletta, *The United States Navy and Defense Unification, 1947-53* (Newark: University of Delaware Press, 1981), 23.
[13] The qualities of the 'well rounded officer' resemble in some fashion those attributes of the 'fusionist' model, but for a paper that will discuss nuclear technology such a phrase poses a problem. For a discussion of the 'fusionist' officer, see Huntington, 1957.

for another reason: the advocates of the 'generalist' model lost the bureaucratic battle for control of the education, assignment, and promotion of young 'line' officers.

During the Cold War a new officer model and system of development displaced the 'generalist' ('integrative') model of command. The new model was indeed something new to the Navy: the scientific-technical expert, platform-specialist officer became the model for senior leader. The contrast between the two types of officer was significant. Whereas the 'generalist' system discouraged line officers from identifying too closely with technology or a platform, the new system *encouraged* officers to identify as engineering or platform specialists. While the old system promoted broader tactical, operational[14]*, and strategic knowledge, the new model favored detailed technical knowledge. This change in models became manifest in the Navy's educational institutions, in particular, the United States Naval Academy at Annapolis. Whereas the old system had encouraged every officer to study a foreign language and to receive a general undergraduate education, the new model focused officer-trainees (midshipmen) on specialized, technical curricula. The techno-centrism and platform-centrism that survives in the Navy's high command is rooted in this shift in officer models and educational priorities that occurred during the Cold War. The immediate catalyst for the shift in models was a nuclear engineer, Hyman G. Rickover, empowered by his new technology, the nuclear powered ship.

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[14]* The term 'operational' is problematic. In the military services the term 'operational' is used inter-changeably to describe a range of activities: from the most basic functions of a technician (e.g., what a 'lathe operator' does in a machine shop, or what the 'reactor operator' does in a power plant) to the 'operational level' of war which involves the movement of entire fleets and armies in a 'joint' environment. The shift in officer models in the Cold War encouraged officers to de-emphasize the study of the operational level of war (the integration of warfare in three dimensions, to include the consideration of strategic, political, and cultural factors) and instead focused officers' attention more toward maintenance and 'operations' knowledge of a single machine technology (the jet aircraft, the reactor, the radar). This shift in policy is captured in the changing description of *what a 'line' officer should know* as recorded in authoritative personnel documents. These documents will be discussed in detail in succeeding chapters.

The primary focus of this study will be on Navy officers and technology, but the findings will be relevant to Marine Corps officers who were members of the same department and graduates of the same colleges as navy officers. Though this paper focuses on the Navy Department's education and development of navy and marine officers, it is believed that an understanding of the naval experience may shed light on the nature of military high command in the early 21st century. The broader significance of a study of naval institutional and personnel policy history is substantiated by the fact that former naval personnel have occupied senior positions of government (to include several American presidents and at least two secretaries of defense), have risen to high rank in the Air Force, and have in the first decade of the 21st century dominated America's senior military leadership body, the Joint Chiefs of Staff. (see Figure 1-1). It is possible, if not probable, that the naval education and professional development system may have influenced the ideas, values, and thinking of these senior leaders. Though more difficult to show graphically, the presence of active duty or former naval officers in the senior civilian staffs of the Department of Defense was also widespread in the early years of the new century.[15]

[15] The Secretary of Defense from 2001 to 2007, Donald Rumsfeld, was a former naval officer. His closest personal advisor, Larry Dirita, was a former naval officer, as were two of three of his personal military assistants from 2001-2006. One of most influential voices in war policy and a senior member of the OSD policy staff was William Luti, a retired Navy captain and former aide to the Vice President. Senior civilian advisors who surrounded the deputy secretaries of Defense, Paul Wolfowitz, and Gordon England, a former Secretary of the Navy, were also one-time naval officers, to include Robert Earl, Jim Thomas, Lynn Wells, and Doman McArthur. In addition, during much of this period, the senior intelligence advisor in the Department of Defense, the head of the Defense Intelligence Agency, was also a naval officer, and after 2006, both the senior Middle East commander (CENTCOM) and commander of Special Forces (SOCOM) were naval officers. Many of these civilians as well as the naval officers who composed the majority of the Joint Chiefs were educated, trained, and professionally shaped by the Navy Department's officer development system, the subject of this dissertation.

Joint Chiefs of Staff Composition by Service

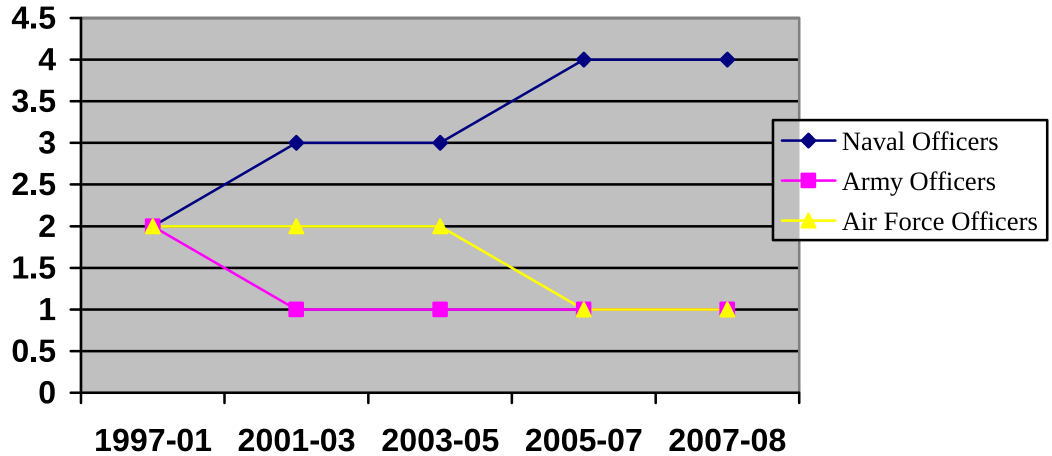

Figure 1-1

This dissertation will contribute to the already considerable scholarship on this subject in the fields of military sociology, military history, and the history of technology. The displacement of the generalist by the specialist model within the broader military profession has been noted by several military scholars, but few have explored its origins, its close associations with the machine, and how the specialist model perpetuated itself in the Cold War United States Navy.[16] Sociologists and historians provide several useful insights and analytical tools that will be used in this study. Scholars of non-military

[16]Morris Janowitz, *The Professional Soldier: a Social and Political Portrait* (Glencoe, Ill.,: Free Press, 1960); Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge,: Belknap Press of Harvard University Press, 1957); John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957); Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore: Johns Hopkins University Press, 1989); R. Michael Worden, *Rise of the Fighter Generals: the Problem of Air Force Leadership, 1945-1982* (Maxwell AFB, AL: Air University Press, 1998); Chris C. Demchak, *Military Organizations, Complex Machines: Modernization in the U.S. Armed Services*, Cornell studies in security affairs. (Ithaca, N.Y.: Cornell University Press, 1991); Vincent Davis, *Postwar Defense Policy and the United States Navy, 1943-1946* (Chapel Hill,: University of North Carolina Press, 1966); Vincent Davis, The Admiral's Lobby, (Chapel Hill: University of North Carolina Press, 1967).

technologies and organizations have produced theories that attempt to explain the nature of human-machine relationships and the social construction of technologies. They have also sought to explain how large socio-technological systems, once created, tend to accumulate power, survive for long periods, and reshape organizational values.[17] This study will build on some of their work and will in turn provide a better understanding of these phenomena within large governmental and military organizations in the 20th century.

The relationship between men and their machines in the 20th century is highly complex and defies simple explanation. There is no one theory that can explain how scientific-technological systems interacted with and shaped the beliefs of the human masters. What is clear is that the machines did not, by themselves, create the condition identified as techno-centrism and platform-centrism. Technology and the platform came to occupy the most favored place in the military because the senior commanders of the organization were socialized to hold such a value system. The socialization process that changed the high command was not predictable or neat but was highly contingent and varied depending on context. This study will show that scientists and engineers were the catalyst for the shift in model from generalist to the "technical expert as commander". But it will also demonstrate that they had lots of help.

The metamorphosis of American command and the creation of modern admiralship followed a winding path. An important pre-condition for the transformation

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[17] Wiebe E. Bijker, Thomas Parke Hughes, and T. J. Pinch, *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Mass.: MIT Press, 1987); Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983); Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge, Mass.: MIT Press, 1977); Jacques Ellul, *The Technological Society* (New York: Knopf: 1964); Neil Postman, *Technopoly: the Surrender of Culture to Technology*, 1st ed. (New York: Knopf, 1992).

was the decision in 1899 to merge the technical specialists—the steam engineers—with the 'line' officers who exercised overall command of the ship, to include control of weapons and general operations. This merger created a privileged position for specialized, technical knowledge within a professional body that heretofore had been more operational and less technical in mindset. Thus was established in the American Navy the fundamental condition for continued conflict and competition between the technical and the operational-minded officers, between the specialist and the generalist. For the next century, each advocacy group would seek to redefine naval command according to their respective interpretations of what a commander should be.[18]

The 1899 merger of the technical specialist and the operational commander proved problematic from the outset. The problems derived in no small part from the unbalanced political and intellectual underpinnings of the merger. The merger was a political expedient, orchestrated, not by seasoned professionals, but by highly influential yet befuddled amateur politician-defense officials. Secretary of the Navy, John D. Long, a novice on military matters, and equally inexperienced Theodore Roosevelt, the future "Rough Rider", did not appreciate the complexities of modern naval operations and naval engineering. They both were informed by a backward-looking concept of naval operations and naval engineering and did not comprehend the degree to which modern engineering and operations would tax the mental faculties of the commander. Naval operations within a matter of years became highly complex and with the innovations of flight and submarine warfare were to become three-dimensional. Moreover, engineering

[18] Little known is the fact that the main proponents of the successful plan of 'amalgamation' were not serving navy officers, but rather the young Under Secretary of the Navy, Theodore Roosevelt, and a Harvard professor of engineering, Ira N. Hollis. It is further interesting to note that most European navies did not follow the American pattern, but rather kept the engineering and command (line) officers separate and distinct. The reason for the differences has never been adequately explained and deserves study.

was itself in the midst of a profound transformation from a skill-based vocation to a science-based profession.[19] Few officers could master both operations and the science of the new engineering. Professional 'line' and engineering officers doubted the wisdom of the merger but eventually gave their support in return for the promise of accelerated promotions of younger officers. The merger of 1899 thus created confusion as to what made up the new 'line' commander, what was to be his identity: was the commander a technical specialist focused on his machine, or a more generally educated officer whose main concerns were the employment of the fleets, ships, weapons, and men?

In the two-decade period following amalgamation, 1899-1919, senior navy leaders came to fear that amalgamation had enhanced the power of technologies and technologists to unduly influence the education and development of the 'line' commander.[20] Conditions in the early 20th century favored an engineering approach to command. The late 19th and early 20th century was a time of "technological enthusiasm", and naval officers, like many Americans, were drawn to their pumps, pipes, turbines, and dynamos. The advent of submarines and aircraft in the First World War produced more machines around which an officer corps could organize and identify. With a revolutionary reform of the promotion system in 1916, there was introduced a new danger: the tendency of an officer to identify with a particular platform or machine could be reinforced by new merit-based promotion boards. Prior to 1916 the seniority system determined who promoted to admiral: there was no means to promote friends or protégés

[19] Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967).

[20] The fear of the influence of machines on the 'line' had deep roots in the Navy. Alfred T. Mahan had first written of this concern as early as 1879. Alfred T. Mahan, "Naval Education," *US Naval Institute Proceedings*, 5, December 1879. See a more detailed discussion of Mahan's concerns in Jon Tetsuro Sumida, *Inventing Grand Strategy and Teaching Command: the Classic Works of Alfred Thayer Mahan Reconsidered* (Washington, D.C.: Johns Hopkins University Press, 1997).

or favored specialists to flag rank. In the reforms of 1916, naval officers became empowered to choose their own successors in a system closed to outside scrutiny. With this new promotion system based on 'merit', it was now possible that cabals or groups could gain control of the selection of future generations of officers. It was quite possible that whichever model of the ideal officer became dominant in the minds of officer-selectors, that that new model would determine the next generation of admirals and perhaps perpetuate itself into succeeding generations.

Naval leaders pondered the prospect of self-replicating, specialized officer groups rising to high command and took action to forestall such an outcome. One of their primary objectives was to maintain an officer corps unified around the Navy mission of command at sea and operational command of the sea. These officers sought to prevent the ascendancy of a new 'line' officer model that might encourage specialized thinking and values. It was not that technical specialists were inherently bad officers. Rather, the Navy's senior leaders feared that to encourage technical and platform specialization in command risked fragmenting the service along technological lines. Unity of action so necessary to effective military action would be lost. To prevent service fragmentation, a positive model of officer had to be developed and made available to the newly empowered promotion boards.

Before the official end of the First World War, the Navy began efforts to develop what would become the 'generalist' model of commanding officer. Captain Ernest J. King, President of the Naval Post Graduate School, along with two other officers, was tasked in 1919 to devise the new model of officer development. King and his co-developers had learned an important lesson in the recent world war: a commander must not confine his thinking to his machines and a specialty but had to cultivate the capacity for integrated, operational command judgment. [21] The King system of officer development (often known as the Knox-King-Pye Plan, but will be referred to as the King Plan or King System)[22] thus established as its primary objective the development of officers capable of integrated judgment in matters of operations and strategy. Of secondary importance to the authors was development of 'line' officers with in-depth technical knowledge of the machines of war, though the Navy did acknowledge the need for a small group of more specialized officers who did not command (a group of engineering specialists that were known as EDOs, or Engineering Duty Only officers).

The King system used three tools to create the integrative, generalist officer: general education at Annapolis followed by advanced non-technical education at the war colleges; assignment of officers to a breadth of billets and platforms; and general 'line' officer promotion examinations. With adoption of the King System, the Navy followed a *deliberate* policy of education, assignment, and promotion that worked actively to *oppose* parochialism; a policy that worked to *oppose* the human tendency to focus on single platforms; a policy that worked to reduce the tendency of a commander from becoming techno-centric and platform-centric in thinking and action. King's model guided the officer development system that helped produce a generation of leaders who commanded

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[21] As further information concerning the conduct and planning by belligerent commanders of the First World War became available, many historians have offered critiques similar to King's. Senior commanders of the Great War were deficient in their capacity to integrate the complex operations with which they were confronted. See Michael Geyer, "German Strategy in the Age of Machine Warfare, 1914-1945," in *Makers of Modern Strategy, 2nd edition*, ed. Peter Paret (Princeton: Princeton University Press, 1986); Stephen W. Roskill, *The Art of Leadership* (Hamden: Archon Books, 1965); G. A. H. Gordon, *The Rules of the Game: Jutland and British Naval Command* (Annapolis, Md.: Naval Institute Press, 1996); J.F.C Fuller, *Generalship: Its Diseases and their Cure: A Study of the Personal Factor in Command* (Harrisburg, PA: Military Services Publishing, 1936).

[22] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings*, 46, no. 8, August 1920.

from 1941-1945 and well into the Cold War.   Despite the remarkable success of the officers produced by the King system, Navy policy would eventually reject the tenets of the King Plan. By the last quarter of the 20^{th} century, navy policy would actively encourage aspiring commanders not to be 'generalists' but instead encouraged the 'line' to become increasingly specialized technical and platform experts. However, this inversion in the Navy policy and action came later than is commonly believed and was not a consequence of the lessons of the Second World War. [23]

Contrary to conventional wisdom, the Second World War and the rise of naval aviators to high command was NOT the decisive event in the evolution toward a more technically and platform-specialized naval commander. The massive wartime expansion of the ‘line’ actually resulted in an influx of tens of thousands of broadly educated young men from liberal arts and technical colleges from around the country. Moreover, actual combat operations placed a premium on officers who were more tactically innovative operators than narrow technical specialists, especially in the submarine fleet. The war also propelled to high command a new breed of officers, the carrier aviator, who served on multiple platforms, both aircraft and surface ships, and who also endorsed King's model of the well-rounded officer.

The new post-war leadership, dominated by naval aviators, embraced the idea that wars of the future must be fought by a highly integrated navy. To achieve 'unity of effort' in combat required, therefore, an integrated and unified officer corps. Unlike the Army,

[23] Respected scholars, to include Huntington and Janowitz, have tended to lump the three services together, and date the timing and attribute the causality of the shift to a more technical and specialized officer corps as one and the same: to the events and experiences of the Second World War. While this is most certainly true of the US Air Force, and perhaps the Army, this is not the case of the US Navy. It will be argued that official Navy policy did not endorse a specialist model of officer until the middle 1960s, and that navy 'generalists' commanded at high levels until well after the publication of Morris Janowitz, *The Professional Soldier: a Social and Political Portrait* (Glencoe, Ill.,: Free Press, 1960).

the Navy did not fragment along lines defined by machine specialties. On the contrary, the Navy promoted aviators up the ranks, pioneered joint service cooperation, and reaffirmed the King model of integrative education in no less than three post-war studies of the officer corps. In the half-generation following the Second World War, officers were expected to broaden their knowledge of Navy, the other services, and the world. To attain this broad knowledge, officers were expected to serve on more than one platform if possible; gain knowledge of the Army and Air Force through attendance at various war colleges; and better understand the larger world with expanded language and cultural education. As late as 1956, the CNO, Admiral Arleigh Burke, established proficiency in a foreign language as one of his top three priorities for the 'line' officer![24] However, these policy priorities did not survive the 1960s.

The shift in 'line' officer models from integrative (generalist) to techno-centric and platform-centric came in the two decades from 1953-1975. In this period the foundational pillars on which King built the 'generalist' model were eliminated in quick succession: integrative education at the war colleges would for those who promoted to senior command all but cease; non-technical, general education (to include universal language training) at the Naval Academy would be severely restricted and replaced with an emphasis on highly specialized technical degrees; the practice of assignment variety and duty on two platform types would become for submariners and aviators the exception rather than the rule; and navy-wide promotion exams for 'line' officers were terminated. Not coincidently, the demise of the King system of integrative education and

[24] Arleigh A. Burke, ADM, USN, "Letter from the Chief of Naval Operations to All Line Officers," *Line Officer Personnel Newsletter*, September 1956.

development paralleled the emergence of the nuclear reactor and the nuclear specialists led by Hyman G. Rickover.

The challenger to the 'generalist' model was three-sided: a highly complex, scientifically engineered technology; a bureaucratic genius; and an aggressive philosophy of technical elitism. The technology was the nuclear reactor, a highly dangerous technology, which enjoyed an unprecedented organizational sponsorship: it was perhaps the first navy technology to belong to two independent organizations--the AEC (Atomic Energy Commission) and the Navy-- and this dual status conveyed to its benefactor, Rickover, a uniquely powerful position from which to effect reforms. Rickover was himself uniquely suited to the role of reformer: he was a scientifically educated non-conformist who had nonetheless survived the Navy's promotion system. Lastly, unlike other reformers, Rickover did not derive his beliefs about men and machines from navy institutions but was instead inspired by a culture and set of ideas alien to the Navy: the ideology of technocracy that originated in the elitist engineering movements of early 20th century New York City.

Many authors have acknowledged Rickover was a genius, as does this author. He was the ‘Father of the Nuclear Navy’, he “…set the standard for all other technical endeavors…” and his progeny “…oriented the entire Navy toward the standards they had learned in the nuclear program.”[25] Arguably the 'Father' of most nuclear power plants in the United States, if not the world, Rickover may well go down in history as one of the Navy's most important officers. However, Rickover did more than set technical standards or build nuclear ships and train nuclear engineers. He, more than any other

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[25] Randolph W. King and Prescott Palmer, *Naval Engineering and American Seapower* (Baltimore, Md.: Nautical & Aviation Pub. Co. of America, 1989), 280.

person, was responsible for the rise to dominance of the techno-centric and platform-centric model of 'line' officer that came to define 20th century navy command. Rickover, more than any other single officer, directly challenged the King system of officer development and the integrative approach to officer education and assignment. Instead, Rickover advocated that man must be conformed according to the dictates of technology, that the modern commander must of necessity be first and foremost a specialized technical expert.

Rickover did not change the model of naval command directly; his specialists did not as a group come from outside and displace a group of old officers in command of the 'line'. Rather, Rickover changed the Navy from within, by shaping the professional development system of line officers. He did so in three phases: first, by gaining control of the personnel levers of training, education, assignment, and promotions in the submarine community; second, by transforming the Naval Academy into a elite engineering college or polytechnic; third, by diffusing his model of 'line' officer through the ranks in the surface and aviation communities with his personnel and technological exemplars. Rickover was a revolutionary who survived long enough to serve in uniform two full generations (1922 to 1982), a full generation of which he wore the stars of a flag officer, 1953-1982. Rickover's remarkable longevity cannot be minimized as a factor in the profound transformation of the officer corps that followed.

Rickover was a revolutionary in his advocacy that a technical elite should command in the Navy, but he was less original in his thinking than is commonly appreciated. Rickover's ideas and his new model of leadership most likely found their inspiration in the early engineering movements of the early 20th century in New York

City. Rickover's idea of the political primacy of technical expert was a key tenet of a most aggressive variant of the activist engineering ideologies in the 1920s, that of the Technocracy Movement.[26] A close analysis of Rickover's educational experiences and writings reveals that Rickover had been a graduate student in the cradle of the Technocracy Movement, Columbia University, and there he seems to have taken for his own the technocratic philosophy of leadership: technical specialists should command. Rickover acted on his adopted philosophy and created the most successful military technocracy and technical program in history: the system that produced and manned nuclear warships and controlled most American civilian nuclear power plants in the United States.[27]

However, belief in 'technocracy' and the creation of the nuclear reactor did not pre-ordain a transformation of the larger Navy nor the displacement of the King model of the integrated, operational commander. In the early years Rickover, though he was a technocrat, had been willing to compromise with the advocates of King's system of officer development. Moreover, in his earlier years he would publicly concede the benefits of a liberal education as compared to that of a narrowly trained technician. As late as 1959, Rickover made a speech in which he called for leaders to be liberally educated in the arts and foreign language. Naval officers who did not continue to expand on their basic education and intellectual interests, including the reading of history, were

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[26] W. H. G. Armytage, *The Rise of the Technocrats: a Social History* (London,: Routledge and K. Paul, 1965); Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971).

[27] Thomas Parke Hughes, *American Genesis: a Century of Invention and Technological Enthusiasm, 1870-1970* (New York, N.Y.: Viking, 1989), 428. Hughes' features the most important technological system builders in the 20th century. Rickover and his program are prominently featured.

to Rickover "...really no more than technicians."[28] As a result, Rickover's first generation of nuclear officers was the most capable and broadly educated in the Navy. Like Rickover[29] himself, almost to the man, the first generation of nuclear officers spoke one or two foreign languages, had served on multiple platforms in addition to submarines, commanded both ships and submarines, and studied warfare at the war colleges. They were also as a group of 'line' officers the most highly educated in the Navy: fully 60 % of the navy's PhD Burke Scholars in the late 1950s and early 1960s were Rickover's officers. Rickover's accommodations with the King system would not last, however, and his truly revolutionary plans became evident in his treatment of the traditional, non-nuclear submarine officers. His policy regarding the diesel officers eventually came to the attention of the larger 'line' community who then opposed Rickover's plans. The dispute over the fate of the diesel submariners ultimately became the battleground for competing notions of command.

The dispute between Rickover and the operational 'line' simmered for several years, but with a tragedy came revolutionary change and the highly contingent transformation of the navy line officer. The tragedy was the accidental loss in 1963 of the nuclear powered submarine, USS THRESHER, which sank to the bottom with all

[28] House Committee on Appropriations, Report on Russia by VADM H.G. Rickover, US Navy, 86th Cong., 2nd sess., August 18, 1959. Rickover testified, page 3: "A liberal education tends to liberate the mind from the narrow confines of personal observation through one's senses. …thus history familiarizes us with the past; anthropology, economics, foreign languages and literature with distant peoples and lands…..The enhancement of man's comprehension of the world enriches his personal life….it has the further invaluable result of making him a better citizen because knowledge and ability to think independently will enable him to make wiser decisions when he…voices an opinion on important national issues." He went on to condemn those officers who did not study liberal arts: "Many of the officers I have talked with have been devoting their energies almost entirely to the practical and material problems of their job, and they go on year after year with hardly an hour spent in increasing their basic education and maintaining intellectual interests in fields such as mathematics, science, and history, with out which they are really no more than technicians."

[29] Rickover served on surface ships and submarines, and before he attended graduate school he applied twice for flight school. In addition, Rickover translated the German U-boat manual into English. He took correspondence courses, but did not attend the War College as a resident student.

hands. Hardly had the memorial services concluded, when senior 'line' officers, led by the CNO George Anderson, used the national tragedy as a pretext to attack Rickover's personnel policies. Rickover was a besieged man and very much alone in the Navy. Around the same time, the Navy had denied promotion to several of Rickover's top EDO specialists. Consequently, most of these senior nuclear EDOs retired from the Navy, which left Rickover a mere navy commander as his deputy, the number two officer in the massive nuclear power program. However, Rickover did have political allies in Congress and in the Navy Secretariat. Key congressmen and the Secretary of the Navy supported Rickover against CNO George Anderson and the operational 'line'. Rickover won the battle the 'line' had started, and on their terms. Since senior Navy leaders had framed the battle as a conflict over personnel policy and between competing models of command, the politicians in essence endorsed Rickover's model when they sided with him.

Triumphant from the battle with the 'old' line, Rickover turned his attention to understand the technical and human lessons of THRESHER. Interpreting the lessons of THRESHER, he believed a naval officer was to be first and last, a technical specialist, who had to be focused on his technology. Convinced of the necessity for specialists, he abandoned his prior policy of accommodation with the King model. No longer would nuclear officers be the well-rounded officers as were the first generation nuclear officers. After THRESHER, Rickover insisted that the less scientifically capable officers, which included the mass of diesel submarine officers, be barred from nuclear training and command. The exclusion of the remaining mass of diesel officers was possible only because Rickover effected a massive transfusion of hundreds of scientifically minded surface and aviation officers into the nuclear submarine force. It did not matter to

Rickover that these officers possessed no tactical or operational experience in submarines. What mattered was that they had a capacity for scientific and highly technical work.

Rickover, in desperate need of even more technically minded officers, had already embarked on a radical transformation of the navy's undergraduate officer programs. After the loss of USS THRESHER, he redoubled his efforts to make the Naval Academy into a leading polytechnic college. At Annapolis, it was Rickover who orchestrated the removal of 'line' officers from the senior academic post, replacing military officers with a civilian academic engineer. The new civilian dean, supported by Rickover and a nuclear-trained superintendent, became a transformative leader of 'line' officer undergraduate education. Successive civilian engineers in the dean's office used a series of curriculum reforms and admissions policy changes to embed a deep technocratic philosophy into the cradle of 'line' officer education. Rickover's plan for undergraduate education was resisted by numerous commandants, superintendents, CNOs, and retired veterans of the Second World War. But despite this considerable opposition, Rickover’s reforms were sustained by political intervention outside the Navy.

Rickover did not limit his transformative efforts to Annapolis and the nuclear navy. Following his bureaucratic victory associated with THRESHER, he enlisted the support of sympathetic members of Congress to propound his technocratic officer requirements to the larger navy officer corps, aviator and surface officer alike.[30] An unexpected twist, a contingent event, further facilitated the diffusion of Rickover’s ideas about officer education and assignment policy: a few days after Rickover’s clash with the

[30] Chet Holifield, Chairman, Joint Committee on Atomic Energy,"Letter from Holifield to the Secretary of the Navy, 16 March 1965", NHC, 00 Files1965, Box 29, JCAE file; Joint Committee on Atomic Energy, Hearings on Loss of USS THRESHER, 88th Cong., 2nd Sess., 26,27 June, 23 July 1963, and 1 July 64.

CNO over THRESHER and personnel policy, the Secretary of the Navy fired the CNO. With Admiral Anderson's retirement by the end of the summer of 1963, gone was the strongest and most outspoken opponent of Rickover's model of command. While later scholarship shows Rickover did not orchestrate the CNO's early retirement, the CNO believed at the time Rickover was perhaps the primary cause.[31] Wary of Rickover's apparent power, CNO Anderson's successor and successive senior navy leaders would not again challenge Rickover's authority on nuclear personnel issues for two decades.

Secure in his position in the Navy and confident of strong support among congressional political leaders, Rickover challenged the larger Navy's education and assignment policies. In apparent response to congressional pressure from Rickover's allies on the Joint Committee on Atomic Energy (JCAE), the Secretary of the Navy acquiesced to what were in effect Rickover's recommendations for command tour lengths and assignment policy changes. The net effect of these changes was to tilt further the entire navy officer corps away from a 'generalist' and toward a specialist model of command.[32]

Rickover's model of commander-as-technical expert diffused through the larger U.S. Navy. At the junior ranks, his emphasis on technical expertise was bolstered with each successive wave of Naval Academy ensigns more technically specialized (or

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[31] George W. Jr. Anderson, ADM, USN,"Tasking Notes to Executive Assistant, Captain Isaac Kidd, dtd 8 May 1963", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Box 52, "X" Folder (sensitive, private). Historical research would later show that McNamera fired Anderson more as a consequence of the Cuban Missile Crisis and the TFX aircraft program, and not because of Rickover. But at the time, in May 1963, Anderson believed Rickover was the primary cause for his early termination.

[32] Chet Holifield, Chairman, Joint Committee on Atomic Energy,"Letter from Holifield to the Secretary of the Navy, 16 March 1965", NHC, 00 Files1965, Box 29, JCAE file; Paul Nitze,"Letter to Chet Holifield, Chair, Joint Committee on Atomic Energy", Naval Historical Center, Operational Archives, CNO Records, 1965, Box 29, JCAE file. Nitze agreed to abandon the policy of frequent assignment changes. He also acted to promote captains much earlier to flag rank. The 1966 flag board picked officers several years younger than had been past practice. Dating from 1966, those officers who promoted to CNO would be consistently and dramatically younger than those who promoted to flag before 1966. See Navy Register for promotion dates.

technocratic) than ever before. At the more senior level, his idea of commander-as-technical expert (or specialist) diffused through the larger Navy, telegraphed by the most persuasive of exemplars: a fleet of nuclear submarines, cruisers, and carriers. Rickover's ships were the newest addition to an aging fleet. His ships were the most technically advanced, beautifully designed, surface ships and aircraft carriers, all nuclear propelled. If a surface officer aspired to command a new cruiser, he would have to become one of the nuclear engineering elite. If an aviator sought command of the newest carrier, he too would have to conform to the Rickover model of command. Non-nuclear officers and enlisted men were also impressed and influenced by the powerful new nuclear ships spreading across the fleet. Particularly ambitious officers did not fail to note in those early years that men selected to command in the nuclear navy almost all subsequently promoted to admiral.[33]

While non-nuclear admirals did not oppose Rickover on strictly nuclear personnel matters, they did attempt to preserve King's system and priorities at advanced educational institutions. But despite the protests and interventions of CNOs and successive War College presidents on broad matters of non-nuclear education, Rickover's philosophy of narrow technical and platform specialization proved unstoppable. Through his reforms of undergraduate education and control of assignments, he had transformed in the minds of

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[33] Hayward, John T., RADM, USN was testifying with Rickover before the JCAE and described that the nuclear standards in training "…spread through the rest of the ship." See Joint Committee on Atomic Energy, Testimony of VADM H.G. Rickover on the U.S. Lead in Nuclear Propulsion Experience, 88th Cong., 2nd sess., 30 October 1963, 61. For the larger effect of Rickover's program on fleet standards, see discussion of competition for interviews and the effects of the Rickover school for captains, SOSMRC. James L. Holloway, III, ADM USN (CNO), *Aircraft Carriers at War: A Personal Retrospective of Korea, Vietnam, and the Soviet Confrontation* (Annapolis: US Naval Institute 2006); Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982). Admiral Thomas B. Hayward, future CNO, recounted that he attempted to become a nuclear officer, but was rebuffed. He was unable even to gain an interview with Rickover. The best sought to serve on nuclear ships in the early years. Thomas B. Hayward, Admiral, USN (former CNO), retired, Discussion with the Author, 24 January 2008.

younger officers the very definition of what it meant to be a ‘line’ officer: higher command was to belong to the technical expert who was deeply versed in a singular platform or technology; to be an integrator, tactician or strategist was of lesser importance. Rickover’s new model would survive a counter-revolution in the 1970s and achieved further fleet-wide diffusion when a nuclear-trained CNO required all commanding officers and many sea-going admirals to attend engineering instruction in the deserts of Idaho, on the site of a nuclear reactor test facility.

Non-nuclear surface and aviation officers would in time follow the example established by Rickover and focus their own officers on narrower, platform-centric career paths.[34]   By the mid-1970s both surface officers and aviators had all but abandoned the integrated career patterns defined by King. The transformation of the surface navy from ‘generalist’ to ‘specialist’ was consummated in 1975 with adoption of the 'surface warfare pin’. The next major technological innovation in the surface navy (phased array radar) led to greater specialization and fragmentation in the surface navy: those who served on the early phased array ships (AEGIS) came to identify themselves as elite technical experts in a mold not unlike that of nuclear officers. Inspired by Rickover's model, but wary of Rickover's influence that he exercised over carrier captains[35], aviation leaders adopted a similar pattern of specialization and developed a more specialized model of aviator commander--commander air group, CAG-- that eschewed surface ship command. This new breed of aviators themselves became even more highly specialized,

[34] Career patterns of surface officers and aviators would follow the pattern first pioneered by the nuclear community. Discursive evidence of this evolution and the leading role played by nuclear officers is graphically displayed in successive editions of Ageton's *Naval Officers Guide,* in print from 1943 to 2008, which will be discussed in chapter seven.

[35] Admiral Holloway explained that the command innovation of "CAG" was in direct response to the growing influence of nuclear power to select aviation leaders. James L. Holloway, III, ADM USN (CNO), Interview with the Author, April 26, 2007.

expert on aircraft *and* aviation operations, but less integrated with the surface ships and surface ship operations than the nuclear-trained carrier captains! The surface and aviation communities subdivided and fragmented along the lines of different types of aircraft and ships as officers attempted to become even more ‘expert’ or specialized. The technological platform became so determinative in officer careers that a 'glass ceiling' emerged to limit promotion opportunities of officers who at an early point in their career had the misfortune of being trained on the 'wrong' type of aircraft or assigned to the 'wrong' class of ship.

By the early 1970s the best officers had been persuaded that the preferred career for a 'line' officer was one that developed specialized expertise on a single platform. Consequently, a high proportion of these best officers avoided the last vestige of King’s system: integrative education at the war colleges. As the best officers avoided the war colleges, the transformation of the ‘line’ from broad and integrative to more specialized was nearly complete. Attempts to restore non-technical and cultural components in the officer education system, to include interventions by a secretary of the Navy in the 1980s, were resisted by uniform officers who after two decades had become firmly persuaded of the validity of a techno-centric and platform-centric model.

The consequences of this changed officer--from the integrative 'generalist' to the technical expert of the late 20th century—were manifest in a profound change in the educational and professional qualifications of the senior leadership of the Navy ‘line’. From the Second World War until Rickover inspired the change in models, the vast majority of the officers who rose to the highest rank—the four star admirals—had been broadly educated with a foundation in general education and language. As late as the

1970s, the officers destined for high rank had attended senior war colleges in great numbers: fully 80% of the officers who held four-star rank in the 1970s had attended a senior war college earlier in their career. By the end of the Cold War, in 1990, the progeny of the techno-centric system had risen to high command and the ratio had been inverted: only 10% of four-star flag officers were graduates of ANY war college. The inversion in the educational and professional experience of senior admirals--from integrator to specialist, from less technical to more technical-- was the result of an inversion in models that had occurred almost thirty years earlier marked by the sinking of THRESHER.

Rickover's techno-centric transformation of line officer education and professional development produced within a generation a naval officer corps shaped in conformance to the perceived requirements of complex machines. Those officers who rose to high command were increasingly technical, more platform-specialized, less linguistically and culturally aware and less broadly educated in the joint profession of arms than the generation of senior officers who had preceded them had been. This is the story of how a techno-centric system of leader development, one centered on a belief in the deterministic role of technology in shaping men, came into being and how it remade modern naval admiralship.

Chapter One

What is a Commander to be? Engineering Specialization, Operational Integration, and the Struggle for Identity, 1899-1916

"Yet in reality the remedy is simple and obvious. All that is needed is to make the line officer and the engineer the same man, by throwing both corps into one."
Theodore Roosevelt, Under Secretary of the Navy, 9 December 1897 [1]

"But we are told the naval officer to-day is a 'fighting engineer", and this mockery of truth has been accepted by the profession."
Stephen B. Luce, RADM, USN (retired), 1911[2]

"…the study of problems in connection with the many possible conditions that would exist in time of war or threatened attack, and practice in solving these problems has not kept pace with the study and solution of problems arising in the single ship."
Josephus Daniels, Secretary of the Navy, 1916[3]

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Summary

Technological change holds manifold implications for naval personnel systems, especially those associated with 'command'. European navies had struggled for centuries with the command implications of technological change. The young American Navy studied the European navy experience and adopted many 'old world' naval educational and professional practices. When confronted with the challenge of steam engineering,

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[1] Naval Reorganization Board Report as appended to Roosevelt letter to J.D. Long, 9 December 1897. See Elting E. Morison, ed., *The Letters of Theodore Roosevelt*, vol. 1 (Cambridge, MA: Harvard University Press, 1951), 728.
[2] Stephen B. Luce, RADM, USN (retired), "On the Relations between the U.S. Naval War College and the Line Officers of the U.S. Navy," *US Naval Institute Proceedings*, 37, no. 3, September 1911, 788.
[3] Josephus Daniels, quoted in John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), pg. 83, quoted from the reports of Secretary Daniels, 1916-19.

both the American and European navies of the 19th century adopted a policy of 'specialization': the engineers became a separate corps who stayed below decks and did not command while the traditional officers became the 'line' officer corps who exercised operational command. The U.S. Navy operated successfully with this divided officer corps for most of the century, though social tensions between the two specialties did exist. Despite considerable success with separate corps, in 1897 a young Theodore Roosevelt decided to champion a radical idea: the 'merger' of line officer and engineer. In 1899 senior political leaders offered inducements that persuaded reluctant naval officers and engineers to merge the two distinct specialties. The merger appeared on the surface to have resolved a century old conflict between two social groups. But beneath the surface the merger quickly proved problematic and was a source of prolonged professional confusion in the 'line'.   For the first two decades of the new century, the Navy would struggle to define the new commander and seek to strike a balance between the competing needs of specialized technical knowledge, on the one hand, and more general operational knowledge on the other.

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Specialist or Generalist

The naval commander is particularly sensitive to the effects of changing technology, in no small part due to the nature of the problem of command. The senior officers who occupy the upper levels of the command structure are faced by issues that are fundamentally different than those addressed by specialists.   The senior operational commander, unlike the specialist, must come to possess a capacity to integrate and synthesize, to make judgments about the larger whole.[4] Specialized education provides a commander with awareness in a narrow field, but broadening education is the tool that enhances the commander's capacity for synthesis in judgment. A perennial problem, then, is to strike the balance between specialized education and training and more broadening and general education that provides the foundation for the synthesis and judgment of the whole, to include the non-technical and human dimension of war. During centuries of technological change, navies have made and remade their commanders using a combination of strategies and adjustments, a mix that was contingent upon unique circumstances of the time. [5]

Navies did not adopt any one personnel strategy in response to technological change. The idiosyncratic responses, however, appear to align with one of three general types of responses. Navies convey new technical knowledge to the commander via a strategy of *specialization*, *merger*, or some combination of strategies, to include what might be described as educational *accommodations*. In the first strategy, *specialization*, an organization subdivided its knowledge-holders to create around the new technology a new group of specialists who advised but did not necessarily rise to command. In the

[4] This tension between the commander's need to balance specialized knowledge and integrative knowledge is a continuing issue in discussions of command. For a recent discussion of the problem by an army general, see Rupert Smith, *The Utility of Force: the Art of War in the Modern World*, 1st U.S. ed. (New York: Knopf, 2007), 65-67. For a particularly insightful naval perspective, see Stephen W. Roskill, *The Art of Leadership* (Hamden: Archon Books, 1965), 162-163.

[5] When confronted with technological change, an organization can adopt any number of strategies to ensure the new knowledge is available to those who would command. My argument that naval command development did not conform to a single, pre-determined pattern draws inspiration from the work of Andrew Abbott. In particular, see Andrew Delano Abbott, *The System of Professions: an Essay on the Division of Expert Labor* (Chicago: University of Chicago Press, 1988), 316. Abbott rejects the deterministic models of professional development. He explains that "…the general forces of bureaucratization, knowledge change, and so on have not uniform but highly idiosyncratic effects on professions, shaped by internal and system forces as well as by choices." While I am generally sympathetic with Abbot's idiosyncratic model, for purposes of argument, I organize the myriad naval officer adaptive strategies under one of three types: strategy of specialization, strategy of merger, or strategy of accommodative education and training.

second strategy, *merger*, the organization merged two or more groups of knowledge holders and created a new commander whose identity was a synthesis of formerly independent groups. The command implications of *merger* were less clear-cut than a strategy of *specialization* and could include a shifting balance of power between the groups that harbored old loyalties. Lastly, there is a mixed strategy of *accommodation* and adjustment that did not subdivide officers along specialist lines nor try to effect an outright merger. A strategy of *accommodation* consisted of training, education, assignment, and promotion innovations that combined to inculcate into the existing pool of commanders the desired level of understanding of the new technological innovation. Though this last strategy may exhibit fewer outward manifestations—no dramatic mergers to be deliberated by Congress, no independent specialist groups emerge to challenge older groups—the effect on the thinking and values of the commander could be profound in the long run.

In the early modern period, when faced with increased technical innovation and rising complexity, navies spawned multiple specialties, to include pursers (finance), surgeons (medicine), and chaplains. In questions of command, however, the benefits of specialization were less clear, and European navies adopted different policies with drastically different results. Europe of the 16^{th} century witnessed perhaps the most profound challenge to long-held more specialist notions of command. The Spanish fleet continued to adhere to the older pattern of *specialization:* the mariner-seaman piloted the ship, and the warrior-commander fought from the ship. The English, however, adopted a new approach: a strategy of *merger* of the two specialties of mariner and warrior, ultimately in the person of a 'midshipman'. The 'midshipman' learned both practical seamanship and practical martial arts and was groomed to command both ship and the warriors. The innovation of the merged commander proved a success and contributed to the English victory in 1588 over the Spanish Armada (though other scholars date the transition later in the 18th century and believe it to have been somewhat more complex than described here).[6] Regardless, the merger (or amalgamation) of seaman and warrior affected more than the outcome of Anglo-Spanish naval battles. The English strategy of *merger* became an important case that was studied by American naval reformers in the late 19th century. It will be shown that the English personnel reforms of the 16th and 17th century in fact guided and inspired the American decision to amalgamate two officer specialties in the U.S. Navy in 1899. However, as will be discussed later in this chapter, it is not entirely clear that English reforms pre-dating the Industrial Revolution were an appropriate model on which to construct American officer policy at the beginning of the 20th century.

Two hundred years after the innovation of the midshipman, naval command was confronted with a new challenge: industrialization and steam. With industrialization came increased organizational complexity. To cope with increased complexity, military

[6] Norbert Elias, R. Moelker, and Stephen Mennell, *The Genesis of the Naval Profession* (Dublin: University College Dublin Press, 2007). Elias provides a fascinating insight into the early English navy as it vacillated between strategies of specialization and merger. A most dramatic example of the conflict between specialists was the turmoil surrounding a South Seas expedition led by Sir Francis Drake. During the expedition Drake's embarked military (land) commander challenged Drake's authority. After some delay Drake executed his military commander, accusing him of insubordination. But astute observers at that time noted that the military commander was not mutinous, rather, he held a different notion of who, in fact, was in command. The conflict was rooted in the larger dispute in the English navy: who commanded, the mariner or the land warrior? The social innovation of the 'midshipman' would ultimately solve this problem by producing a merger of the two specialties. For a contemporary account of this changing English navy, see Sir William Monson, *The Naval Tracts of Sir William Monson, 1569-1643* (London: Naval Records Society, 1902). For a history of officer development in the 18th and 19th centuries, see N.A.M. Rodger, *The Wooden World: An Anatomy of the Georgian Navy* (Annapolis, MD: Naval Institute Press, 1986). While Elias dates the development of the midshipman in the 16th century, Michael Lewis argues that such a transition came later. See Lewis, Michael, *England's Sea Officers: the Story of the Naval* Profession (London: G. Allen and Unwin, 1939).

organizations of most western nations adopted a strategy of greater specialization: the commander came to rely on a growing group of officer specialists.[7] The US Navy followed this general pattern and adopted a strategy of specialization, giving rise to two corps of officers: the operational and tactical 'line' and the technical specialists of the 'engineering corps'.

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The Sailor vs Engineer: Mahan and Melville, 1880-1899

The commander in the age of sail had to be expert in two things: ship-handling and combat. He controlled the sails (the motive force of the ship), he controlled the guns predominantly by his maneuvers, and he could from his vantage point on the ‘bridge’ direct and even participate in repelling enemy boarding parties when ships grappled. But the steam engine disrupted the unity of 'line' officer command perhaps more than any other innovation. Secretary of the Navy Upshur writing in 1841 recognized the import of the development of steam ships and observed that they brought about a “…different order…”[8] With steam engines below decks and propellers below the waterline, the captain could no longer control as he had with sail the motive force of his ship. As the billowing sails gave way to belching engines, the 'line' officer’s status and knowledge was increasingly challenged by the machine specialists—the engineers.

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[7] Morris Janowitz, *The Professional Soldier: a Social and Political Portrait* (Glencoe, Ill.,: Free Press, 1960), 9; Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge: Belknap Press of Harvard University Press, 1957), 32.

[8] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 175.

The rise of engineers prompted disputes with the 'line' regarding multiple problems, to include questions of ship design, bureaucratic organizational structures, finances, wardroom privilege, to name but a few.[9] But the most vexing problem area was over the question of command: what would be the identity of the officer who would command, who would lead in battle? Masland and Radway observed: "The rise of these specialists produced a crisis over command at sea. By sending his crew aloft, the captain had once controlled the movement of his vessel and confirmed his authority over his men...the rise of a separate corps of officers who alone understood its mysteries, by destroying this unity of knowledge, threatened to destroy unity of command…."[10] The officer corps would struggle for a century over the questions of how much should a commander trust to his engineers and how much did the commander himself need to study and understand of the new engineering.

Alfred Thayer Mahan, perhaps best known as a naval strategist, devoted considerable attention to the implications fossil fuel machines might pose for 'line' officer education and development. During his career Mahan applauded as a naval professional identity emerged to displace early 19th century organizational forms constructed around material bureaus, what was then called 'technicism'.[11] The naval officer corps, in

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[9] Elting E. Morison, *Men, Machines, and Modern Times* (Cambridge, Mass.,: M.I.T. Press, 1966). Elting Morison describes this conflict between the 'line' and engineers. The most famous early example of conflict may have been the battle over the fate of the first ocean going steam ship, the behemoth, WAMPONOAG, which though a marvel of modern engineering, was ordered scrapped by non-engineering 'line' officers who controlled the Navy.

[10] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 213.

[11] See Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge: Belknap Press of Harvard University Press, 1957), 195-198. Huntington explains military services in the early 19th century were organized around material and techniques ('technicism'), and later evolved into an organization with a broader professional identity. For discussion of the rise of professionalism in the naval service in the mid to late 19th century see Ronald H. Spector, *Professors of*

particular the 'line' officers, had become by the third quarter of the 19th century a respected 'profession'. It had established several professional institutions, to include one of the first professional colleges in the country (Annapolis, 1845) and a professional society and accompanying journal (US Naval Institute, *Proceedings,* 1873). Despite these considerable professional innovations, Mahan feared a resurgent form of 'technicism' in the personae of coal-dusted mechanics and their machines, which were then proliferating across America and the sea service. A particular danger to the profession, Mahan warned in an 1879 essay, was if the Navy attempted to blur the lines between 'line' officers and the engineers.[12]

Mahan argued that naval officer education must be primarily education in the profession of war, a profession he interpreted to be centered on combat operations, not upon the technicalities of machines. Given his operational bias, it was not surprising that Mahan advocated that technical specialists, especially steam engineers, remain subordinate to the operationally-minded 'line' officer. Mahan feared an excessive focus on the machines and things mechanical would narrow an officer: "The necessarily materialistic character of mechanical science tends rather to narrowness…."[13] An overly mechanistic and scientific approach to command, he argued, eroded the human and moral aspects of leadership and tended "to promote caution unduly; to substitute calculation for

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War: the Naval War College and the Development of the Naval Profession, 1st ed. (Newport, R.I.: Naval War College Press 1977), chapter 10, "Applying the Science of Naval Warfare", 130.

[12] Alfred T. Mahan, "Naval Education," *US Naval Institute Proceedings*, 5, December 1879. For a thorough analysis of Mahan's thinking on this subject, see Jon Tetsuro Sumida, *Inventing Grand Strategy and Teaching Command: the Classic Works of Alfred Thayer Mahan Reconsidered* (Washington, D.C.: Johns Hopkins University Press, 1997).

[13] Alfred T. Mahan, "Naval Education," *US Naval Institute Proceedings*, 5, December 1879, 352.

judgment; to create trust in formulas rather than in one's self." [14] Mahan continued to hammer on the theme throughout his career and helped establish the Naval War College in 1884 to promote his vision of naval commander as tactician, operator, and strategist. In lectures in 1888 he vocalized his fears of materialistic and machine thinking. He warned that one should take care that the study of the art of war not come into "...too close contact with that mechanical and material advance upon which its modifications depend."[15] Peter Kirsten, a leading authority on Mahan, wrote: "Time after time thereafter he warned of the debilitating and corrupting effects of 'too exclusive attention to mechanical advance, and too scanty attention to the noble art of war…"[16] Mahan's arguments about the limits of technology, especially the steam engine, exerted a powerful influence on the Navy.[17] His arguments were, however, not uncontested. Mahan's writings provoked spirited rebuttals by leaders of the engineer corps who saw their type of officer, the engineer, to be ascendant in the Navy and in war.

The most outspoken opponents of Mahan were the Engineers in Chief, the senior engineers in the navy, who fiercely promoted their technology and the engineers. Charles Loring, Engineer in Chief of the Navy, and later President of the American Society of Naval Engineers, levied blistering personal attacks on Mahan and those like him who did not embrace what he saw as the deterministic role of technology. In considering Mahan

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[14] Ibid. 347, and as quoted in Jon Tetsuro Sumida, *Inventing Grand Strategy and Teaching Command: the Classic Works of Alfred Thayer Mahan Reconsidered* (Washington, D.C.: Johns Hopkins University Press, 1997).
[15] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 343.
[16] Ibid., 345.
[17] Harold and Margaret Sprout, *The Rise of American Naval Power* (Annapolis, MD: Naval Institute Press, 1966). In their later editions of their work, Sprout speculates that Mahan's conservative views outweighed those of the engineers and may have influenced the Navy long after his death. See forward to 1966 edition, pg. ix.

and others like him, Loring in the President's Annual Address to the American Society of Mechanical Engineers in 1892 wrote that they failed to appreciate the decisive role of engineering. Loring claimed that they had "... but scantily drawn attention to the immense influence upon modern history by the steam engine. They follow in the same well worn ruts giving dubious description of battle, names of monarchs....and the whole array of puppets who seem to push the cart of time, while they are only flies upon its wheels."[18] Loring, however, retired as Engineer in Chief before the issues of personnel reform came to a head. His replacement was unlikely and unexpected, one George Melville.

Melville was a naval engineer, but also a celebrated explorer made famous in the 1880s for his Arctic expeditions. He was plucked from the nether regions of the engineers' list to head the Bureau of Steam Engineering, which he would lead from 1888 to 1903. Melville was an outspoken and articulate advocate for the advancement of naval engineers. Writing an article in 1896, entitled 'The Engineer in Warfare", Melville quoted at length a sympathetic European author: "…there is strife between the deck and the engineer officer. While the role of the former is growing less every day, that of the latter is constantly increasing in importance. Everything is engines in the Navy. We refuse to admit it, but strife does exist, and it is only when compelled and forced that we give the engineer due rank and authority."[19] Melville's allies went further and equated the environment of the engine room and the duties of a technician to those of a

[18] Charles Loring, "President's Annual Address: The Steam Engineer in Modern Civilization", ASME, Transactions, XIV (1892-93), pg 255, as quoted in Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967), 159. See also Karsten, 345.
[19] Melville, quoted in Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 442.

commander in battle: “The steam engine is now as important a military feature as the turret-gun …As a matter of fact the duties of the two officers are very similar…the gunnery officer also directs machinery and thus does the work of an engineer whether he is one or not and whether he relishes it or not….Each is locked in a steel-clad compartment full of men and moving machinery….each must, if efficient at his post, possess the quality of command.” [20] Melville and others like him enjoyed the support of rapidly growing heavy industry and the legions of engineers coming out of shops and schools across America. The status of engineers was on the rise throughout society. Thus his efforts to promote the engineer within the Navy had the sympathies of many in industry and the civilian engineering societies.

Civilian society in this period was coming to believe that technological innovation was increasingly the driving force in history, and that specialized technical knowledge was superior to general and non-technical knowledge. The late 19th and early 20th century witnessed a remarkable increase in the status of engineers in the larger national consciousness. The enthusiasm for things technical, and for engineers in particular, captivated the public. H.G. Wells, Mark Twain, Edward Bellamy all sold best sellers, some books destined to be classics, all heavily laden with the speculations of science, technology, and heroic men who understood such things.[21] As a share of the population

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[20] Frank M. Bennett and Robert Walter Weir, *The Steam Navy of the United States: a History of the Growth of the Steam Vessel of War in the U. S. Navy, and of the Naval Engineer Corps* (Pittsburgh: Warren & Co., 1896), 848.

[21] Mark Twain, *A Connecticut Yankee in King Arthur's Court* (Hartford, Conn.: American Pub. Co., 1899); H. G. Wells, *The Time Machine, an Invention* (New York,: H. Holt and company, 1895); Edward Bellamy, *Looking backward, 2000-1887* (Boston, New York,: Houghton, Mifflin and company, 1889). All emphasize the wonders of science and technology, and engineers and scientists play a particularly elevated role. For a discussion of the cultural influence of engineering at the time, see Cecelia Tichi, *Shifting Gears: Technology, Literature, Culture in Modernist America* (Chapel Hill: University of North Carolina Press, 1987).

engineers had exploded in number, rising from 1 out of 30,000 Americans in 1880, to 1 out of 9, 000 by 1900.[22] In the largest corporate entities of the time, railroads and electrical power generation, technicians and engineers came progressively to command at higher levels of the organization. One of these practical-minded inventor engineer-mechanics, Thomas Edison, came to establish one of the largest corporations in the history of the country, what was to become General Electric.[23] Moving beyond the machines to the people, it was in this period that Frederick Winslow Taylor developed his system of management which applied engineering principles to the management of personnel.[24] As machines and engineering knowledge became the engines of American progress, the engineers both inside and outside the Navy agitated for increased status and power.

Political and professional agitation among engineers was of such a magnitude that at least one scholar termed the movement a 'revolt of the engineers'. The revolt was a professional movement among technicians and was energized by what has been described as an 'ideology of engineering'. Edwin Layton, a leading historian of this movement, explains that the engineers were elitist and "…assumed that they were morally as well as intellectually superior to other groups". Engineers were, like their navy brethren, politically restless. Layton explains the cause of this unrest as rooted in the idea of who

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[22] W. H. G. Armytage, *The Rise of the Technocrats: a Social History* (London,: Routledge and K. Paul, 1965), 172. The rise in engineer population was dramatic. By 1920, there was 1 for every 2, 290 persons, by 1949 1 of 910. As a percentage of the *workforce* the rise was even more dramatic. From 0.4 engineers for every 1000 workers in 1880, to 2.4 in 1930, and 7.0 per thousand by 1950.

[23] Steven W. Usselman, *Regulating Railroad Innovation: Business, Technology, and Politics in America, 1840-1920* (Cambridge, U.K. ; New York: Cambridge University Press, 2002); Robert D. Friedel, Paul Israel, and Bernard S. Finn, *Edison's Electric Light: Biography of an Invention* (New Brunswick, N.J.: Rutgers University Press, 1986).

[24] Robert Kanigel, *The One Best Way: Frederick Winslow Taylor and the Enigma of Efficiency*, Sloan technology series. (New York: Viking, 1997).

should be in command of industrial organizations: "Engineers complained that their place was taken by lawyers, businessmen, and politicians, while the engineer was relegated to a subordinate position. The engineer was "a servant where he should be a master." The unrest eventually became politicized: "The philosophy of (engineering) professionalism carried engineer's ambitions beyond technology to politics and policy making generally."[25]

The engineering movement gained strength well into the first third of the 20th century, and though engineers as a class of technicians did not take control of American industry and government, they did create for the first time the semblance of unified, national engineering organizations in 1918. (The first president of one of the activist engineering organizations was Ira N. Hollis, a key figure in the naval engineer's battle for greater status, a role that will be discussed later in this chapter). Engineers eventually celebrated the election to the White House of one of their own, the professional engineer, Herbert Hoover, the last engineer to be elected to the presidency until a nuclear engineer, James Carter, was elected some fifty years later.

The movement also planted its engineering ideology in campuses and professional organizations around the country. One particularly noteworthy offshoot of the engineer movement was a radical activist group known as the Technocracy Movement. The Technocracy Movement promoted the idea that an elite made up of engineers and technicians should lead a social and political transformation of America. Though these 'technocrats' fell out of favor in civil society, their ideas, as will be shown in later

[25] Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971), 60-61.

chapters, had gained an intellectual foothold with at least one naval engineering student who returned to the Navy. Conveyed by this single officer, the values of Technocracy would play an important role in shaping the naval commander almost a half century later.

Activist engineers did not wait a half century for their disciples to promote to high rank before they began to reshape the naval officer corps. Rather, by the end of the 19^{th} century civilian engineers began to agitate to reform the naval officer corps. As a consequence of their efforts, the 'line' officer would become, by law, as much an engineer as he was a tactician or operator. The shift in 'line' officer toward a stronger technical and material identity came with the Act of 1899 when politicians adopted a strategy of merger: they merged the 'line' and the engineers to form a common officer model. This model decisively linked the navy's concept of operational command with the technical requirements of the engineering profession.

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Confusion, Merger, and more Confusion: The Act of 1899 and the Blurring of Operational and Technical Expertise

The Navy had for almost a century struggled with the implications of the steam engine and the need to reconcile the competing demands of the ‘line’ operators and the engineers. At the end of the 19^{th} century a particularly ambitious and young Under Secretary of the Navy, Theodore Roosevelt, was looking to make his mark. Solving the 'line' and engineer rivalry would certainly be to his credit. Though inexperienced in the government and the Navy, he was well connected with the elites and professoriate. In September 1897 he began a correspondence with a one-time engineer officer and then engineering professor from Harvard, Ira N. Hollis, who had published in the *Atlantic Monthly* a plan for the amalgamation (merger) of the 'line' and engineering corps.[26] Roosevelt seized on the plan and, in a series of confidential letters, worked closely with Hollis to assemble a group of line and engineer officers believed to be supportive of amalgamation. As an inducement for hesitant engineers and 'line' officers to support his efforts, Roosevelt linked their support of merger with an offer to accelerate officer promotions, perhaps the most vexing and worrisome issue faced by those in uniform.[27]

Roosevelt introduced Hollis to the Secretary of the Navy, John D. Long, and not long after their first meeting, Long authorized Roosevelt to convene what was called the Naval Reorganization Board in November 1897. Roosevelt promptly invited Hollis to advise the board.[28] *A mere four weeks later*, in December 1897, despite the initial objections of senior engineers, including Melville, Roosevelt's board recommended to the Secretary a plan that mirrored in almost every respect Hollis' plan for amalgamation.[29] The board recommended amalgamation using language very similar to that used by the Harvard professor, arguing that "... every officer on a modern war vessel in reality has to be an engineer whether he wants to or not." [30] The report dismissed notions that amalgamation might yield negative consequences and argued instead that though for

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[26] Ira N. Hollis, "A New Organization for the New Navy," *The Atlantic Monthly*, no. 80, September 1897. Elting Morison notes that Hollis' plan was a basis for the ensuing amalgamation plan that was ultimately adopted. See Elting E. Morison, ed., *The Letters of Theodore Roosevelt*, vol. 1 (Cambridge, MA: Harvard University Press, 1951) 677, footnote two.
[27] Elting E. Morison, ed., *The Letters of Theodore Roosevelt*, vol. 1 (Cambridge, MA: Harvard University Press, 1951). See Roosevelt letter to Hollis, 24 September 1897. See Edward Latimer Beach, "The Results of the Navy Personnel Law of March 3, 1899," *US Naval Institute Proceedings*, 28, no. 2, June 1902.
[28] Elting E. Morison, ed., *The Letters of Theodore Roosevelt*, vol. 1 (Cambridge, MA: Harvard University Press, 1951). See letters from Roosevelt to Hollis dated 24 September and 3 November 1897.
[29] Ibid. See letter to J.D. Long of 9 December 1897 found on page 726. Engineers did not enthusiastically support the proposal of merger. For discussion of the hostility of Melville to the Hollis plan, see Roosevelt letter to Hollis, dated 3 November 1897, page 706.
[30] Naval Reorganization Board Report as appended to Roosevelt letter to J.D. Long, 9 December 1897. See Ibid. , 728. Compare to language in Hollis' article of September 1897, 315.

generations it seemed "... very difficult to hit upon the right expedient...Yet in reality the remedy is simple and obvious. All that is needed is to make the line officer and the engineer the same man, by throwing both corps into one."[31] The main argument for amalgamation was an historical analogy to the English navy in the 16th century. The need for amalgamation was more asserted than analyzed or argued.

Roosevelt and Long had every intention to quickly push for legislation in support of the plan, but their efforts were interrupted early in 1898 by the Spanish-American War. A year later, in the wake of victory in that conflict, the Secretary of the Navy presented the plan to Congress in 1899. But the popularity of the war-time administration not withstanding, the Full House of the U.S. Congress debated the reforms for four days, and when completed, the act constituted five pages in U.S. statutes.[32] The Congress recognized that what was at stake was not mere wardroom privileges or officer titles, but the identity of the naval officer corps which just recently proved so critical to the nation's security. Differing conceptions of the role of technology and technological knowledge were at the root of the debate. A leading expert in the development of the officer corps in this period, Donald Chisholm, explains: “The amalgamation of engineers and the ‘line’ was to be sought, not because of discipline and morale problems, but to adapt to the changed requirements of modern warships.” [33] Congress in its lengthy deliberations sought to help answer the question: what type of officer should command the fleet of the future?

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[31] Naval Reorganization Board Report as appended to Roosevelt letter to J.D. Long, 9 December 1897. See Ibid. , 728.
[32] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 462-463.
[33] Ibid. , 451.

The proposal to amalgamate was at first resisted on both sides of the technological divide, sailor and machine engineer alike. Line officers feared the merger might result in an officer who was more engineer than a 'line' officer, a new manifestation of the 'technicism' that had in the past characterized the technical and shore-bound bureaus, the most influential of which was the Engineering Corps.[34] Until the later 19th century the Navy was less a profession and more a fragmented agglomeration of competing bureaus.[35] The establishment of the War College and the Naval Institute in the last quarter of the century was seen by many in the 'line' as important progress toward becoming a profession which merger with engineers might undo.[36] For their part, many of the leading engineering specialists feared they would lose their identity with amalgamation, a not unreasonable fear given that the Engineering Corps in the plan was to be merged into the "line". The former Engineer in Chief of the Navy, retired, RADM G. W. Baird, would later lament that he had "lost his identity" with amalgamation.[37]

But there was a deeper fear: the merger would be dangerous to both of the *former* professions, engineer and 'line' officer alike. RADM Thomas Selfridge warned that the blurring of the line between operational command and specialists hazarded both corps,

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[34]Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge, MA: Belknap Press of Harvard University Press, 1957), 247. Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 356.

[35] In 1842, by Act of Congress, the Navy had been organized by technical bureaus, to include 'Navy Yards and Docks', 'Construction Equipment and Repair', 'Provisions and Clothing', Ordnance and Hydrography', and "Medicine and Surgery'. In 1862, the number of bureaus was increased to eight by the addition of the Bureau of Navigation and Bureau of Steam Engineering and Bureau of Equipment and Recruiting. See Julius Augustus Furer, *Administration of the Navy Department in World War 2* (Washington: U.S. Govt. Print. Off., 1959), 195.

[36] Ronald H. Spector, "The Triumph of Professional Ideology: The US Navy in the 1890s " in *In Peace and War: Interpretations of American Naval History, 1775-1978 ed*. Kenneth J. Hagan (West Port: Greenwood Press, 1978).

[37] Baird, as quote in Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 355-356.

that "…mixing of the two corps would be fraught with great injury to the service". [38] Echoing the concern of the engineers, some lawmakers on Capitol Hill interpreted the Act of 1899 not as a victory but as a step backward. In their critique, engineering was an increasingly complex field of knowledge that required specialization. The amalgamation of engineer and 'line' placed excessive knowledge-demands on a single officer, and as a consequence, the merged officer would be both a less effective operational commander *and* a less knowledgeable engineer. Congressman Low, NY, a vocal advocate of this view, portrayed merger of 'line' and engineer as a step back because "…strict attention paid to training the human mind in specialties is the only path that leads to higher attainment."[39] Though Congressman Low may have been out-voted, in the minds of many officers his arguments were compelling. Apparently, most professional naval officers who opposed the bill were never persuaded of the wisdom of amalgamation. Rather, 'line' officers and engineers supported the bill only because it was politically expedient. In return for naval officers' and naval engineers' support of amalgamation, the politicians promised to ameliorate the unrelated but urgent problem of slow promotions.[40]

The critically important decision to amalgamate or merge the engineers and line was the result of a political 'deal'; it was not a decision based on a carefully studied and

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[38] Ibid. , 355.
[39] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 451, 459, 462-67. That amalgamation meant a shift away from specialization was quite clear, and controversial.
[40] Edward Latimer Beach, "The Results of the Navy Personnel Law of March 3, 1899," *US Naval Institute Proceedings,* 28, no. 2, June 1902, 232: "The reason that induced officers who condemned amalgamation as utterly Utopian, to hope that the bill would be made a law, was because some features of the bill would to a certain extent relieve conditions in the naval service that were intolerable (promotion bottleneck)". Beach goes on, pg. 233: "The most important change made by this law was not, in the minds of many, this amalgamation, but was to officer the navy with some respect to present necessities, and to provide for a proper flow of promotion. "

coherent rationale. The aggressive advocates for amalgamation were neophyte politicians under the influence of an engineer academic. The support of professional naval officers and naval engineers was secured through the linkage to accelerated promotions. The persons who pushed for amalgamation were those with the least experience in the Navy, and their justifications for merger reveal their relative shortcomings of ignorance. Their justifications were not particularly rigorous or analytical but were a rehash of Dr. Hollis' historical analogies to 16th and 17th century English navy. Secretary of the Navy, John D. Long, repeated Hollis' essay of 1897 almost verbatim when he did not argue but asserted that amalgamation was consistent with the times, in consonance with the nature of things.[41] Long justified the merger of 1899 with Hollis' analogy to the English merger, some three centuries before, of the practical seaman and practical warrior: "England's ships were once sailed by men especially employed for that duty and fought by soldiers who had nothing to do with the operation of the vessels; but the combination of these two types produced the sailor who could not only sail his ship but who could fight it as well…..As the work of the soldier and the sailor gradually approached each other and finally intermingled, so has that of the navigator and the engineer."[42] In the end, Congressional opponents could not stand up to the wildly popular McKinley Administration and adopted Roosevelt's board recommendations more or less intact. As a consequence, the new law blurred the

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[41] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 451.

[42] Secretary Long, as quoted in Ibid. See also, John Davis Long, *The New American Navy* (New York,: The Outlook Company, 1903), 87. It should be noted that Long's arguments are the same as those first presented by Dr. Ira N. Hollis, a former naval engineer, and a Harvard engineering professor, published in the *Atlantic Monthly* in September 1897. See Ira N. Hollis, "A New Organization for the New Navy," *The Atlantic Monthly*, no. 80, September 1897 313. Hollis later became president of Worcester Polytechnic Institute. A civilian president of another polytechnic would also prove to be an important naval reformer some six decades later.

distinction between officers who would command and those with specialized technical knowledge who had not previously aspired to command as a matter of course. This change in personnel law shifted the identity of the 'line' strongly in the direction of those skills and qualities defined by machines and machine systems.[43] The precedent of the Act of 1899 would be invoked a half century later as justification for a further technical transformation of the 'line'.

Not long after passage of the bill, however, Secretary Long had second thoughts, and he reconsidered the wisdom of the amalgamation that he, Roosevelt, and Hollis had pushed upon the Navy. He sounded a cautionary note. He expressed doubts about the permanence of the merger as a solution to technological and social change that might soon confront the officer corps. Long explained that the merger was a decision made for a specific context, in a specific time. The personnel law was, he wrote, "…framed to meet special conditions, and so long as those conditions exist it will produce the results intended; but when they (conditions) change, it will require revision." [44] Secretary Long was thus unsettled about his decision for merger.[45]

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[43] Mcbride describes the significance of engineer amalgamation as a critical conceptual shift toward a machine orientation within the naval profession. Mcbride writes: "With the delineation of the battleship strategy, the construction of the battleship, and the eventual subsuming of the engineering specialists, the naval officer corps accepted scientifically engineering artifacts as the basis of its profession." See William Michael McBride, "The Rise and Fall of a Strategic Technology : the American battleship from Santiago Bay to Pearl Harbor, 1898-1941" (Thesis Ph D --John Hopkins University, 1989), 362.
[44] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 466.
[45] John D. Long was perhaps a poor choice to serve as Secretary of the Navy during a time of great change. He was ***not*** the most insightful Secretary of the Navy to guide such momentous decisions. As scholars describe him: "For one who knew nothing about the Navy and did not bother to learn about the details, Long proved to be a fairly competent secretary." But perhaps most troublesome, was the fact that Long sought to avoid conflict, a predilection that may have tipped his sympathies toward amalgamation: " He was conservative, loved order and peace…." See Paolo E. Colletta, "John Davis Long, 6 March 1897 to 20 April 1902," in *American Secretaries of the Navy*, ed. Paolo E. Colletta (Annapolis, MD: Naval Institute Press, 1980), 454.

Long’s anxiety sprang from perhaps his intuition that certain major conditions, those upon which the decision for merger had been made, were about to change. In particular, the gulf separating engineering knowledge and that of operations was about to widen considerably. The ability to bridge the gulf between engineering and operations, already strained in 1899, would become increasingly problematic as the two fields diverged even more greatly. At the turn of the century, unbeknownst to many naval and political leaders alike and recognizable now only with historical perspective, there was beginning to emerge a new type of engineer, the scientific engineer, and one who would require increasingly advanced and scientific education.[46] The engineering profession in this period was increasingly at odds with itself: the old engineering practitioners were threatened by the new, more scientific engineers, and each group struggled to define a new system of selection, training, and socialization of future engineers.[47] The Navy leadership had made a profound policy decision to merge two specialties at the very moment engineering was itself in a state of professional confusion about what it would mean to be an ‘engineer’ in the future.

An analysis of Roosevelt's 1897 Board Report and the justifications offered by senior leaders make clear that the Navy made its decision to amalgamate on the basis of confused understanding of the engineering profession. The old, fading model of engineering, a model that required relatively modest intellectual and academic demands

[46] The engineering field was undergoing its own transformation in this period, evolving from one of a ‘shop culture’ to that of a ‘school culture’ more closely connected with the study of science and mathematics. For a discussion of this evolution, see Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967). Also, for changes to American universities in this period, see Bruce Seely, "Research, Engineering, and Science in American Engineering Colleges, 1900-1969," in *Technology & American History : a Historical Anthology from Technology & Culture*, ed. Stephen H. Cutcliffe and Terry S. Reynolds (Chicago: University of Chicago Press, 1997).
[47] Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967), 277.

of the line officer, seems to have been foremost in politicians understanding of engineering. An examination of the Navy Reorganization Board Report shows that the reigning conception of engineering was one more practical than scientific and therefore relatively easy to master by the 'line' without the need for specialized knowledge. The Board recommended that all officers become engineers, a specialty, but at the same time they asserted that the mastery of such a profession did not require specialization: "... there can be no specialization in command." The board recognized more technical training would be required of the amalgamated officers, but rejected the possibility that such training might 'crowd out' other important command qualities or experience: " The increased technical training will be in no sense a substitute for those qualities of daring resolution, cool judgment, power of command, willingness to run risk, and readiness to accept responsibility which have in all ages marked the great captains. It will merely be an indispensable addition." [48] The reason this indispensable engineering knowledge was achievable by the new line with no apparent cost to other core competencies was that engineering was perceived to be largely practical and easy to master. Engineering knowledge was to be no more demanding or specialized than that of the "...duties of the navigator, the compass or electrical expert, or the torpedo officer..." [49] This practical idea of engineering was further confirmed when, in response to a shortage of engineers, the Navy proposed not college educated engineers but the "…appointment of 100 warrant

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[48] Elting E. Morison, ed., *The Letters of Theodore Roosevelt*, vol. 1 (Cambridge, MA: Harvard University Press, 1951), 730-731.
[49] Ibid. , 731. The Board explained that "...The actual driving of the engines, like the actual management of the sails, and of the electrical and torpedo apparatus, must be done by the enlisted men." The new engineer-line officers should "... be specialized only as the duties of the navigator, the compass or electrical expert, or the torpedo officer are specialized. All places of this kind alike should be filled by detail, and all alike should be in line of command."

machinists who are competent by their service and experience…" to serve as naval engineers.[50]

To the decision makers of 1899, engineering was thus a practical trade more than it was scientific or mathematical. Even expert observers of the profession identified the engineers by simplistic criteria, for example, by the material composition of an officer's surroundings. Bennett, the leading writer on naval engineering at the time of amalgamation, equated the engineer tending the boilers to the line officer topside directing a gun battery.[51] But this type of engineering, and this conception of engineering, was soon to be overtaken by science. When Congress passed the laws to amalgamate, the larger engineering profession was in the midst of a "... a period of self examination and compromise from 1890 -1905, and ended with the ascendancy of the school (science) forces after 1905..."[52]

The new culture, rising to eclipse the old, was that of the 'school culture' that was "… impersonal and stressed the importance of such external factors as examination scores in judging a man's worth." The old culture of 'hands on' and practical engineering was to be replaced by a new culture centered on science and research. As one expert on the movement explained, the "...The ultimate reference point, however, is that the key to shop culture was applied science. Engineering educators (the school culture) put

[50] United States. Navy Dept., *Annual report of the Secretary of the Navy* (Washington: U.S. Govt. Print. Off.), Report of 1899, pg. 20. As further evidence of the practical idea of engineering, with the passage of the act apparently former engineer corps officers, who were now commissioned, were barred from engine room watch-standing. In their place warrant officers and chief mechanists were assigned to stand watch. See Edward Latimer Beach, "The Results of the Navy Personnel Law of March 3, 1899," *US Naval Institute Proceedings*, 28, no. 2, June 1902, 235.
[51] Frank M. Bennett and Robert Walter Weir, *The Steam Navy of the United States: a History of the Growth of the Steam Vessel of War in the U. S. Navy, and of the Naval Engineer Corps* (Pittsburgh: Warren & Co., 1896), 848.
[52] Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967), 281.

emphasis on pure science and on calculus and higher mathematics as the universal tools which trained the mind to do any task. Intuition was linked by them with superstition and the Dark Ages. Consistency was valued by them over pragmatic eclecticism." [53] What we know of Roosevelt's concept of the leader does not match the model of the emerging engineering culture. Roosevelt was the avid proponent of the model of leader who was widely read and the beneficiary of a liberal education. He exhorted aspiring leaders to read classical and modern history, languages, and literature.[54] The adoption of a type of officer education and training that would 'crowd out' such broadening activities, that would replace intuition with calculus, would not seem to have been in consonance with Roosevelt's idea of leader or commander. The only explanation for Roosevelt's enthusiastic advocacy for amalgamation, then, is clear: his conception of engineering was more practical than scientific and thus relatively easy to 'master'. The necessity to compromise one or the other areas of knowledge -- operational ability and breadth on the one hand, engineering expertise on the other-- was not anticipated.

Roosevelt and Long supported amalgamation on the basis of an old understanding of the engineering profession. Roosevelt and Long, the key political leaders who eventually 'sold' the merger to Congress, failed to appreciate that engineering training, education, and professionalism was on the verge of profound change and that this change would ultimately invalidate key assumptions upon which they made the decision to

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[53] Ibid. , 279.

[54] Theodore Roosevelt, *The Autobiography of Theodore Roosevelt: Condensed from the original edition, supplemented by letters, speeches, and other writings, and edited with an introduction by Wayne Andrews* (New York: Octagon Books 1975). Roosevelt writes, pg 175, "Now and then I am asked as to 'what books a statesman should read', and my answer is, poetry and novels... He ought to read interesting books on history and government, and books of science and philosophy..." Roosevelt explains further his priorities for aspiring leaders, pg 176, " But, in the final event, the statesman, and the publicist, and the reformer, and the agitator of new things, and the upholder of what is good in old things, all need more than anything else to know human nature, to know the needs of the human soul; and they will find this nature and these needs set forth as nowhere else by the great imaginative writers, whether of prose or poetry..."

amalgamate. Amalgamation, the merger of technical specialists and the 'line' of operational and tactical officers, was thus attempted in a context of not clarity and resolution, but of continuing conflict and confusion.

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Operations vs Engineering: Dueling Educational Institutions, 1900 to 1916

Some historians have argued that with the Act of 1899 the 'line' officers no longer needed to fear the engineers, since with the merger the 'foe' was vanquished.[55] But in fact, the professional transformation was incomplete. The 'threat' of the engineers now took a different form: the engineers through education, assignment and promotion threatened almost like a Trojan Horse to capture the ‘line’ profession from within. The architect of the merger plan, Hollis, who would later become the president of a polytechnic, predicted as much when he wrote: "The line officers fear that the engineers wish to command the ships. Let the commanding officers become engineers, and let the engineers rule our ships, then all fears will be dispelled, and the Navy will quickly become a unit."[56] The period from 1900 to 1916 was one of experimentation, uncertainty, and turmoil for the officer corps, a turmoil that was shared by other modern navies grappling with similar issues, though the US Navy was almost alone in its

[55]Ronald H. Spector, "The Triumph of Professional Ideology: The US Navy in the 1890s " in *In Peace and War: Interpretations of American Naval History, 1775-1978 ed*. Kenneth J. Hagan (West Port: Greenwood Press, 1978), 184. Spector writes that with the Act of 1899, the “…threat of the naval engineers, the chief rivals to the line officer’ claim of special expertise in naval warfare, had been eliminated.”

[56] Ira N. Hollis, "A New Organization for the New Navy," *The Atlantic Monthly*, no. 80, September 1897, 315. Hollis was quite unabashed in his advocacy of a determinative nature of machines and technology. He wrote in 1913: "Undoubtedly every phenomenon, material or otherwise, goes back to the mind, but the growth of man's mental power has been determined in the main by *his material environment*." See Herbert Foster Taylor, *Seventy years of Worcester polytechnic institute* (Worcester, Mass.,: Printed by the Davis press, 1937), 249.

adoption of a strategy of *merger*. [57] Secretary Long retired and Roosevelt moved on to the White House, leaving to naval officers the details of the historic merger.

Educational changes at Annapolis came first on the reform agenda: merger of the engineering and 'line' curriculum. In the years preceding amalgamation, the share of the curriculum devoted to engineering and sciences had gradually increased. In 1889 Commander Sampson, the Superintendent and a one-time physics professor, established a system of engineering specialization at the academy that allowed midshipman in their fourth year the choice to specialize in either the 'line' or in the engineering corps. With the Personnel Act of 1899 this choice was made moot as the 'line' and the engineers were now, by order of the Secretary of the Navy, merged into one. Accordingly, the curriculum was adjusted to include engineering course work for all midshipmen.[58] The result was that very quickly the entire student body pursued a course of study that was now two specialties merged together: that of the traditional 'line' (focused on operations, to include foreign language, history, geography, seamanship, navigation) and that carried over from the engineering corps' curriculum, heavily technical, populated with a majority

[57] Professional turmoil was not limited to the US Navy. The Royal Navy struggled on and off with similar issues, and adopted a system of 'common entry' in an effort to achieve greater professional unity. Eventually, however, the Royal Navy adopted a system more specialized than that of the US Navy. See James Goldrick and John B. Hattendorf, *Mahan is Not enough: the Proceedings of a Conference on the Works of Sir Julian Corbett and Admiral Sir Herbert Richmond* (Newport, R.I.: Naval War College Press, 1993). See Barry D. Hunt, chapter 5, "Richmond and the Education of the Royal Navy", a discussion of Adm Herbert Richmond's reforms focused on education. The RN pushed for goals similar to the US Navy, for a greater appreciation of engineering, and an "interchangeability" between officers. "Its most controversial departure was that provision for a common system of entry for all officers of the executive and engineering branches and the Royal Marines, and their common training through their first eight or nine years of service…" See detailed discussion in Ruddock F. Mackay, *Fisher of Kilverstone* (Oxford: Clarendon Press, 1973), 334-335.

[58] Jack Sweetman, *The U. S. Naval Academy: an Illustrated History* (Annapolis, Md.: Naval Institute Press; 1979), 125.

of specialized courses that prior to amalgamation the ‘line’ had most severely criticized.[59] While educational adjustments were effected with relative ease, making changes beyond the academy proved more problematic.

The limitations posed by a merged curriculum at Annapolis quickly became evident to the professional engineers. It was quite an impossible task for a midshipman to learn both the fundamentals of the ‘line’ and to keep pace with the engineering body of knowledge. Melville had from the outset appreciated the dangers of amalgamation and actually thought it best to have kept the engineering corps separate. But as CDR Ed Beach in 1902 explained to interested naval officers, Melville and other officers supported amalgamation as the least worst outcome: it may have confused the identity of the profession, but at least it provided faster promotion for his officers.[60] But Melville was never quite convinced of the wisdom of the merger, nor was he convinced it would prove permanent. After 1899, Melville implemented educational measures to compensate for the reduced education program of engineers. He established a graduate school at Annapolis that he hoped would promote a greater appreciation of engineering by the line, and, with regard to amalgamation, “…might have a very important effect in making the *experiment* a success.”[61]

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[59] William E. Simons, "The Service Academies and Higher Education," *US Naval Institute Proceedings*, no. 87, Oct 1961. See also Charles Paul Sheppard, “An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974” (Thesis Ph D --George Washington University, 1974), 170.

[60] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 448. Edward Latimer Beach, "The Results of the Navy Personnel Law of March 3, 1899," *US Naval Institute Proceedings*, 28, no. 2, June 1902.

[61] Melville, as quoted in William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 30. See also Alexander Wolfgang Rilling, “The First Fifty Years of Graduate Education in the United States Navy, 1909-1959” (Thesis - University of Southern California, 1972), 12, 79. Rilling explains that it was Melville who, in response to amalgamation,

The 'line' did not initially welcome Melville's engineering educational initiatives. Graduate school policy became a scene of battle between differing conceptions over the identity of the line officer. The traditional 'line' officers attempted to limit educational programs in order to exercise more control over the engineers while the technical bureaus saw this additional education as essential to the continued efficiency of the Navy.[62] But even as the 'line' attempted to control the former engineers, the navy leaders began to concede that advances in the engineering profession might indeed require some naval officers to receive an advanced technical education. The Secretary of the Navy's report of 1900 observed: "It is not certain, however, that they (the machinists) can fully take the place of the highly trained technical engineer, upon whom must fall the duty of designing, superintending, construction, instructing in engineering branches, as well as supervising the motive power of our great ships. The officers of this higher type should, in addition to practical knowledge, be possessed of that thorough theoretical training in steam engineering which comes from full academic education. The act has not yet been long enough in operation to warrant the Department in a more extended statement as it its effect."[63] Within a few years of amalgamation the older "line" officers became more appreciative of the value of graduate education and in fact came to the aid of the technical bureaus when Admiral of the Fleet Dewey, senior member of the newly constituted

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recommended in 1901 the establishment of "post-graduate course of instruction in marine engineering and design to be started at USNA." In 1904, the recommendation to educate 3-4 officers yearly in ordnance or steam engineering was approved, and finally in 1909 Melville's vision was manifest in physical form with the establishment of the graduate school at Annapolis. Prior to the establishment of the NPGS there had been some means to educate engineers in Britain, but in the late 19th century, the Royal Navy terminated this cooperative effort.

[62] William Michael McBride, "The Rise and Fall of a Strategic Technology: the American battleship from Santiago Bay to Pearl Harbor, 1898-1941" (Thesis Ph D --John Hopkins University, 1989), 44.

[63] United States. Navy Dept., *Annual report of the Secretary of the Navy* (Washington, D.C.: U.S. Govt. Print. Off.) Report of 1899, 20.

General Board, attempted to terminate naval graduate education in the first decade of the twentieth century.[64]

Despite their temporary alliance against Dewey, the line and engineers continued to compete over their respective share of officer education. To be sure, machines were becoming more complex, but so too were naval operations. As a consequence of the Spanish-American War, the Navy had assumed new responsibilities across the globe, to include Asia and the Caribbean. The rivalry between the operational 'line' and the technical engineers played out in competing educational institutions: the Naval War College devoted to operations and strategy, and the engineering post-graduate school focused on more technical subjects. Given the general reluctance of officers to pursue advanced education of any type, the competition for students was acute. The Naval War College remained undersubscribed throughout this period, but in the year after the graduate school was established, the shortfalls in students at Newport were especially evident: in 1910 the War College received no voluntary applicants while almost 200 line officers competed to attend the new marine engineering program at the graduate school.[65] The popularity of the 'material' schools of engineering caused a growing unease on the

[64] William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 30. See also Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 207. Dewey represented the older school, the school of the ship that frowned on advanced education of any sort, NWC or graduate school. Karsten described Dewey's attitude as representative of something of a tradition in the Navy: " …education beyond the barest elements was looked upon as over education, and officers admitted with disarming frankness that such over-education would lead the naval apprentice into disgusts for routine and discouragement of rewards, and result, 'in nine cases out of the,' in their leaving the Navy."

[65] Ronald H. Spector, *Professors of War: the Naval War College and the Development of the Naval Profession*, 1st ed. (Newport, R.I.: Naval War College Press 1977), 122. The 200 line officers to which Spector refers in 1910 were applicants to the new Marine Engineering course at the NPGS. James O. Richardson, a future senior fleet commander, was one of the first. See Richardson memoir. He notes there were 200 applicants for the ten openings. James O. Richardson and George C. Dyer, *On the Treadmill to Pearl Harbor: the Memoirs of Admiral James O. Richardson as told to George C. Dyer* (Washington,: U.S. Govt. Print. Off., 1973).

part of those officers convinced the mastery of integrated fleet operations was the highest calling for an officer.[66] Retired Rear Admiral Stephen Luce, a founder of the war college, bitterly complained that the 'line' was unable, if not unwilling, to see the need for general (integrative) operational education:

> "The point I wish to make is the lack of perception by the naval profession of the proper relations between the several parts of our system of naval education. Our line officers seem to suffer from a species of 'mental astigmatism" or the inability of the will to focus the mental rays effectively upon the subject of naval education. The rays of the mind are foreshortened, or they are unequal or they are divergent. This is not uncommon with individual students. But it is very rare when the great majority of the members of a profession are so afflicted. Our officers fail to regard the navy as a unit, with several interdependent parts, just as the human body may be considered a unit made up of interdependent parts. The specialist can diagnose his own particular part only, irrespective of all other parts and without regard to the whole. But he only is master of his profession who can diagnose the entire body and discern the relations between the several parts and the influence on each upon the whole." [67]

Despite Luce's protest, Newport struggled to attract more officers. In desperation, the Naval War College even began to increase the technical content of its otherwise operational and strategic curricula in an attempt to appeal to the machine-inclined young officers.[68] But educational debates were only part of the transformation. Promotion and assignment policies and practices remained controversial as well.

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Increases in Engineering and Operational Complexity: Unresolved Questions of Assignment and Promotion, 1900-1916

[66] Yates Stirling, Jr., RADM USN, *Sea Duty: The Memoirs of a Fighting Admiral* (New York City: G.P. Putnam's Sons, 1939), 138.
[67] Stephen B. Luce, RADM, USN (retired), "On the Relations between the U.S. Naval War College and the Line Officers of the U.S. Navy," *US Naval Institute Proceedings*, 37, no. 3, September 1911, 796.
[68] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 67.

In the years following amalgamation both fleet operations and naval technical systems grew increasingly complex. The events of the Russo-Japanese War of 1904 reinforced the idea that the Navy needed to nurture officers versed in both engineering and operational knowledge. The war evidenced the operational complexity of global naval operations: the Russian fleet sailed halfway around the world to do battle. The imperative for maximum engineering performance was equally clear: a small speed differential enjoyed by the Japanese helped doom the Czarist fleet. In addition, issues of engineering material and engineering officer competence loomed larger in the American fleet as American ships in the post-amalgamation period proved prone to breakdowns. The falling engineering reliability was attributed to the fact that inexperienced officers were now replacing the retiring veterans of the old engineering corps. [69]

The need to better determine who should command grew more urgent as the naval arms race accelerated in Europe. Prior to 1916 American officers who rose to high command were selected by the combined processes of the assignment and promotion system. The promotion system had been equalized for both 'line' and engineer with the Act of 1899. But in the century-old promotion system, equality between officers did not result in an active competition for promotion. The reason: a competitive promotion system did not yet exist, rather the old system of promotion-by-longevity survived more or less intact. As early as the 1890s younger officers, facing long periods before being promoted, railed against the system. But substantive promotion reforms would be delayed almost a generation until 1916. In the interim, a central contest within the 'line'

[69] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 356.

was the debate over assignment of officers: who was compelled to serve as an engineer and who was qualified to command.

The Act of 1899 did not compel any particular officer to pursue engineering, nor did it dictate the amount of engineering education an officer should receive. The merged 'line' officers frequently had but cursory knowledge of engineering and thus were poor substitutes for the Corps of Engineers of the pre-1899 period.[70] Leading engineers of the day saw amalgamation initially as a failure, attributed to the lack of legislation that would compel more 'line' officers to pursue engineering with the necessary devotion.[71] While 'line' officers were going to school in greater numbers, they were not attaining proficiency in the increasingly complex field of engineering. In 1904 the Chief of the Bureau of Engineering sounded the alarm: "So few officers of the line are taking up engineering seriously that the situation is becoming alarming."[72] The results of the professional confusion were tragic when in 1905 a steam explosion on the USS BENNINGTON killed several sailors in the engine room. While boiler explosions were not unheard of, what caused particular concern was the perception, widely held by the public, that the young 'line' ensign who served as chief engineer was unqualified for his assignment.[73] The question of who was qualified for what assignments remained unresolved.

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[70] Edward Latimer Beach, "The Results of the Navy Personnel Law of March 3, 1899," *US Naval Institute Proceedings*, 28, no. 2, June 1902, 240. Beach observed that engineering expertise had fallen so drastically that "...it is generally believed that a new engineering corps will be established in the near future".
[71] William Michael McBride, "The Rise and Fall of a Strategic Technology: the American battleship from Santiago Bay to Pearl Harbor, 1898-1941" (Thesis Ph D --John Hopkins University, 1989), 309-315.
[72] Ibid., 34.
[73] William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 33.

The question of fitness for command—like that of the assignment of ship's engineer-- also remained an issue. In the past only those officers experienced in tactics and operations--the old 'line' officer-- could rise to command. In the post-1899 period the educational and professional development process that led to command was unclear and the requirements for and methods for selection to command were subject to intervention by persons outside the profession. In at least one instance a narrowly trained, non-seagoing specialist officer was given command of a ship, an action that outraged more traditional 'line' officers. In this particular case, President Theodore Roosevelt named a naval medical specialist to command the hospital ship RELIEF. In protest, RADM Willard Brownson, Chief of the Bureau of Navigation, the senior sea-going line officer in the Navy, promptly resigned. [74] While the medical specialist example may have been an extreme case, it illustrated the confusion that surrounded command qualifications.[75] Rather than a repeat of a Brownson-like dispute, line officers feared a gradual, more subtle threat to their concept of command: the ascension to command of officers trained to think more like engineers than as an operationally-minded 'line' officers.

The fears of the older 'line' officers were not unfounded. The advocates of engineering indeed sought a gradual professional metamorphosis of the 'line' commander. Senior engineers hoped that all 'line' officers would become through education and

[74] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 65.
[75]The Navy Department guidance was unclear as to which engineers could or should command. By regulation the only "engineers" prohibited from assuming command of a ship were 'design specialists'. Any other engineer was thus eligible. See Navy Department General Order 27, June 9, 1909. Copy of the order is included in Alexander Wolfgang Rilling, "The First Fifty Years of Graduate Education in the United States Navy, 1909-1959" (Thesis - University of Southern California, 1972), 350. The order notes that "design engineers' will not serve aboard ship or command: "...those officers selected for permanent duty as designing engineers will not be detailed to command at sea." However, the eligibility of other engineering line officers is left ambiguous: "All other graduates of this school (marine engineering) will be available for detail to any duty." All other duties included that of command. Who exactly was a 'design' engineer was not particularly clear.

experience not sailors but engineers. Advocates of the engineering ideal confidently asserted their argument: "The honor and safety of the navy must hereafter depend upon machinery and those who know how to use it. The mind who will supply the intelligence for successfully directing the many operations of the fighting ship of the immediate future must be engineers." [76] Melville, who remained influential in the Navy and continued to lecture at the Naval Post Graduate School,[77] explained in a 1909 speech to the Society of Mechanical Engineers that the old line officer would, in essence, cease from commanding any ship, for it was "…no longer appropriate to speak of naval officers as sailors, rather, they were primarily engineers who had, in addition, acquitted proficiency in the military exercises which are, obviously, necessary for a fighting officer."[78] To Melville, if the two corps had to be amalgamated, it was better that the officer be more engineer than tactician. This philosophy did not remain confined to speeches or books, but was put into action, and transmitted to young officers in the form of career planning guidelines. The Navy's Engineer in Chief reminded his engineering officers in official letters that, even when doing specialized engineering work, they must not lose sight of the goal of command, and thus they were directed to "…keep in touch with those other duties which lead to command…"[79]

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[76] Frank M. Bennett and Robert Walter Weir, *The Steam Navy of the United States: a History of the Growth of the Steam Vessel of War in the U. S. Navy, and of the Naval Engineer Corps* (Pittsburgh: Warren & Co., 1896), 852.

[77] Lectures Presented to Student Officers at the School of Marine Engineering (NPGS) from 1909 to 1913. Admiral George W. Melville lectured on engineering education. For reproduction of lecture list and lecturer, see Alexander Wolfgang Rilling, "The First Fifty Years of Graduate Education in the United States Navy, 1909-1959" (Thesis - University of Southern California, 1972), appendix E.

[78] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 451.

[79] Letter from Engineer in Chief to Prospective Line Officers students detailed for instruction, May 1905, reproduced in Rilling, 348.

At the same time the engineers were calling for a commander more specialized in engineering, other influential voices were calling for a contrary shift, that of a re-emphasis on operations of squadrons and fleets. This type of at-sea operational knowledge should not be confused with the knowledge needed for specialized machine operation. Rather, the at-sea type of operational knowledge was known as "... the art of war."[80] As fleets grew larger, naval responsibilities became more global and the development of doctrine and the education of those in higher command took on greater importance. Educators and reformers, while not disparaging of engineers, insisted that commanders of ships, modern squadrons and fleets must be more broadly educated in the non-technical arts of language, culture, tactics, operations, and strategy. A member of the Naval Institute Board of Control, LCDR John Hood, writing several years after amalgamation, discussed at length the training and experience requirements of those who would command, and nowhere in his twelve page essay did he make *any* mention of the need for study or experience in engineering.[81] Retired Rear Admiral Stephen B. Luce was also an outspoken critic of the tendency to neglect the study of operations and strategy: "But we are told the naval officer to-day is a 'fighting engineer", and this mockery of truth has been accepted by the profession."[82]

These operational-minded reformers were at a disadvantage when competing with engineers who advocated more technical training and education. The exact reason for this disadvantage is difficult to determine, but some observers at the time attributed it to

[80] Stephen B. Luce, RADM, USN (retired), "On the Relations between the U.S. Naval War College and the Line Officers of the U.S. Navy," *US Naval Institute Proceedings*, 37, no. 3, September 1911, 796.
[81] John Hood, LCDR, USN, "The School of the Officer," *US Naval Institute Proceedings*, 28, no. 2, June 1902. The three priorities for an aspiring commander were, according to Hood: learn to handle the ship; inspire the men; master the weapons.
[82] Stephen B. Luce, RADM, USN (retired), "On the Relations between the U.S. Naval War College and the Line Officers of the U.S. Navy," *US Naval Institute Proceedings*, 37, no. 3, September 1911, 788.

an innate human tendency to favor the material of engineering over things conceptual or abstract, like operational planning and strategy. RADM Yates Stirling, an early 20th century naval reformer, submarine pioneer, and war college strategist, observed that important requirements such as planning and strategy were at an innate disadvantage to the material concerns which benefited from a physical primacy. Stirling wrote that "...material seems more immediate and concrete. Thinking and planning for naval war seems stuff of which dreams are made." [83] As the events of the European battles of 1914-1916 were studied by naval officers, however, the pendulum began to swing back to 'dreams'. A more operational-centric identity of command, one less material or engineering in emphasis, began to take shape. In contrast to 1899 when civilian politicians pushed the officer corps toward a more technical basis, it was activist civilian leadership which moved the naval officer corps to a more integrated, operational, and less technical orientation.

The new Secretary of the Navy, Josephus Daniels, one of Navy's longer serving secretaries, recognized the growing mechanical narrowness in the naval officer corps and reemphasized the operational and strategic elements of naval commanders. Daniels saw the need for the integration of the proliferating specialties if the Navy was to attain the paramount goal of effective and unified fleet operations. To Daniels, officer education and development, more than machines and material, were of utmost importance. Daniels argued that "...first attention should always be given to the personnel, for the man is greater than the machine."[84] The Secretary, with the support of Navy bureau chiefs,

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[83] Yates Stirling, Jr., RADM USN, *Sea Duty: The Memoirs of a Fighting Admiral* (New York City: G.P. Putnam's Sons, 1939), 138.
[84] Annual Report of the Secretary of the Navy, 1 December 1914, page 145, as quoted in Chisholm.

promoted several changes to officer professional development, to include policies that encouraged the cultivation of operational thinking by the officer corps: attendance at the Naval War College by senior officers was made a pre-requisite for promotion.[85] Daniels valued the education provided at the War College such that it was he was the one who finally gained for the institution the official recognition and permanent status it had been lacking.[86] Daniels acknowledged that officers had attained a high level of training and proficiency for the duties of the individual ship, but "…the study of problems in connection with the many possible conditions that would exist in time of war or threatened attack, and practice in solving these problems have not kept pace with the study and solution of problems arising in the single ship."[87] Ronald Spector, a leading scholar on the history of the War College, concluded that it was "…Daniels, the pacifist editor who had never been to sea who perhaps best understood the nature and purpose of the War College….and did more toward furthering its mission than any of his more war-like predecessors."[88]

In recognition of the global nature of the Navy and the need for integrative and operational thinking, Daniels expected officers to increase their exposure to different cultures as well as different operating environments. Daniels believed that naval officers required education in the liberal arts and sought to upgrade the teaching of literature,

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[85] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 554.
[86] Innis LaRoche Jenkins, "Josephus Daniels and the Navy Department, 1913-1918: a study in military administration" (Thesis--University of Maryland, 1960), 181.
[87] Josephus Daniels, as quoted in John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 83.
[88] Ronald H. Spector, *Professors of War: the Naval War College and the Development of the Naval Profession*, 1st ed. (Newport, R.I.: Naval War College Press 1977), 126.

history, and languages at the academy.[89] To promote such qualities, including foreign language and cultural experience, Daniels reversed prior policy and sent increased number of officers to naval attaché assignments.[90] In further recognition of the need to counterbalance the appeal of desks, bureaus, and specialized duty ashore, Daniels insisted that first and foremost, 'line' officers spent most of their career at sea. To encourage the attainment of greater operational expertise by 'line' officers, Daniels instituted strict sea time requirements for senior officers.[91] As part of his efforts to expand and integrate the knowledge of the officer corps, Daniels pushed for more officers to attend graduate school at Annapolis and civilian universities, both in the US and abroad, the result of which was a rise in attendance rates during this period.[92]

Daniels was not isolated in his advocacy of non-technical and broader officer education and experience. He was supported by many uniform officers, in particular the influential RADM Victor Blue, head of the Bureau of Navigation. Daniels' requirement for time at sea, in command, was not merely a paper policy of the Secretariat, but was supported by the Navy's active duty officers who made up the 'plucking board" which identified poor performing or otherwise 'less fit' officers from the service. The primacy of sea duty to the "line" officer was evident when the "plucking board" of 1915-6 retired both the Naval Academy Superintendent and the director of the Office of Naval

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[89] Paolo E. Colletta, "Josephus Daniels 5 March 1913 to 5 March 1921," in *American Secretaries of the Navy*, *1913-1972*, ed. Paolo E. Colletta (Annapolis, MD: Naval Institute Press, 1980), 527.
[90] Innis LaRoche Jenkins, "Josephus Daniels and the Navy Department, 1913-1918: a study in military administration" (Thesis--University of Maryland, 1960), 180.
[91] Daniel's Annual Report of the Secretary of the Navy, 1 December 1913, as quoted in Chisholm, 556. The rule was that at least 40% of an officer's career must be served at sea.
[92]Report of the Secretary of the Navy 1914 pp. 38-39, Report of the Secretary of the Navy, 1915, pp. 188-189 as referenced in Innis LaRoche Jenkins, "Josephus Daniels and the Navy Department, 1913-1918 : a study in military administration" (Thesis--University of Maryland, 1960), 181.

Intelligence because they had had insufficient time at sea. [93] The reorganization of Navy—the establishment of the office of Chief of Naval Operations (CNO) in 1915, which was placed above the various specialized bureaus— emphasized the need for mature officers who were more operators and integrators than technical experts. The Navy by 1915 recognized it needed leaders who could integrate the many disparate strands of naval activity and knowledge.

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Identity Unresolved

The period between 1899 and 1916 was one of technological innovation that drove competing visions and policies of officer education, assignment, and promotion. The identity of the line was, on the face of it, redefined in 1899 with the stroke of a pen: all engineers were line officers, and all line officers were engineers. But beneath the slogans, uncertainty reigned, in no small part due to the confusion of what exactly was an engineer. The merger of 1899 threatened to undermine both operational effectiveness and engineering performance. Engineers established the Naval Post Graduate School in an effort to maintain engineering standards. At the same time the more traditional sea-going officers feared the infusion of engineers into the heretofore operational-minded 'line' would create a new form of 'technicism'. If they were allowed to be distracted by engineering duties, some operational ‘line’ officers expressed a growing unease about their capacity to operate the increasingly complex fleets at sea. There was, in short, a general consensus that neither engineering nor operations as fields of knowledge had

[93] Secretary Daniels as quoted in Chisholm, 281. See also Josephus Daniels and Woodrow Wilson, *The Wilson Era; Years of Peace, 1910-1917* (Chapel Hill,: The University of North Carolina Press, 1944), 281, 285.

gained through merger, but that merger had diluted both knowledge sets. Despite these reservations, the new amalgamated ‘line’ officers pressed forward and did their best to make the social experiment work. Despite the boiler explosions, wiped bearings, poor understanding of fleet tactics or strategy, the amalgamated officer corps continued an ad hoc policy of preparing 'line' officers for both engineering duty and operational command.

The reason for this willingness to live with confusion and ambiguity was two fold. Aside from the occasional boiler or turret explosion, few if anyone had or was expected to die as a result of command confusion or poor leadership, at least not until war girdled the globe in 1914. Further, the drive for clarity lacked a compelling incentive for those seeking advancement: the promotion system was still largely the same as it always had been, and officers were still promoted on the basis of God-given longevity, not merit. But the reality of global war would soon upset the old promotion system and usher in the most profound changes since the establishment of the U.S. Navy. What had been complacent confusion gave way to an urgent necessity to reconcile the competing demands of technological advance, growing operational complexity, and the need for younger officers in command. The years of the First World War and the early 1920s would witness a renewed commitment to rationalize and formalize the teaching, preparation, and promotion of those who rose to command.

Chapter Two

Integrating Commanders in Three Dimensions: Ernest King's System of Officer Development, 1916-1941

"Instruction and training for duties of command...are requisite for the thorough cooperation and coordination which make 'unity of action' a real and compelling factor in the attainment of victory...Successive periods of instruction and training occurring between periods of practical experience is the best means to develop judgment..."
Ernest J. King, Captain, USN, August 1920[1]

"… all line officers should be so assigned to successive duties as to afford them a well rounded career in order to develop the requisite command qualities."
The General Board of the Navy, September 1936[2]

"The war college teaches that there is a higher and more important goal than the mastery of material things. The goal is the mastery of the art of naval war..."
Yates Stirling, RADM, USN (retired), submarine pioneer, 1938[3]

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Summary

American naval participation in the First World War was modest, but the experience nonetheless dramatically demonstrated the need for a reformed system of naval officer development. Participation in major conflict required large numbers of younger commanders. This revelation exposed the limitations of the American system of

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[1] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings,* 46, no. 8, August 1920. The first quotation is drawn from paragraph 10, page 3; second quotation is drawn from page 7.

[2] Report of the General Board on the Selection and Promotion of Officers in the Navy, 28 Sept 1936, BG No 421 LDB. Records of the General Board, National Archives. As quoted in Chisholm, 699.

[3] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 138.

promotion-by-longevity and its progeny of geriatric commanders and admirals. Global war revealed glaring strategic and operational inadequacies of American command and control. Lastly, the war's three dimensional sea combat demonstrated the importance of submarine and aviation platforms and the concomitant need to enhance the associated skills in the ‘line’. The diffusion of war into three dimensions, however, stoked fears that the Navy profession might fragment around two of the machine systems. In response to these challenges, the Navy created a multi-faceted personnel policy of *merger* and educational *accommodation*. The machine operators of the three platforms were maintained or merged in the 'line'. The line officers were then educated and professionalized to value unity and integration over specialist skills or expertise. The Navy chose a group of officer-educators led by Captain Ernest J. King to craft a plan for a new system of officer development.[4] The Navy endorsed the plan and used it to guide assignment policy changes, the creation of new educational institutions, and to inform curricular changes at the undergraduate, graduate, and senior war colleges for the next five decades. The King System produced what would be known as the 'generalist' officer, the integral of the three variants of line officers. While the plan was not hostile to engineers and engineering education, the attainment of technical expertise was manifestly subordinate to tactical, operational, and strategic education. The King system was successful in meeting its primary goal: it produced operational 'line' officers who could exercise integrated command judgment in combat. Graduates of King's system would help win the Second World War and would command well into the Cold War.

[4] This plan has been in the past known most commonly as the Knox-King-Pye Plan, because Knox was senior at the time. However, as research has revealed, it was King who drafted the plan, and with his rise to CNO, he more than any of the others had the greatest influence in implementation. Hence, it will be referred to as the King plan for purposes of consistency.

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The Implications of War: Promotion Act of 1916, Three-Dimensional Technology, and Global Operations

Anglo-American naval operations of the First World War were primarily a Royal Navy show, and though American ships deployed to the European theater, they acted in a subordinate role to the British. The war was important for the American Navy not as a test of hardware but as a clarion call for personnel and educational reform, the most urgent of which was the promotion system. Even before the United States formally declared war, naval leaders had been studying events in Europe and concluded that the American system of promotion-by-longevity would be inadequate to the tasks of modern war. The long awaited promotion reforms were enacted into law in what became known as the "The Line Personnel Act of 1916"[5]

Prior to 1916 the promotion system had remained relatively unchanged from its inception in the 1790s. The determinant of promotion for almost 125 years was God-given longevity: if one lived long enough, one would rise to and retire from the senior rank of the officer corps, that of admiral. As such, the main objectives of an officer aspiring to high command was to preserve his health and attempt to matriculate at and

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[5] The most significant aspects of the 1916 reforms have survived relatively intact to the 21st century. Therefore a discussion of the Act is essential to understanding how navy officer development changed in the 20th century. Unfortunately, the chapters that follow can only provide a partial explanation of how the promotion system influenced officer development. The reason for this is quite simple: records of promotion boards were seldom if ever preserved. The proceedings of boards were closed. Furthermore, most officers who served on such boards refrained from recording in their memoirs matters pertaining to promotion decisions.

then graduate from Annapolis as the youngest in his class![6] This system based on longevity was not irrational or the product of inept naval officers. The rationale for such an arrangement was that promotion-by-longevity precluded the creation of military cliques that could threaten the civilian leadership of the new American republic. Despite its political benefits, the system had at least one major drawback: promotions came slowly. By the end of the 19th century many came to believe the old system had outlived its usefulness, especially younger officers who were most affected by the policy of 'waiting for dead men's shoes'.[7] This problem of slow promotion was a target of the young "Line Officer's Association", and they broke with senior officers on this issue as far back as 1895. This action by the younger officers contributed to the establishment of a temporary palliative, the "Plucking Board", instituted with the Naval Act of 1899.[8] The "Plucking Board" was driven by notions of what was "not" the ideal identity of a line officer. The "Plucking Board" looked for failures and deficiencies and proved wildly unpopular with the officers it 'plucked'. By equating retirement with poor performance, the board publicly humiliated officers who otherwise had served honorably and effectively for decades. Perhaps out of fear of embarrassing too many of their former shipmates, the "Plucking Board" was not particularly aggressive.

Like most large industrial organizations, the Navy had a pyramidal personnel structure: a large number of lower and mid-level officers and significantly fewer officers

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[6] James O. Richardson and George C. Dyer, *On the Treadmill to Pearl Harbor: the Memoirs of Admiral James O. Richardson as told to George C. Dyer* (Washington, U.S. Govt. Print. Off., 1973), 65-66.
[7] The leading authority on the evolution of the officer promotion system from 1790 to 1941 is Don Chisholm, a professor at the Naval War College. See Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001).
[8] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 455, 458.

at the upper ranks. With a system based on longevity, the only way a junior officer could 'rise to the top' was to spend long periods in the junior ranks and then pass quickly through the senior ranks as mortality or the 'Plucking Board' did its work. In the early 20th century the fleet was expanding, but the logic of the organizational structure meant that the number of ensigns and lieutenants at the base grew far faster than the number of ship captain and admiral billets near the top of the pyramid. This growing demographic imbalance, when combined with reluctant plucking boards, resulted in officers growing old wearing a lieutenant's uniform. The problem was so severe that on the eve of the First World War a multitude of middle-aged lieutenants and geriatric captains filled the ranks and the problem was only to get worse. The Secretary of the Navy reported that "…junior ensigns of the Class of 1915 can not expect to be promoted to lieutenant commander under such conditions under 40 years, or at a time when they will have reached the statutory retirement age of 62….If the matter were not so serious it would be ludicrous."[9] Furthermore, a growing number of highly skilled officers of the old Engineering Corps were retiring, and line officers were not being produced fast enough to replace them in the design and production of ships and weapons.[10] The plucking board could no longer solve these problems. What was needed was a mechanism that more quickly retired the old and promoted the young.

Informed by the European experience, a core of reform minded officers (William Sims, Dudley Knox, Victor Blue, and Roy C. Smith), supported by the Secretary of the Navy, created what Chisholm described as "…the pivotal point in the history of the

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[9] Josephus Daniels, Annual Report of the Secretary of the Navy, 1 December 1914, as quoted in Chisholm, 559.

[10] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 589.

Navy."[11] The new personnel law broke with a century of traditional practice. The law of 1916 required promotion-by-selection of the most qualified officers, a true system of merit. The reforms of 1916 solved one problem--the block to timely promotions of the younger officers—but brought with it another set of challenges: how to agree upon a positive concept of officer identity, a notion that would then be reinforced by "selection up" promotion boards.[12] Officers worked to fashion a positive notion of promotion, but they soon realized they would replace a biological bias with a social one. The old biologically-biased system, while it had its problems, had one important quality: it guaranteed independence of thought for each individual officer.[13] An officer's promotion had nothing at all to do with performance or with consonance of views with one's elders. Seldom was a junior officer's career ruined because he challenged a senior officer over issues of doctrine, strategy, or technological innovation. In this way the old system guaranteed independence and militated against the development of patronage and factions of all types, political, ethnic, or socio-technical.

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[11] Ibid. , 587. The law also made provision for and established the Engineering Duty Only officer, a field to which line officers could transfer and learn the detailed knowledge necessary for the design and construction of modern ships and weapons. In so doing, however, the line officers gave up their opportunity to command, hence the somewhat deflating title: Engineering Duty ONLY. This verbal reminder of engineers' command limitations wounded the pride of engineers. They would successfully lobby later in the century to have the words changed: the specialists engineer would remain an EDO, but the letters would be renamed to become "Engineering Duty *Officer*" rather than "Engineering Duty *Only*". The adjustment, while a sop to wounded engineer pride, would however further confuse the officer identity since the 'EDOs' still remained "line" officers, a blurring of identities originating with the Act of 1899. Eventually command eligible 'line' officers would become known as "Unrestricted Line Officers".

[12] Ibid., 587. Chisholm succinctly describes the problem; "The act left unsaid much that would have to be worked out in practice by the secretary and selection boards. Unlike seniority or 'selection out," "selection up" required a positive concept of the naval officer for each grade. Tremendous discretion over how this concept would be defined would accrue to the selection boards. Such discretion introduced the potential for, if not the probability of, systematic bias in the type selected, as there was not unanimous agreement in the officer corps about how such an officer should look. This, rather than idiosyncratic biases for or against particular individuals, would constitute the principal problem created by selection up, becoming especially important as submarines and aviation became more significant."

[13] James O. Richardson and George C. Dyer, *On the Treadmill to Pearl Harbor: the Memoirs of Admiral James O. Richardson as told to George C. Dyer* (Washington, U.S. Govt. Print. Off., 1973), 66.

But with the reforms of 1916 the problem of factions emerged. The factions or cliques were not, however, of the political type that might threaten civilian authority. The cliques were those associated with a particular technology or type of engineering. The Navy was rapidly becoming machine-intensive and thus, earlier than the Army or many civilian organizations, proved fertile ground for the rise of socio-technical factions. RADM Yates Stirling observed, as noted previously, that officer loyalties tended to drift toward the material and the machine and away from the less tangible fields of naval operations and their associated planning. To Stirling, material enjoyed a tendency to wield the "scepter of power".[14] David Mindell, a leading historian on naval and military technologies in the interwar period, also observed the powerful draw and shaping force technology exerted over humans: “What people are doing, who they are, and how they related to each other has everything to do with what kind of technologies they build.”[15] The new system of merit promotion provided a potentially powerful tool for officers seeking to remake the Navy in a new image, and the image was looking increasingly mechanical and specialized.

In the first years after the change in promotion policy, many officers and civilian officials warned that one consequence of the change would be increased factionalism in the Navy. A particularly stark warning of the possible consequences of the new promotion system appeared in the Naval Institute *Proceedings* just a few years after implementation of the reforms. An experienced officer observed:

[14] Yates Stirling, Jr., RADM USN, *Sea Duty: The Memoirs of a Fighting Admiral* (New York City: G.P. Putnam's Sons, 1939), 138.
[15] David A. Mindell, *Between Human and Machine: Feedback, Control, and Computing Before Cybernetics* (Baltimore: The Johns Hopkins University Press, 2002), 14.

"Placing in the hands of a small group the power to perpetuate themselves and their ideas is bureaucracy. Selection up enables a small group of leaders in Washington to select those who would fill their places and eliminates any element from among the high ranking officers who think differently on any major subject. To perpetuate their policies this group can build up around themselves a coterie of followers whose service would become personal service rather than independent service to country and lofty ideals. The reward for servility would be promotion, the penalty of independence, oblivion….Such a system is un-American and a menace to national safety. It takes no wild flight of fancy to imagine the control of the Navy in the hands of a group of officers whose policy….born of prejudices, and whose actions, protected from just criticism, would plunge the nation into a disastrous war."[16]

Two future CNOs, Robert Carney and Arleigh Burke, also expressed concern for the possible negative effects of merit promotions.[17] Arleigh Burke was the more critical of the two future CNOs and argued that the new system of promotion by selection stifled independence of thought. He expressed the hope, however, that those with "...knowledge and confidence in their abilities..." would nonetheless challenge the orthodoxy and try out new ideas.[18] These officers proved to be prescient in their predictions and concerns. The tendency in the officer corps to form technological factions gained strength in the years after 1916 and became one of the major issues reformers would struggle with for decades to follow.[19]

Two new technological innovations of the First World War--armed aircraft and submarines-- further threatened to fragment the navy officer corps. Aviation, more than

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[16] W.C. Barnes, CDR USN, "Promotion by Selection," *US Naval Institute Proceedings*, 48, no. 9, September 1922, 1486-90.
[17] Robert B. Carney, LCDR, USN, "Selection, Security, and Morale," *US Naval Institute Proceedings*, 61, no. 6, June 1935. Arleigh Burke also questioned the wisdom of such a system, and even exchanged letters with retired Admiral Sims in the mid-1930s on the subject. See David Alan Rosenberg, "Officer Development in the Interwar Navy: Arleigh Burke--Making of a Naval Professional, 1919-1940," *Pacific Historical Review*, 44, no. 4, November 1975, 518.
[18] Burke, as quoted in David Alan Rosenberg, "Officer Development in the Interwar Navy: Arleigh Burke--Making of a Naval Professional, 1919-1940," *Pacific Historical Review*, 44, no. 4, November 1975, 518.
[19] C. C. Hartman, RADM, USN, Bureau of Personnel,"Report of the Board to Study and Recommend a Program of Education and Training of Line Officers to Best Fit Them for High Command, dtd 8 April 1948", NARA, RG 24-470-54-25-6, Box 6. Three decades after the promotion reforms senior navy leaders explicitly addressed the deleterious effects of technological cliques that emerged around new technologies.

submarine technology, posed a challenge, in part because modern war seemed to require large numbers of flying machines and with them, legions of officer and enlisted personnel. By the end of the war, the British and French had produced over 100, 000 aircraft and numerous pilots to fly them.[20] Though US naval aviation was used sparingly in the war, it also expanded rapidly from seven planes, nine officers, 23 men in 1914 to 2,100 planes, 7,000 officers, and 40,000 men in 1918.[21]

Aviators seemed more likely to fragment the Navy profession than submariners for the additional reason that many of the early aviators came from non-navy institutions; they were not typically navy 'line' officers. To be sure, the very first naval aviator was a former ship and submarine officer.[22] Furthermore, the senior aviator commanders would for a generation remain exclusively Annapolis graduates and regular line officers. However, in the lead-up to war and during the First World War, the bulk of the flyers were pilot-enthusiasts, in particular, wealthy New York bankers and graduates from Yale and Princeton.[23] These outsiders, who were confident and outspoken, agitated early for increased recognition and benefits for the non-'line' officer flyers, who were typically

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[20] Michael S. Sherry, *The Rise of American Air Power: the Creation of Armageddon* (New Haven: Yale University Press, 1987). See chapter one for a discussion of the formative experience of the First World War as to thinking about aviation.

[21] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 138. In the 1916 Naval Appropriations Act provision was made for the establishment of the "…Naval Flying Corps, and also provided for the establishment of a Naval Reserve Force of six classes, including a Naval Reserve Flying Corps, which would come to include First Yale Group/Unit". See also Roy A. Grossnick and William J. Armstrong, *United States Naval Aviation, 1910-1995* (Washington, D.C.: Naval Historical Center Dept. of the Navy : For sale by the U.S. G.P.O. Supt. of Docs., 1997).

[22] Richard C. Knott and Malcolm W. Cagle, *The Naval Aviation Guide*, 4th ed. (Annapolis, Md.: Naval Institute Press, 1985), 2. It is interesting to note that the first naval officer to be trained as an aviator in 1910, LT "Spuds" Ellyson, was not a technical specialist, engineer, or reservist, but a serving a line officer, experienced on surface ships and submarines.

[23] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 139. One of the early non-USNA aviators later became the same Secretary of Defense Forrestal, for whom one of the first super-carriers was named.

naval reservists. These ‘outsiders’ were not particularly fond of the professional ‘line’ officers, and in the early post-war years, they expressed doubt that the navy 'line' could make the necessary adjustments to accommodate aviation.[24] Ronald Spector in his study of the naval profession observed that, indeed, aviation was too “dynamic” and required too many men to be “comfortably” absorbed into the traditional framework of the “line”; a new framework was required.[25] Admiral Moffett, a surface ship officer turned aviation pioneer, developed a new aviation framework that became part of the Navy’s larger officer development plan. The larger Navy plan for integrated officer development successfully blunted the tendency toward a platform-fragmentation in the officer corps. As will be discussed in the next section, the plan helped ensure that regular naval aviators, unlike the army aviators, remained naval officers first and aviation specialists second, a hierarchy of priorities that would last for almost fifty years.

The third difficulty demonstrated by the European War was the global nature of war and the concomitant rising complexity of operations. To fight such a war required officers in large numbers to study tactics, strategy, and the integrated art of command. The war thus validated the purpose of the war college which was dedicated to the study of the art and operations of war. A Naval War College president and future CNO, Admiral Veazie Pratt observed: “It took the World War to prove to the service at large the inestimable value…” of the war college methods of education. He went on: “In fact it was Admiral Benson, our CNO, who told me after the war how much he felt he owed to

[24]F. W. LT USN Wead, "The Navy and Naval Aviation," *US Naval Institute Proceedings,* 52, no. 5, May 1926, 886.
[25] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 139. It will be argued that the new framework included the plan to broaden all line officers. (The plan, devised by Captain Ernest J. King, will be discussed at length in this chapter). The new framework was one that emphasized the naval service and command over loyalties to a particular machine and socio-technical community.

the College whose doctrines, by this time, had become partially disseminated throughout the naval service."[26] Even Admiral Fiske, an enthusiastic advocate for engineers and advanced technology, recognized the need for integration and breadth of operational experience on the part of those who would command. In 1911 he argued that organizations such as the Navy needed to work actively to "...keep down the tendency to subdivide".[27] And, in 1916, he argued for the cultivation of the officer who could achieve breadth and unity of vision: "....the higher one is in position, the more imperative it is that he understand all elements involved, and estimate properly their various weights."[28] A particularly important measure of the increased importance attached to the Naval War College and the importance of teaching operational command was the extension in the duration of the course from a paltry four months to a full year. [29]

The global war, the promotion reforms, and the new machines all combined to persuade senior navy leaders of the urgent need for a new process of officer development that would prepare men for command. To win in a global war at sea would require the 'line' officers to maintain the engines, drive machines in three dimensions, but also hone at the War College the command judgment necessary to operate a global fleet. Relying on past practice and habit would no longer do. The Navy needed to communicate to its officers the desired education, assignment patterns, and career milestones that should guide the new officer. In response to this need, the Navy developed a new method of officer development that emphasized integrative education and experience.

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[26] Veazie Pratt, as quoted in Ronald H. Spector, *Professors of War: the Naval War College and the Development of the Naval Profession*, 1st ed. (Newport, R.I.: Naval War College Press 1977), 144.
[27] Bradley Fiske, RADM, USN "Naval power: Motto...'Sleepers Awake'," *US Naval Institute Proceedings*, 37, no. 3, September 1911, 727.
[28] Bradley Fiske, *The Navy as a Fighting Machine* (New York, NY: Charles Scribner's Sons, 1916), 200.
[29] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 63.

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Authors of the New Model of Command:

The Architects and Inspiration for the Integrative Commander

The Navy acted quickly to reform the officer development system. Before the troops were home from Europe, the Navy tasked three captains-- Ernest King, Dudley Knox, and William Pye-- to make recommendations concerning the instruction and training of line officers.[30] This group of officers produced a plan (which will be referred to as the King Plan) by the end of 1919. While the plan recognized the importance of the technical specialties, the plan placed primary importance on the cultivation of operational command judgment. The plan sought to produce what would be called the ‘generalist', ‘rounded’, ‘well rounded’, or 'integrative' officer who could command the integrated and unified fleet. King and his co-authors wanted to produce an officer who could integrate both the technical and the non-technical; who understood how to use the machines of war; but who had developed the capacity for judgment needed to command fleets at the operational, strategic, and potentially political level. Lastly, the authors realized that the new model of command had to provide an officer with the capacity to lead and command for a whole career, from midshipman to admiral, for a generation. As the future was unpredictable, it was best that officers be broadly educated, not narrowly specialized, so that the officer would have the capacity to adapt to new conditions or innovations that might arise.

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[30] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings,* 46, no. 8, August 1920.

The authors' decision to emphasize integrative, operational knowledge rather than technical knowledge was a particularly important statement about the identity of the 'line'. This choice of priorities did not come as an accident, nor did the choice originate with the three board members. Rather, the priority placed on integrated operations was most likely inspired by the authors' knowledge of Mahan's view on this subject. All three men were either students, protégés, readers or admirers of Mahan.

Dudley Knox had the closest connection to Mahan and served as the direct link to Mahanian thought about the officer corps. Knox had been one of Mahan's students.[31] While Knox was at the time the better known of the three officers, King was already a rising star and was the main author of the new officer development system: both Knox and Pye attest that King wrote the entire multiple page report.[32] Since King was both the main author of the plan and would rise to the highest command in the Navy, a discussion of his early career, his experience with technology, and his professional associations is critical to our understanding of his plan and his larger purpose.

King respected both Mahan and the early engineer, Melville. King was, one might argue, a synthesis of Mahan and Melville, both of whom were professionally active when King was a midshipman and during the first 10 years of his career. King could

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[31] Ronald H. Spector, *Professors of War: the Naval War College and the Development of the Naval Profession*, 1st ed. (Newport, R.I.: Naval War College Press 1977), 112. In the early years of the 20th century "…marked the transition between the 'first generation' of reformers associated with the War College and those who were to guide its fortunes up to the eve of the First World War." The next generation of leaders included William L. Rodgers, Dudley W. Knox, and later William S. Sims, and "…nearly all of the younger men had been students of Mahan or Luce and shared their basic view about the nature of war and the officer's place in society. They differed in being more technically oriented…." Knox was one of the most influential thinkers in the early years of the 20th century. Knox was a co-creator of the Applicatory System of staff work and study, and worked on tactics with Sims in 1913; and with Fiske helped draft the plans for the establishment of the CNO office. See pages 119, 142.
[32] Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980), 565. King was indeed the author of the plan. He wrote the draft and the others agreed with but minor changes.

appreciate the concerns and values of naval engineers like Melville. King had grown up in a family surrounded by machines and practical engineers: his father worked in a machine shop that supported the railroad. King himself dropped out of high school for a year and worked as a practical engineer. He respected engineers and engineering and was comfortable with technology. But when King came to Annapolis in the years before amalgamation of 1899, he set his goal to be a 'line' commander at sea, not an engineering officer.

At Annapolis King broadened beyond his mechanical roots and proved to be a skilled sailor, a gifted writer, and a diligent student of history. He trained in the rigging of sailing ships before they were retired from service[33] and was one of the few midshipmen to fight in the Spanish-American War off the coast of Cuba. King ranked in the top five of his class and served as the *Lucky Bag* (the Academy's yearbook) editor where he began his career as a prolific naval writer. Young LT King was a self-avowed disciple of Mahan (his favorite book was Mahan's work on admiralship, *Types of Naval Officers*, and his favorite admiral was Jervis).[34] He was an avid student of strategy and history and "...plunged into a study of Mahan..." and other historians of war.[35] A

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[33] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 19-20. King was among the last of the midshipman to train aboard ships dating from the Civil War, in particular, the USS *Monongahela*, which had served with Admiral Farragut at Mobile Bay.

[34] Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980), 52-53. According to Buell, King was a disciple of Luce and Mahan. King thought it was incumbent on a naval officer to study strategy and tactics. King's March 1919 *Proceedings* article on battleship design was an example of King's commitment to this model of officer. King wrote: "A naval officer must not let his mind stagnate. Go to the Naval War College. Read, Think. Write." Buell explained that King pored over Mahan's' book, and his favorite was, perhaps not surprising, A. T. Mahan, *Types of Naval Officers drawn from the History of the British Navy: with some account of the conditions of naval warfare at the beginning of the eighteenth century, and of its subsequent development during the sail period*, 3rd ed. (Boston: Little, Brown, and Company, 1901, 1918).

[35] Ernest Joseph King and Walter Muir Whitehill, *Fleet Admiral King: a Naval Record* (London: Eyre & Spottiswoode, 1953), 74, 86, 106. King wrote that he "...plunged into a study of Mahan" and other

supporter of the War College, King took and passed *every* correspondence course and later attended the college before he promoted to flag. Though King did not want to become a technical specialist, he nonetheless had an aptitude for technology: he was an inventor and liked to tinker. Together with his friend and co-author, William Pye, they designed a range-finding instrument that was eventually adopted and used by the Navy. Against the advice of others, King volunteered to serve in the engineering department aboard ship. As Chief Engineer on USS NEW HAMPSHIRE in 1911, he aggressively pursued engineering awards (though did not win). He published articles both in US Naval Institute *Proceedings* but also in the *Journal of the American Society of Naval Engineers* in August 1913.[36]

Informed with this knowledge of King's past, it is possible to see the King Plan of 1919, which strove to balance technical training and broader education, as reflective of his own experience. King was a generalist, an integrator, who served as engineer, designed and produced technical inventions, and thought and wrote about strategy and tactics. It is not surprising, therefore, that his plan of officer development demanded future officers to be 'generalists', to include time spent as part-time engineers. But, as we shall see, when technology became increasingly complex and scientific, the capacity of the 'line' officer to be proficient at both engineering and operations became well-nigh impossible. King's plan had made some provision for such an eventuality: operations and

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historians of war. King admired the NWC and Mahan, writing that "...the greatest improvements in the fleet before World War I were brought about by the increasing effectiveness of the US NWC..."; "By 1916 the ablest officers were all anxious to take the course at the War College, though there were still a few die-hards who fought against it..."; King read foreign works as well, complementing his study of Mahan with that of Sir Julian Corbett.

[36] Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980) , 36, 39-41, 564.

'command' were always favored over technical expertise and specialization, especially in the 'line'.

King was also an educator, and therefore particularly qualified to draft what became the inter-war officer education and career plan. King served as a Naval Academy instructor in 1906 and taught multiple subjects to include ordnance, gunnery, and seamanship. King also served as the battalion drillmaster and in this capacity taught marching and infantry maneuvers, and even trained landing parties. According to Buell, King's biographer, King drove the midshipman relentlessly in marine and infantry type drills: forced marches, amphibious landings from whaleboats, rifle and artillery exercises.[37] He ended his string of educational assignments with the Presidency of the Naval Post Graduate School, an assignment that was not in the 'main stream' of officer career paths at the time. More than once he infuriated those who did not support the advanced education of naval officers. Apparently some admirals sought to demean King by referring in public to him as “the professor". [38] But despite such attacks, King was no blue-suited ‘Ivory Tower’ intellectual: he was cognizant of the importance of being able to operate the newest naval technologies and achieved perhaps the unprecedented feat of serving or qualifying in all three platform communities, surface, submarine, and aviation.

King’s war-time service in Europe no doubt reaffirmed his conviction that the Navy required a system to integrate the officer corps and teach command. King, who won the Navy Cross in the war, served on the staff of the Atlantic Fleet commander,

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[37] Ibid. , 31.
[38] King disliked senior flags who criticized the graduate school, in particular, Admirals Henry B. Wilson and Hugh Rodman. King believed these officers and their supporters were stifling intellectual growth in the Navy. See Ibid. , 52.

Admiral H.T. Mayo, USN. King credited Mayo as the most significant senior officer in King's professional and intellectual development. In light of this close relationship, it was perhaps not surprising that King's advocacy of an integrated and broadly educated 'line' officer corps conformed to Mayo's views of integration, in particular with regard to aviation. Admiral Mayo advocated the development of naval aviation but urged that aviation remain part of the larger officer corps, not a specialty unto itself. [39] As a member of Mayo's staff, King traveled extensively in war-time Europe and observed the complexity of not only naval operations but those on land as well. This war experience may have informed his strong advocacy for joint integration among officers. But his war experience did not leave King with a feeling of confidence about the US Navy. Rather, after his European assignment, King observed that naval officer reform was urgent because "… prewar career patterns had been overtaken by events."[40]

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The King Plan: Education and Assignment Policy to Foster Unity

King drafted the new officer plan over a period of nine months in 1919. The ultimate objective of King's plan was to develop in the officer corps the capacity for integrated command judgment in a unified, three-dimensional, and global navy. King's plan acknowledged the need for an officer to understand the technical aspects of the machines of war, but prioritized the mastery of operations and strategy as the 'line' officer's higher goal. The system was composed of several components: a foundation of

[39] William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 132.

[40] Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980) , 565.

general education at Annapolis; universal service aboard a large surface ship; practical experience on one or two platforms in the first seven years of commissioned service; further integrative education at a new “General Line Course”; further service at sea on multiple platforms; and two educational periods at the War College. Lastly, promotion through the ranks could come only after successful completion of a series of general 'line' officer examinations.[41]

King’s recommendations were endorsed by Navy headquarters almost immediately and were commented upon and referenced by individual officers and navy boards for over a generation. One of the first and more illustrious officers to endorse King's plan was future Admiral Thomas C. Kincaid, who in 1922 described King's progressive educational system as a means to make the officer corps “broader” in thinking and judgment.[42] A decade later a board reviewed the Navy's education and assignment patterns and in the Taussig Report of 1929 reaffirmed King's plan. The essential elements of the King plan would be revalidated and referenced repeatedly over the next thirty-five years in fleet messages, curriculum review boards, and by study groups as late as 1963.[43]

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[41] The manual that dictated officer qualifications in this period, the Bureau of Navigation Manual, embodied this significant change. The obligatory promotion examinations were explicitly linked to the attainment of tactical and operational knowledge. Prior to the King Plan of 1919 the knowledge was to be gained in the ‘school of the ship’, at sea. Following this report the manual changed and allowed the explicit linkage of progressive education with the promotion exam: an officer could validate those sections of this demanding exam by attendance at the Naval War College or the successful completion of the War College correspondence course in tactics and operations. For evidence of this change, see the 1921 BuNav Manual and compare the officer education requirements of the later manuals in the chapter on officer policy.

[42] T.C. Kincaid, LCDR, USN, "Naval Corps, Specialization, and Efficiency," *US Naval Institute Proceedings*, no. 48, Sept 1922, 1491-1500.

[43] Alfred W. Pride, ADM USN (Ret),"Criteria for Selection to Flag Rank in the USN, Report of Board 20 February 1963", NARA RG 24-470-54-25 Box 6.

King's overriding goal was to develop a system that provided line officers the capacity to exercise integrated and unified naval command. King wrote:

> "Instruction and training for duties of command is essential to carrying out of war operations in order that the whole body of commanding officers and of unit commanders and their staffs may have common conceptions of basic considerations and or practical methods which are requisite for the thorough cooperation and coordination which make 'unity of action' a real and compelling factor in the attainment of victory. This instruction is best given in two periods: the first, before attaining command rank and the second before attaining flag rank."[44]

King's report went on to explain that the modern world was practically overwhelmed by specialized knowledge and specialists. An officer had a higher responsibility than specialization: to integrate the knowledge from many fields of endeavor. Operational knowledge was for the 'line' officer of paramount concern:

> "The present advanced state of civilization includes great development in every branch of the arts, industry, and science, so great that keeping abreast of developments in one branch of art, industry or science is practically a life-work….The requirements of the naval profession have an even broader scope….The naval profession is the most varied in the world; leadership, material, skill, judgment, operations—all are needed. The term "officer" is synonymous with "leader," which established the primary reason for the existence of officers. In the earlier years of an officer's career, he is concerned with the exercise of his profession in employments of limited scope. As he advances in rank and experience, the performance of details becomes less important. In the higher grades "operations" becomes of paramount importance, while material and its manipulation (management), though essential, are viewed as the means to the end, and not, as earlier, the end itself. The naval officer required a working knowledge of many branches of human endeavor. At present, he is "educated" only in preparation for the lowest commissioned grade….the government should, at recurring periods in a career of forty years of commissioned service, provide the time and opportunity for officers to be instructed along the lines with which their increasing rank and consequent responsibility calls them to be thoroughly familiar. The extreme case appears to be: Instruction for four years at the Naval Academy and then none for forty years of commissioned service. The Board considers recurring instruction periods as indispensable to efficiency. Successive periods of instruction and training occurring between periods of practical experience is the best means to develop judgment, which, in positions of great responsibility, is an

[44] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings*, 46, no. 8, August 1920 See Part One, "Instruction of the Line Officer", 3.

attribute which is hardly of inferior importance to the ability to reason to a logical conclusion.” [45]

While such eloquence speaks for itself, several points warrant emphasis. The authors saw first that the naval profession was a complex one. For this reason, those who would command had to develop skill with machines, understand material, integrate operations, lead men, and exercise judgment. The plan also recognized that education and training must be progressive, that it must match the responsibilities of each grade. Technology was acknowledged as important, but no where in the text was it defining of the profession or of those who would command: there is no mention in this summary of separate identities of officers as defined by machines. Rather, the technology was seen as subordinate after the first years of commissioned service to the higher priority of operational command.

In a review of the lengthy document, the priority on unity and coordination was inescapable. The authors repeatedly used the phrases and terms of unity, coordination, cooperation, unify, or 'unity of action'. The need for a certain level of technical proficiency was noted but was subordinated to the necessity for 'line' officers to master integrated operations and strategy.[46] Integration was reinforced by the stipulation that all 'line' officers complete an assignment aboard a large surface ship prior to schooling or duty associated with destroyers, submarines, or aircraft.[47] The surface ship and the surface fleet were in this way envisioned as a means of integrating and building a common framework of understanding among 'line' officers.

[45] Ibid. , 6-7.
[46] Ibid., 6.
[47] Ibid., 16.

The authors of the plan also recognized that merger and integration could not solve all the problems that confronted the 'line', that there was a case to be made for some degree of specialization, and for this they developed the concept of the 'sub-specialty'. The 'line' officer needed to specialize for part of his career so that he could bring specialized skills or knowledge to the larger body of officers. King and his co-authors justified this limited degree of specialization on the basis of the "exchange theory" of trade: similar to the production of commodities, knowledge too benefits from specialized production followed by trade. They explained: "The business principle, 'that exchange is best which gives both parties the largest possible profit,' has been found as successful in the exchange of knowledge as in commodities." [48] Thus King and his co-authors recognized that every officer could not know everything, but as a corporate body all the specialties could be mastered and the knowledge 'traded'. Those who rose to command would be responsible to integrate the various 'sub-specialties' to achieve unity of the larger organization's overall effort.

King was so strongly operational in his orientation that even the 'sub-specialty' was not limited to technical fields, but included a 'sub-specialty' in naval operations. King's plan made available to the 'line' three types of sub-specialties: "design and production" of material; "manipulation" (management) of material; and the general field of "operations."[49] The authors recognized that, though an officer might possess a material (technical) sub-specialty, his over-riding identity remained that of the operational 'line' officer. King, Knox, and Pye were firm in their conviction that the 'line' officer must devote his greatest energies to the mastery of operations. The 'line' officer

[48] Ibid., 11.
[49] Ibid., 15.

was not to identify himself with specialized technology and machines on which he trained. Rather, those officers who rose to command were to identify with the larger service and were to work to achieve unity of operational effort.

To create the integrative commander (the generalist), the board recommended a policy of alternating periods of education, sea duty, and shore duty. The process included assignment of all officers following graduation from the Naval Academy to a two year tour aboard a surface "ship of the first rate". This large surface ship duty was followed by the option of duty for three years in aviation, submarines, destroyers, and numerous smaller ships. Sea duty was then interspersed within a pattern of progressively more integrative education, starting with a new "General Line Course" (GLC) developed by King in 1919.[50] For those desiring a 'design' or 'production' specialty, attendance at a civilian graduate school was to follow completion of a year at the GLC.[51]   Following completion of a civilian degree, the officer would then return for more sea duty that was then followed by assignment to the junior and senior courses at the Naval War College. It is worth noting that with each progressive stage of education, the technical content quickly fell off to be replaced by progressively greater study of operations and non-technical course work. Even the GLC for junior officers at the seven year point included the study of politics, economics, and tactics which constituted a greater share of the

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[50] Ibid., 14.   It is also interesting to note that this policy of service aboard surface ships was not completely discarded until 1960, which will be discussed in chapters 5-7. King's school, the General Line Course or School, was terminated in 1962.

[51] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 91. The Naval Academy educational program was focused at the junior officer role, and therefore deemed insufficient to provide for the educational needs of officers as they progressed to levels of greater and more integrated responsibilities. The GLC was seen as necessary to lay the foundation for the continuing broadening of naval officers as they prepared for increased levels of responsibility, some of which would be taught at the war college.

curriculum than marine engineering.[52] In many ways the King plan resembled elements of the emerging Army system of officer training and education. This may not have been coincidental, for King was influenced by the Army, not just in his tours of European battlefields and installations in 1917-1918, but before the war. In particular, King credits his inter-service knowledge to his brother in law, Walter D. Smith. It was Smith who expanded King's interests beyond Mahan to include land campaigns of Napoleonic Wars and the American civil war. Accompanied by Smith, King visited the battlefields of Antietam and Gettysburg. According to Buell, an authority on King, after years of study, reflection and interaction with Smith, King considered "...himself as the naval officer most knowledgeable in the work of generals and their armies." [53]

The authors of the King plan envisioned the educational requirements as compulsory, similar to the Army's educational pattern, which was enforced by a policy of mandatory attendance.[54] The mandatory nature of the Navy system, however, was never fully realized.[55] If the progressive education could not be made mandatory, a surrogate of sorts was found in compulsory written promotion examinations that were explicitly connected to the educational requirements codified in King's system of education. The connection between the promotion exams and education were recorded in the BUNAV Manual shortly after the Navy's approval of King's plan. The BUNAV Manual linked lower-level operational education (the junior war college phase) with mandatory

[52] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings*, 46, no. 8, August 1920, 3, 9,12, 16.
[53] Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980), 34.
[54] Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980), 34.
[55] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 129.

promotion exams in tactics and operations. In this period the mandatory exams were of growing importance to young officers eager to present their best record to the recently empowered promotion boards. The content of the exam mirrored the material taught at the Naval War College, and if desired, an officer could validate a section of the exam by completion of the war college curriculum, either in resident or by correspondence course.[56] Given the surplus of officers during much of the inter-war period, an officer’s promotion could well hinge on an examination grade, and a validation of the exam thus reduced the risk of failure. As a consequence, war college correspondence and resident courses were well subscribed in the interwar period.[57] The benefits that may have accrued to the Navy as a consequence of a policy that encouraged younger officers to read and write about strategy, tactics and operations is impossible to measure. But it would not be unreasonable to conclude that the Navy's operational and strategic success in the Second World War may have had at least some connection to King's system of early education for young officers who would one day become the planners and strategists in a global war.

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[56] Louis J. Connelly, CDR USN (Ret), *Sequel to the Line Officer's Examiner* (Charleston, S.C.: Furlong and Son, 1926), 7-56. “With the approval of the Secretary of the Navy, the Naval examining Board will accept certificates of the satisfactory completion of a War College correspondence course as evidence of proficiency in Strategy and Tactics of candidates for promotion in the ranks of Ensign, Lieutenants (j.g.,) and Lieutenants (Sr G), appearing for promotion to Lieutenant (j.g., and Sr. gr.) and Lieutenant-Commander."

[57] Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings,* 56, no. 8, August 1929, 746. In one month alone a remarkably high 520 officers were enrolled in the correspondence courses, a high percentage of officers in the relatively small, inter-war navy.

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The King Plan Tested: Proliferating Scientific Specialties and the Rise of Skilled Aviators

The Navy quickly and forcefully endorsed King's plan for officer education and professional development. Within a few months the Navy published the plan in the leading professional periodical of the time, the United States Naval Institute *Proceedings* of August 1920. The Navy high command lent additional authority to the plan by including in *Proceedings* a cover-page endorsement of the recommendations.

The plan's recommendations quickly diffused into authoritative personnel policy documents. Of particular importance, the Bureau of Navigation (BUNAV) Manual was revised almost immediately to match the King recommendations. The BUNAV Manual that pre-dated the plan made no mention of integrative education and assignment. However, in later versions of the publication—from 1927 to the 1960s—the manual's 'line' officer education and assignment pattern was almost identical to that of King's plan, including even the timing of when each educational stage should occur. The revised BUNAV manual also made note of the importance of engineering education in the career of a general 'line' officer. Echoing King's plan, the BUNAV manual endorsed engineering as a respectable sub-specialty in a 'line' officer's career. Indeed, a BUNAV dispatch of 1921 asserted that "…engineering is an essential feature of the duties of a line officer".[58] But the fact that the King Plan received an immediate welcome and survived

[58]BUNAV Dispatch of 20 July 1921, as quoted in Bureau of Navigation Navy Department,"Bureau of Navigation Manual, 1921", NARA RG 405, USNA Special Collections, call number VA 52.A65 1921, page 58.

and flourished for so many years did not mean integration and progressive education came easily to the organization.

The Navy authorized the King study, publicly endorsed the findings, included the guidelines in official documents (the BUNAV manual), and then widely distributed the report in the leading officer publication of the day. However, as noted previously, the Navy did not make the plan's requirements mandatory for *all* 'line' officers. Some scholars have interpreted the lack of compulsory officer education to be indicative of luke warm support for the plan. But an educational and development policy that refrained from comprehensive enforcement had benefits. Such a policy gave personnel administrators additional flexibility in dealing with unique individual assignment situations that might arise. There were, no doubt, some officers unqualified for the course work at the progressively more advanced schools. Senior leaders may also have been mindful of contingencies or emergencies that might require the assignment of an officer to something not recommended by the plan. The safe, bureaucratic approach to this plan was to publish it, support its recommendations and expect shrewd officers and promotion boards to follow its recommendations and standards but preserve an administrator's right to depart from the plan. As will be discussed later in this chapter, the majority of senior officers did in fact attend advanced educational institutions more or less as prescribed by the King Plan. Those officers who would rise to the highest leadership positions in the next war almost to the man would attend the Naval War College, the ultimate educational requirement for the generalist officer.

The weakest point of the King Plan sprang from the difficulties of the Act of 1899: that "all line officers were to be engineers". The merger of 1899 destroyed the

Engineering Corps, and thus a large number of ‘line’ officers were needed to study engineering, and hopefully a few would choose to become a ‘sub-specialist’ in a technical field. In addition to gaining a sub-specialty in engineering, engineering educated ‘line’ officers were expected to progress upward through the phases of integrative education at the General Line Course and the War College. As engineering grew more complex it became increasingly difficult for the ‘line’ officer to achieve this balancing act, to substitute for the old engineering corps officers and at the same time prepare for operational command at sea. Congressman Low’s 1899 criticisms of amalgamation as a step backward looked increasingly more valid as time passed and engineering became more scientific. The Personnel Act of 1916 implicitly recognized Low’s critique when it granted that some ‘line’ officers were by their studies of engineering too specialized to rise to command and were thus designated “Engineering Duty Only officers" (EDO). But this group of EDO officers remained small. Consequently, operational, unrestricted ‘line’ officers were often called upon to fill numerous engineering billets while at the same time they attempted to remain proficient in naval tactics and operations.

A decidedly less scientific challenge to King’s plan of integration was the requirement to accommodate within the ‘line’ new skill-based groups of practitioners: the naval aviators and submariners. The war had raised the profile of both submarine and aviation technology. Submariners constituted a relatively modest problem as the operators of this technology considered themselves from the outset to be a component of the ‘line’, and in fact shared a common ‘designator’ or identifier with surface navy officers until 1970.[59] Aviation, however, proved more problematic. Early aviators explained that they were different than any other officers. The aviators pointed out that submarine and destroyer officers were easy to integrate into the 'line' due to the simple fact that "…both submarines and destroyers have much in common with other naval surface craft. Submarines are *water craft*…" In contrast, airplanes are by their name distinct, they are not water but *air-craft*. [60] Though glib, such an argument had substance: aircraft were different than ships. They required more independence of operation by a single officer, required substantially greater eye and hand coordination, and possibly more physical strength and stamina.

Aviation factions soon threatened the integrity of the inter-war Navy. These factions may have been inspired by army aviator Billy Mitchell, but the outcome of their agitation was very different than the army experience. Though King's plan was already in place by the time aviation factionalism peaked, navy leaders made several additional organizational adjustments to convince political decision makers that the Navy could accommodate within the profession the specialized skills of the aviation officer. The accommodations included financial and bureaucratic innovations. Aviators on occasion received huge financial incentives to fly in the navy, as much as 50% over base pay.[61] Bureaucratic innovations included the creation of the Bureau of Aeronautics in 1921, two years after completion of King's plan. But questions of compatibility persisted, and

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[59] United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002). See changes in designators from 1969 to 1971, from a '1100' designation common to both submariners and surface officers, to a split designation of '1110' for surface and '1120' for submarine after 1971.

[60] F. W. LT USN Wead, "The Navy and Naval Aviation," *US Naval Institute Proceedings*, 52, no. 5, May 1926, 886.

[61] Bureau of Navigation Navy Department,"Bureau of Navigation Manual, 1921", NARA RG 405, USNA Special Collections, call number VA 52.A65 1921. See pg 61 for discussion of financial incentives.

President Calvin Coolidge established the “Morrow Board” to study further the question of aviation. Ultimately Congress enacted legislation that in 1925 established the Assistant Secretary of the Navy for Aeronautics and also required that the commanding officers of carriers and naval air stations be qualified aviators. To facilitate broader integration with the existing “line”, older URL officers were allowed to qualify in aviation, and several ultimately did.[62] While the Navy recognized flight duty as the equivalent of ‘sea duty’, aviation was still considered to be a subordinate specialty within the larger navy 'line'. Accordingly, aviation-trained line officers were guided in their professional development by the outlines of the King’s 1919 plan: all regular ‘line’ aviators were required to serve on surface ships prior to flight school; periodically rotate their assignments between aviation and large surface ships; and attend the Naval War College in order to cultivate the capacity for integrative command of a three dimensional fleet.

Not all aviators were in total agreement with all of King's integrative educational and assignment policies,[63] but a decisive share of the new officers embraced the over-riding idea: that of a unified navy and an integrated officer corps. A young aviator, LCDR C. A. Pownall observed of the Navy and aviation in 1926: “…attempts to divide

[62] Yarnell and Reeves qualified as aviation observers, and King, Sherman, and Halsey as aviator pilots. See Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 143.

[63] King’s plan had in fact recognized that an officer could not be expert in all things: “It is apparent that no one officer can be really expert in all branches of the naval profession.” Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings*, 46, no. 8, August 1920, 11. Moffett argued that an officer could not be expert at both, but Moffett did not want an independent navy air arm. It seems that King and Moffett were saying essentially the same thing: there had to be some degree of specialization, but unity and integration had to be achieved. In the end, aviators remained in the 'line' and were granted relatively wide latitude in their education and assignment patterns. However, almost all aviators who rose to higher command served on surface ships and studied at the War College, both requirements of the King's plan.

the Navy against itself…" had failed. The unity of the officer corps in all three dimensions was the preferred course. He went on: "Let us weigh, then venture, over the sea, on the sea, and under the sea, together." [64]

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New Foundation for an Integrative 'Line': Changes in Undergraduate Education

The lessons of the Great War and new technologies (especially aviation) soon influenced curricular debates at the Naval Academy. The curricular debate of the 1920s centered on a question that would become central to most academy reform debates for the next fifty years: how much time should a midshipman devote to learning about specialized engineering and machine technology as compared to time spent on gaining a more general education, which included a substantial component of non-technical, cultural, and linguistic education?

The King plan recognized the importance of the Naval Academy as the educational foundation of all officers who would rise to command the ships, squadrons, and fleets of the nation. The report explained that the issues of officer education and development could only be addressed as "…part of a whole scheme for instruction and training of naval officers during their entire careers, from midshipman to admiral, both

[64] C. A. Pownall, LCDR, USN, "The Airphobia of 1925," *US Naval Institute Proceedings*, 52, no. 3, March 1926, 461, 463.

inclusive."[65] While the King plan did not stipulate specific Annapolis reforms, the report did acknowledge that midshipmen needed to be prepared for future leadership responsibilities and at the same time receive an adequate technical education. The report called for the academy to "…develop the mental capacity, principally the ability to reason to logical conclusion….to develop military character, including discipline, the attributes of leadership, and the basic virtues….and to supply knowledge of the technical groundwork of the profession."[66] This last goal, to supply knowledge of the "technical groundwork" of the profession, was contested ground in the early inter-war years. It was contested because aviation-- and to a lesser extent submarines-- had expanded the scope of an officer's "technical groundwork": it was now three dimensional.

In the immediate post-war period, Naval Academy leaders wrestled with the technological implications of the Great War. The academy's mission statement of 1922 affirmed the need for a general education, which provided "…educational fundamentals upon which experience afloat may build the finished naval officers."[67] Some of the older aspects of the curriculum remained even though the passage of time and the emergence of new technology would seem to argue for their elimination. Midshipmen still trained in the cutlass and small arms, landing party drills, and small unit land tactics, though these were over time increasingly conducted for ceremonial purposes. In other areas, the academy was highly responsive to the new realities of war. New courses were added for

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[65] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings,* 46, no. 8, August 1920, 6.
[66] Ibid., 9.
[67] M.S. Tisdale, LCDR USN, Aide to the Superintendent, drafted this academy mission statement of 1922 that was to sustain until 1934, as quoted in Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 176.

instruction on mine warfare, and a modern battleship fire control system was installed in Dahlgren Hall for training midshipmen.[68] Aviation was, however, embraced more cautiously. Whether or not Annapolis could accommodate aviation and aviators remained in doubt for several years after the war.

Resistance to aviation curriculum came most forcefully in the personae of a one-time champion reformer, RADM Henry B. Wilson, class of 1881. In the early years after the First World War, while he served as superintendent, Wilson refused to add any aviation studies to the curriculum.[69] Faced with the slow pace of reforms at the academy, Admiral Moffett speculated that the flight school at Pensacola could become a new naval academy, devoted to the undergraduate education of those officers destined for the cockpit.[70] But Annapolis reformers finally overcame traditional resistance to aviation, and following Wilson's retirement, an aviation component was added to the curriculum. In the summer of 1925 the academy officially recognized aeronautics as a field of study; in 1926 it offered a three month course in aeronautics; renamed the Department of Seamanship the Department of Seamanship and Flight Tactics; and renamed the Department of Marine Engineering and Naval Construction to the Department of Engineering and Aeronautics.[71] By 1930s, an official training squadron

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[68] Ibid., 125.

[69] See Frank M. Hertel, LCDR USN, "The Naval Academy and Naval Aviation," *US Naval Institute Proceedings*, no. 74, Jan 1948, 37-38. See also Karsten, 360.

[70] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 360; William Michael McBride, "The Rise and Fall of a Strategic Technology : the American battleship from Santiago Bay to Pearl Harbor, 1898-1941" (Thesis Ph D --John Hopkins University, 1989), 225.

[71] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 177.

was established at Annapolis for midshipmen flight indoctrination during the summer, and all junior 'line' officers were expected to take and pass an exam in aviation.[72]

With the addition of more technical courses in the academic curriculum, some officers became concerned that technical studies threatened to overwhelm the midshipmen's cultural and non-technical education. Officers argued over the balance between narrow technical and broader curriculum, and the resultant curricular policy see-sawed for a decade. Some officer reformers were so convinced of the inferior condition of midshipman cultural education as compared to foreign officers that they recommended the relegation of all technical and engineering courses to the post graduate school.[73] Reports of several Boards of Visitors to the Naval Academy agreed that the curriculum was too narrowly technical.[74] Not only the Board of Visitors but also respected 'line' officers called for a re-balancing of technical and non-technical. Members of the academy's own academic board called for an expansion into the fields of economics, government, and the addition of a *second* foreign language.[75] In 1930 the Academy gained recognition as the rough equivalent of an undergraduate college, though not necessarily a polytechnic college, and was certified for the first time in its history to grant the baccalaureate degree.[76] Those who advocated a broader and less technical academy

[72] Louis J. Connelly, CDR USN (Ret), *The 1930 Edition of the Naval Line Officer's Examiner* (Charleston, S.C.: Furlong and Son, Inc., 1930).
[73] Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge,: Belknap Press of Harvard University Press, 1957), 296.
[74] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957) , 92, refers to Boards of Visitors of 1923, 1924, 1931.
[75] A.J. Chantry, CDR (CC) USN,"Ltr from CDR Chantry, Chair of Department of Mathematics, to Superintendent of the Naval Academy, dtd 11 August 1924, Subject: The Place of the Naval Academy in the Education of the US Naval Officer", NARA RG 405, Record of Superintendent, General Correspondence, Curriculum Studies, 1924-39, box 1, folder 1.
[76] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 126.

education were opposed by several senior officers, to include Admiral Leigh, Chief of the Bureau of Navigation. Leigh observed that the "advent of new appliances...have placed great burdens on all officers…" He went on to explain, however, that this burden was necessary, for the Navy was an "…industrial institution as well as a fighting machine," and thus naval officers "must possess a technical background". [77]

RADM Thomas C. Hart, 1931-34, a future four star admiral,[78] sided with proponents of broader education: he championed a new curriculum that emphasized fundamentals in the sciences and increased the time spent on liberal arts subjects. To facilitate the shift toward the non-technical subjects, Hart established the Department of Economics and Government.[79] During this period Hart upgraded the civilian faculty, especially in the areas of English, history, foreign language and mathematics. Other naval educators and observers of the institution followed Hart's lead and wrote favorably of the changes, in one case observing that the study of foreign language was highly valued in the inter-war period as it made the midshipman a "…more competent officer…adding to the efficiency of the fleet."[80] The study of language was further expanded with the inclusion of German and Italian. [81]

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[77] R. H. Leigh, RADM USN, CHBUNAV, "Navy Personnel," *US Naval Institute Proceedings*, no. 55, Oct 1929.

[78] Hart went on to promote to full admiral and commanded the Asiatic Fleet in the months before the Pearl Harbor. His promotion would appear to confirm that he was not a naval officer with reform ideas on the margins of the profession, but was one of the most respected officers of his generation. See Thomas B. Buell, *Master of Sea Power: a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980), 132.

[79]Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 172.

[80]Kendall Banning, *Annapolis Today* (New York City: Funk and Wagnalls, 1939). Banning described the mandatory three years of language training in the most positive of terms: "He is a more competent officer because he can do it (speak language); he is adding to the efficiency of the fleet...", 69. See also page 12 for a description of language requirements: one language for three years required of *all* midshipman.

[81] William E. Simons, *Liberal Education in the Service Academies* (New York: Published for the Institute of Higher Education by the Bureau of Publications Teachers College Columbia University, 1965). See also

Coincident with enhancements of the non-technical curriculum, there was a de-emphasis on technology training, particularly in aviation. By the middle 1930s, the actual time devoted by midshipmen to aeronautics declined. Indoctrination fell to three weeks in the summer; aeronautical courses were integrated back into existing departments, and all aviation/aeronautic titles were deleted from all departments.[82] The de-emphasis on the academic study of aviation subjects was as dramatic as it was puzzling, for in this same period there was an explosion of aviation technological innovation in the private sector, especially in Germany and England. A more detailed analysis of why the academy deemphasized aviation studies is, however, beyond the scope of this study.[83]

The Naval Academy trend toward a more general, perhaps even more liberal arts curricula, was confirmed in studies by leading scholars of military education. Masland and Radway concluded that from the 1920s to the later 1930s the Naval Academy expanded the curriculum in order to broaden officers' intellectual and professional development.[84] Huntington described the shift toward humanities in 1932 as "drastic", a

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Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 178.

[82] Frank M. Hertel, LCDR USN, "The Naval Academy and Naval Aviation," *US Naval Institute Proceedings*, no. 74, Jan 1948, 38.

[83] Early naval aviators saw naval aviation as an academic-related pursuit such that the first pre-flight schools were established at the leading scientific institutions of the day, MIT. See Richard C. Knott and Malcolm W. Cagle, *The Naval Aviation Guide*, 4th ed. (Annapolis, Md.: Naval Institute Press, 1985), 6. One may speculate as to the reason for the decline in the academic study of aviation by the academy. At root may be the fact that the physical requirements placed on early aviators were extreme. When aviation began to rapidly expand in the mid 1930s aviators were pressed for time and personnel, and thus may have had to choose between a more academic approach to aviation, and one that emphasized the more immediate needs for highly honed skills and physical endurance. As a consequence, the academic study of aviation experienced a decline which was not arrested until a robust corps of aviation EDOs was established.

[84] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 89-92.

change in the curriculum that "…increased the proportion of the midshipman's academic time on cultural subjects from 21.6 percent to 31.2 percent." [85]

All things considered, policies pursued at the Naval Academy in the interwar period achieved a remarkable balance which was to last for a generation.[86] In consonance with the values and goals expressed in the King plan, the academy produced officers with the capacity for immediate employment on the technologies of the day, but officers were also given an educational foundation to support progressive and integrative education later in their career.[87] Though they may not have been immediately suited for advanced scientific engineering graduate school, they could with some remedial work meet the requirements of even the most demanding of graduate schools, as did young LT Rickover in the late 1920s. An astute observer of the Academy described the inter-war Annapolis education succinctly: "Four years of combined classical and technical EDUCATION prepared the midshipmen for commissions as ensigns, assignment to sea duty, and the beginning of their TRAINING."[88] The question remained, how did the

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[85] Samuel P. Huntington, *The Soldier and the State; the Theory and Politics of Civil-Military Relations* (Cambridge,: Belknap Press of Harvard University Press, 1957), 295-96.

[86] Following the termination of the naval arms treaties in the later 1930s and the lead up to war, there would be a counter-reformation of sorts at the academy, most often associated with RADM Sellers, the superintendent in this period. With war looming, he moved the curriculum in the direction of practical preparation of junior officers, though he did not rescind many of Hart's broadening reforms. This ramp-up for war and the temporary effects on the academy curriculum will be discussed in chapter three. For a comparison of Hart's and Sellar's policies, see Richard S. West, Jr., "The Superintendents of the Naval Academy," *US Naval Institute Proceedings*, 72, no. 4, April 1946, 59-67.

[87] Kendall Banning, *Annapolis Today* (New York City: Funk and Wagnalls, 1939), 71-73. With the approach of war, the academy in the years under the command of RADM Sellers saw a shift back to more practical training. Seller's goal was to prepare midshipman to fight on the ships and machines that were then in the fleet. This temporary reversion to a narrower technical-training regime is explained by the urgency of war, and was not indicative of a secular shift toward a permanent, more technical focus of the institution.

[88] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 1st- ed. (New York,: Whittlesey House, 1943), 90. Caps were original emphasis by Ageton.

King plan and the lessons of the Great War reshape more senior officer's education and assignment policy after they left Annapolis?

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Graduate School and the Naval War College

The Navy moved quickly in the early 1920s to align officer assignment and post-academy education with the requirements as delineated in the King plan.[89] To this end, the Navy established additional schools (the General Line Course/School) and added a new course at the Naval War College (the 'junior' course). For line officers, the emphasis remained the cultivation of the capacity for integrated, operational command. But at the same time the King plan emphasized operations, it also required many 'line' officers to obtain a technical 'sub-specialty' so that they could fill billets once held by the former engineering corps officers. This split requirement--to be technically and operationally proficient--proved to be the most problematic aspect of the King plan. The split requirement was fulfilled when an officer completed the education and assignments that qualified him in two specialties: a main specialty, which for 'line' officers was always operations at sea, and a sub-specialty that was frequently technical in nature.

The Bureau of Navigation Manual of 1927 explained that graduate education was increasingly important to the attainment of a sub-specialty. Technical sub-specialties

[89] In quick succession over the next couple years, the officer manual (BUNAV manual) was changed to reflect King's recommendations. Schools and courses were established at the NPGS and NWC. Not even senior officers were immune to the new requirements, evidenced in the Navy General Order number 168 issued in 1927, wherein an advanced course for senior captains and junior admirals was established. In a supplementary report in 1929, senior officers were strongly recommended to attend the NWC a second time so as that the "...‘cycle in progressive education’ might be completed." See Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings*, 56, no. 8, August 1929.

earned in graduate school would allow operational officers to also fill technical billets. As noted previously, the manual explained that 'line' officers in graduate school could sub-specialize in one of three fields: further study in 'operations', material 'design and production', or material 'manipulation' (management).[90] Those officers sub-specializing in operations spent one year at graduate school in the General Line Course and then returned directly to navy assignments ashore or at sea. Those who chose a sub-specialty in material management, or the more technical specialty of 'design and production', also attended the GLC. However, these officers continued their education with an additional year of study at a civilian university, factory, or ordnance station.[91] After two years of education, some of these 'line' officers then worked ashore, which delayed their return to the operational fleet. Some of the more technical officers successfully reconciled the technical and operational requirements and, despite years spent in labs or factories, still achieved high level operational command, for example, Admiral Arleigh Burke, an ordnance specialist who later became Chief of Naval Operations. But in general, navy officers found it increasingly difficult to reconcile the demands of scientific engineering with the operational requirements of their career. The reason officers found it difficult to balance the two demands was that naval engineering was growing increasingly scientific and complex.

In the inter-war period engineering was becoming an increasingly scientific field, and the associated disciplines and sub-fields were rapidly proliferating.[92] With scientific

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[90] Navy Department Bureau of Navigation/Personnel United States,"BUPERS/BUNAV Manual", Naval Historical Center, general collections, call number VA 52.A65.
[91] David Alan Rosenberg, "Officer Development in the Interwar Navy: Arleigh Burke--Making of a Naval Professional, 1919-1940," *Pacific Historical Review,* 44, no. 4, November 1975, 212.
[92] Navy Department United States, *Annual Reports of the Navy Department (1920 Report of the Secretary of the Navy)* (Washington, D.C.: United States Government Printing Office, 1920). Radio engineering, as

advances and increased rigor in the engineering field, the URL officers who chose a sub-specialty in engineering had difficulty meeting the other requirements of a line officer. In the middle 1920s some thoughtful observers began to express doubts that the URL could in fact be both engineer and a 'line' officer. An educational advisor to the Naval Academy Superintendent, who at the time controlled both undergraduate and graduate education programs, expressed the opinion that growing engineering complexity was approaching a "...a limit to human capabilities, and efficiency of the service falls off rapidly when this limit is transgressed. I believe this limit has been exceeded under the present expectations of the line officers. It seems logical and necessary therefore to relieve him of duties involving design, construction, and maintenance."[93]

In spite of such warnings, the Navy's personnel managers and educators persisted in the dual-tasking of the 'line'. Regular 'line' officers of the inter-war period shouldered the dual burden remarkably well, though in the later 1930s they had more help as the number of EDOs gradually increased, and a new category of EDO, the Aviation EDO, was established. The 'line' was able to sustain such a balancing act for as long as it did because naval engineering remained for much of this period more practical than it was scientific, though the latter component was steadily increasing. The practical nature of most engineering was evidenced in university engineering curriculum. While some universities were moving rapidly toward a more demanding mathematical and scientific engineering program in the 1930s, these colleges were in the minority. The

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an example, was by 1920 a degree program for officers offered at Harvard University. Those who decided to amalgamate the engineers were only vaguely aware in 1899 of the existence of radio waves, let alone the coming wave of engineering innovations which would challenge naval officer education.

[93] A.J. Chantry, CDR (CC) USN,"Ltr from CDR Chantry, Chair of Department of Mathematics, to Superintendent of the Naval Academy, dtd 11 August 1924, Subject: The Place of the Naval Academy in the Education of the US Naval Officer", NARA RG 405, Record of Superintendent, General Correspondence, Curriculum Studies, 1924-39, box 1, folder 16.

Massachusetts Institute of Technology, MIT, perhaps the leading technical university in the nation, did not embrace a curriculum of scientific engineering until the mid-1930s.[94] The Navy's other civilian graduate university programs were further behind and remained more practical than scientific and mathematical until after the Second World War.

The practical and 'applied' character of most naval engineering graduate education was evident in the graduate school manuals of the time. In a summary provided to the Secretary of the Navy in the early 1920s, the list of graduate school programs could today be mistaken for vocational courses at a community college or a company training facility.[95] For example, the Navy's graduate program included work in non-university settings, often 'proving grounds' or factories: the study of ordnance engineering at the 'proving grounds' located in Indian Head, MD; the study of ordnance engineering at the torpedo station located in Newport, RI; and the study of electrical engineering at the General Electric Company plant located in Lynn, MA.

While the Navy was moderately successful in the production of 'line' officers proficient in engineering, the service enjoyed greater success in developing integrative, operational commanders. This operational bias was not accidental but, as discussed previously, was explicitly built into the program for all 'line' officers. Even the goal of technical graduate education for 'line' officers was to cultivate the capacity to 'integrate' engineering into operations, not to specialize in engineering. That integration was the

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[94] Bruce Seely, "Research, Engineering, and Science in American Engineering Colleges, 1900-1969," in *Technology & American History: a Historical Anthology from Technology & Culture*, ed. Stephen H. Cutcliffe and Terry S. Reynolds (Chicago: University of Chicago Press, 1997), 367.

[95] Navy Department United States, *Annual Reports of the Navy Department (1920 Report of the Secretary of the Navy)* (Washington, D.C.: United States Government Printing Office, 1920), 554.

primary goal of graduate education was evident in the requirement that all officers were to attend the General Line Course, even the engineering students.

The General Line Course was designed to promote greater 'line' officer integration and admitted the first class shortly after the Navy approved the King plan. Evidence of the non-specialized nature of General Line Course (GLC) is found in the Chief of the Bureau of Navigation report to the Secretary of 1920: “The scope and character of post-graduate education is such that the officers who take it are of increased capability not only for technical work, but also for regular naval duties…..When the projected “general line course” is added to the field of post graduate instruction, the navy will be well provided with the means of improving and maintaining the efficiency (effectiveness) of its officers.” [96] Accordingly, the stated goal of the General Line Course when it was formally established in 1927 was not to produce specialists but to “…prepare students for higher military assignments.”[97]

To fulfill its integrative function, the GLC included the broad study of naval weapons and doctrines as well as the study of history and economics. The Navy continued to broaden the GLC curriculum through the addition of foreign languages in 1930s, to include Russian, Chinese, and Japanese. Overseas study programs were also initiated, which provided several future flag officers years of study in Europe.[98] That the General Line Course was not an engineering course is further evidenced by the fact that

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[96] Navy Department United States, *Annual Reports of the Navy Department (1920 Report of the Secretary of the Navy)* (Washington, D.C.: United States Government Printing Office, 1920), 554.
[97] The 1927 Navy annual report, as quoted in Alexander Wolfgang Rilling, “The First Fifty Years of Graduate Education in the United States Navy, 1909-1959” (Thesis - University of Southern California, 1972), 152-170.
[98] Alexander Wolfgang Rilling, “The First Fifty Years of Graduate Education in the United States Navy, 1909-1959” (Thesis - University of Southern California, 1972), 171. Later head of BUSHIPS VADM Mumma, and a future personnel reformer, RADM Weakly, participated in these over-seas programs.

students spent a substantial amount of time on non-technical subjects (humanities, social sciences, and international relations).[99]

Large numbers of officers in the inter-war period sought to further broaden their education. To make available more opportunities for officer education and to move it beyond a narrow technical or parochial education, the Navy began to encourage more officers to study at non-navy institutions. The rationale for moving naval officers to civilian colleges for advanced education was two-fold: recognition of the superior educational quality of civilian institutions and an appreciation of the benefits of broadened education outside the Navy. Navy leaders in the 1930s were concerned that young officers be afforded increased opportunity to broaden out so as to avoid "in breeding" of ideas. To achieve greater broadening, the Navy aggressively pursued a plan to relocate the entire navy graduate school from a navy installation to a civilian university campus. The Navy even approved plans to move the navy graduate school to the University of California at Berkeley in 1933, but the move was blocked at the last minute by a local Maryland congressman.[100]

The broadening experience of graduate education represented by the GLC was not confined to a small minority of officers. For several years the majority of regular officers

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[99] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings,* 46, no. 8, August 1920. See annex and course description.

[100] Alexander Wolfgang Rilling, "The First Fifty Years of Graduate Education in the United States Navy, 1909-1959" (Thesis - University of Southern California, 1972), 158. See letter from RADM F.B. Upham to then Superintendent RADM T.C. Hart of 15 April 1933, in which Upham complains of the danger of "in breeding" should graduate education continue to remain exclusively the domain of a navy institution. To broaden officers the Navy intended to move the NPGS to Berkeley. One can only speculate as to how UC Berkeley may have shaped naval officer education and thinking if it would have gained a monopoly on naval officer graduate education!

attended the General Line Course following their first sea duty.[101] Even those bound for advanced technical and scientific specialization attended the GLC in large numbers.[102] But the GLC was only the intermediate institution in the integrative development of the naval commander. After Annapolis, the Naval War College, the senior service school, was perhaps the most influential educational institution in the inter-war period.

The Naval War College (NWC) quickly conformed to the King Plan and expanded its course offerings to better facilitate integrative operational and strategic education for more 'line' officers. The NWC established a junior course in 1923 and created the Advanced Course in 1927.[103] As the most revered of post-graduate institutions, the War College had long been on the forefront of the effort to broaden the naval profession, to move it beyond the 'technicism' which militated against an integrated and unified Navy in the 19th century.[104] With the rise in status of engineering and technology early in the new century, however, prospective students began to drift away from the war college to pursue more technical studies. In an attempt to appeal to the young officers, the NWC mimicked some of the features and practices of a technical school. In the lecture series before the Great War, technical subjects briefly dominated.

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[101] Exact numbers of attendees apparently no longer exist. However several scholars have provided estimates. See John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 93. See also David Alan Rosenberg, "Officer Development in the Interwar Navy: Arleigh Burke--Making of a Naval Professional, 1919-1940," *Pacific Historical Review*, 44, no. 4, November 1975, 515. Rosenberg reports that in several years in the interwar period, approximately half of all regular officers attended some form of graduate school, either the General Line Course in isolation, or the combined General Line Course followed by additional graduate education.

[102] Approximately 30% of all NPGS students attended the GLC from 1928-1931, including those destined to specialize in design and material or operations. See Rilling, 262.

[103] The advanced course was established with Navy Department General Order No. 168 of September 21, 1927. See Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings*, 56, no. 8, August 1929, 749.

[104] Samuel P. Huntington, *The Soldier and the State: the Theory and Politics of Civil-Military Relations* (Cambridge,: Belknap Press of Harvard University Press, 1957), 195.

Michael Vlahos, a former professor and scholar of the War College, showed that at the end of the first decade of the 20th century the War College staff gave nine of ten lectures on technical subjects (engineering, mines, telegraphy, and ordnance) and only one on political subjects.[105] This curricular pattern contravened the spirit and requirements as represented by the approved King plan. Not surprisingly, the NWC in the inter-war period changed to become a more broadening and integrative institution that would offer officers the "…best means to develop judgment…" so necessary in the exercise of command.[106] Admiral William Sims, under whom both Knox and King had worked, returned to the college after the war and reformed the curriculum to emphasize the methodology of command and placed a renewed emphasis on international relations, area studies, and policy. By the 1920s, 50% of the lectures would reside in the areas of international relations, and in the 1930s their share would rise to 70%.[107]

The college continued to adjust the curriculum to account for the lessons of both the Great War and changing technology. RADM Veazie Pratt, President of the War College in the later 1920s, and a future CNO, recognized that the NWC had an important role preparing an officer for command at the highest levels, a preparation that required a "breadth of visions".[108] To this end Pratt emphasized in the curriculum "joint and

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[105] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 67.
[106] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings,* 46, no. 8, August 1920, 7. Later scholars describe the role of college in words quite similar to those of King and Knox: "...the college took for its area of work the education of senior officer in problems of command"….the "development of good judgment …to be gained through study, reflection, and mental exercise." See John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 153.
[107] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 67, 70.
[108] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 134.

combined" aspects of war and placed renewed emphasis on International Relations.[109] Though the famous war college games of this period placed great emphasis on the 'battle line', the games did evolve to incorporate an increasingly broad range of naval weapon capabilities, to include aviation, amphibious landings, and submarines. [110]

The value of the NWC, already high when Sims returned to assume the presidency after the First World War, continued throughout the inter-war period. So elevated was the status of a war college degree that Admiral Pratt, not himself a graduate of the institution, gladly received an honorary degree in 1927 when he stepped down as president.[111] The college attracted the best and brightest officers in the navy profession and helped unify them through "doctrine and shared experience."[112] The college's importance in this period was such that attendance became a de facto prerequisite for promotion to high command.[113]

Despite the college's inter-war popularity, some scholars pointed to Newport's failures of prediction (e.g., underestimation of the influence of carrier aviation in the Second World War) and questioned the value of college in preparing officers to command. But such criticisms miss a larger point. The important fact remains: those officers who were destined to command in war did not focus exclusively on their machines of war but attempted to broaden their understanding of war by study at the War

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[109] Ibid. , 131.
[110] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 136-37.
[111] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 138.
[112] Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 84.
[113] As will be explained in following section on the promotion to high command, the vast majority of officers to attain high command in the Second World War were indeed graduates of the NWC.

College. An entire generation of future commanders had been taught to think about operations and strategies and to hone their critical and problem-solving skills. Ronald Spector in his study of the Naval War College concluded that, in spite of the institution's failures of prediction, the college nevertheless insured that strategy and tactics would occupy a central place in the American officer's professional outlook.[114]

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Assignment and Promotion Policy En Route to Command

King's plan sought to develop in the 'line' the capacity for command judgment that would contribute to the organization's overall 'unity of effort'. In addition to class room education, King believed it was essential to carefully manage an officer's pattern of assignments. Officer assignments needed to have a certain degree of commonality (e.g., universal service aboard a ship of the 'battle line') across the service so as to promote common understanding among fellow officers. But perhaps more importantly, officers were to have a breadth of assignment experience.

Not long after the Navy endorsed King's plan, officers began in significant numbers to move through the progressively broadening stages of advanced education. Most eligible officers left the academy, completed the universal requirement of duty on a

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[114] Ronald H. Spector, *Professors of War: the Naval War College and the Development of the Naval Profession*, 1st ed. (Newport, R.I.: Naval War College Press 1977), 147-148. Though it failed to fully appreciate submarine or air craft, the NWC did include more than 100 problems on the use of aircraft. Why the low esteem for submarines? Spector speculates that the moral ramifications of unrestricted submarine warfare may have deterred the creativity of officers who studied submarine warfare. Also, the experience of WWI wherein not a single troop transport was lost to the U-boat may have implied the submariner problem was solved. In balance, scholars judge that the NWC attempted to provide an integrated study of naval warfare though it certainly failed, like most military institutions, to anticipate fully the role advanced technologies would play in the coming war.

large surface ship, completed specialized training and service on either destroyers, submarines or aviation, and moved ashore for education at the General Line Course and then at the Naval War College. When officers deviated from the plan, the Navy investigated. In those recorded instances where a noticeable number of officers in a promotion group did not attend the war college or GLC, the cause was attributed to demographic imbalances or 'bottle necks' in the personnel system, not as a result of officers' reluctance to attend the schools.[115]

The fact was most 'line' officers conformed to all or at least a large part of King's requirements. They attended King's schools and rotated assignments to various platforms. As an indicator of popular appeal of the program in the 'line', it was reported that in a single month 520 regular officers and 20 reserve officers were enrolled taking the War College strategy and tactics correspondence courses.[116] This constituted a remarkably high percentage of officers in what was then a relatively small navy, constrained in size as it was by the requirements of naval arms control agreements.[117] Surface officers rotated from large ships of the line to fast, small destroyers, which were, at the time, considered a different type of ship. In the interwar period, and for almost two decades after the Second World War, regular line officers hoping to serve aboard submarines spent a mandatory three tour aboard a surface ship, a requirement that was

[115] Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings*, 56, no. 8, August 1929. The Taussig report noted that some officers failed to comply with the progressive timelines (e.g., more junior officers attending a course for senior officers), but that these violations were caused by slowing promotions and imbalances in year groups.

[116] Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings*, 56, no. 8, August 1929, 749.

[117] United States. Bureau of Naval Personnel and United States Navy Dept., "Register of Commissioned and Warrant Officers of the United States Navy and Marine Corps." In 1929 there were approximately 5,000 regular line officers. The senior officers (captains/commanders) and the more junior officers (Ensigns and LTJGS) were not as likely to take the exam, leaving LTs/LCDRs. As there were approximately 2500 officers of that rank, the participation rate in any one year (500) was remarkably high, bordering on 20%.

subsequently shortened by a year.[118] A similar requirement applied to those regular officers who sought to earn their wings, though short service reservists and enlisted men were exempted from such a practice, which was an entirely logical exception to the plan since the reservists were excluded from exercising higher command.

The inter-war policy on promotion exams also served to reinforce the development of a ‘generalist’ or 'integrative' officer identity. Initially, the Navy took so seriously the ‘promotion by selection’ that all ranks of officers were examined. Even those officers to be considered for promotion to admiral had, as a general rule, to report to statutory examining boards.[119] Senior captains in later years appear to have been spared the examining boards, but more junior officers, from ensign to full commander, continued to face the exams, which included two sections in strategy and tactics and, by 1930, a section on aviation.[120] These rigorous exams, as discussed previously, contained a clause wherein officers who completed the correspondence course or the Junior Course at the War College received passing credit for that portion of the exam.[121] This ‘credit’ was highly sought after, and the bulk of young officers attempted to gain such

[118] Prior to the King plan, the practice as delineated in the surviving BUNAV manuals was for three years of duty on surface ships, followed by submarine school. The service on surface ships was sometime in the later 1920s shortened to two years. See Bureau of Navigation United States. Navy Department,"Bureau of Navigation Manual", USNA General Collection, VA 52.A65 1921 and later manuals retained in the Naval Historical Center general collections.

[119] Bureau of Navigation Navy Department,"Bureau of Navigation Manual, 1921", NARA RG 405, USNA Special Collections, call number VA 52.A65 1921. See page 70a for discussion of senior officer examinations: “As a general rule, officers due for promotion to the ranks of rear admiral and captain will be ordered to report to the nearest statutory examining board, which boards are in session at the Navy Department at Washington, D.C. and at the navy yard, Mare Island, CA. If such officers are on the Asiatic or European stations, special statutory boards may be convened on those stations by direction of the Bureau of Navigation.”

[120] Louis J. Connelly, CDR USN (Ret), *The 1930 Edition of the Naval Line Officer's Examiner* (Charleston, S.C.: Furlong and Son, Inc. , 1930). An aviation examination replaced the exam in ‘gyro-compass’ operations which had been tested for the past six years.

[121] Navy Department Bureau of Navigation/Personnel United States,"BUPERS/BUNAV Manual", Naval Historical Center, general collections, call number VA 52.A65 See 1942 edition, chapter four, pg. 331 as evidence of the continuation of such a policy up to the start of the war.

allowances.[122] The linkage between promotion and education at the War College may in part explain the strong propensity of officers to so readily conform to the requirements of King's model and may in part explain the popularity of War College among these year groups.[123] That these examinations had 'teeth' is further evidenced by the complaints offered by some officers: the officers recommended that the test material be expanded to include their area of expertise so that they could earn higher marks![124] The inter-war popularity of King's plan was not limited to only sea-going 'line' officers. Rather, even Engineering Duty Only officers, the true technical specialists, saw the benefits of broadened education and experience. One specialist wrote in *Proceedings* that an engineer should be "…almost as competent in the domains of policy…." as he is in his technical knowledge. [125]

Approximately ten years after King drafted his plan, the Navy revisited the subject of officer development. In 1928-29 a review panel known as the Taussig Board affirmed that "…after a thorough study of the Knox-King-Pye board report, the study of the subject as then made was thorough and complete and the recommendations basically

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[122] Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings*, 56, no. 8, August 1929.

[123] J.R. Haile, ENS, USN, "Examination of Junior Officers," *US Naval Institute Proceedings*, September 1932, 1264.

[124] F. W. LT USN Wead, "The Navy and Naval Aviation," *US Naval Institute Proceedings*, 52, no. 5, May 1926, 891. Wead explains that the promotion examination of the mid-1920s excluded any element of aviation knowledge, which represented a deficiency in the officer corps: "….the Navy does not appreciate the complexities of modern aviation nor give credit for the wide scope of special knowledge which a naval aviator must have. The fact that naval aviators must take regular line officer's examinations which necessarily ignore aviation, else other line officers could not pass them, gives credence to this view."

[125] H.C. LCDR Fischer, USN (CEC), "Lest the Essence Be Lost," *US Naval Institute Proceedings*, 61, no. 4, April 1935, 527. Fischer critiques a leading engineering journal, *Engineering News Record*, and its endorsement of the idea not only of a well rounded line officer, but of a well rounded engineer who would be "…almost as competent in the domains of policy…." as the engineer is in his technical knowledge.

sound."[126] The Taussig Board, however, had one recommendation: to further expand officer participation in the war college program. The Taussig Board recommended that a significant number of senior officers be sent a second time to the Naval War College so as to take "…advantage of the advancement made in the War College since that time..." of their first matriculation in Newport. The report went on to recommend that even flag officers who had not yet had the chance to attend the War College also be allowed to matriculate in order that "…the cycle of progressive instruction be completed…"[127] This official validation of the war college in the late 1920s and early 1930s is particularly important to our purposes here. The Taussig Board report suggests strongly that the decline in war college enrollment that occurred in the years before the Second World War was not due to a retraction of official support for the King plan or indicative of a lack of support for the War College program. Rather, the decline in enrollment was due to other factors, most likely the manpower shortage that resulted from the rapid fleet expansion after 1936.

As the evidence shows, large numbers of 'line' officers in the inter-war period sought integrative professional education at the GLC and war college. They also followed assignment patterns as described in the King plan. But an analysis of career patterns of mid-grade officers does not provide a complete picture of what type of officer was, in the end, promoted to high rank. Did the operational integrators promote to high command or did the specialists? The answer to the question can be found through an analysis of the careers and assignment patterns of those officers who became the senior

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[126] Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings,* 56, no. 8, August 1929, 746.
[127] Ibid., 749.

flag officers. Such an analysis confirms that the more broadly educated officers--the generalists-- did indeed rise to and come to dominate the high command of the Navy.   In surveying those who would lead in war, there are almost no exceptions to the pattern of the ‘well rounded’ (or 'generalist') officer rising to high command. A brief summary of the leading admirals' biographies helps illustrate the pattern of development and education.

Admiral J.O. Richardson, who was a year senior to King and who served as the Navy's senior fleet commander prior to King, received a general education at Annapolis, followed by graduate school in marine engineering, and finished his education at the War College. He served in multiple assignments throughout his career, an assignment pattern that he credited with giving him a breadth of view. Richardson described his career as constituting two phases: ‘pre-high command training’, wherein his specialty in ships and engineering was important to selection up to the rank of LCDR. The second phase was that of widely varied assignments (six different assignments in one six year period) that prepared him for flag. To Richardson, the break between specialty and the cultivation of the qualities and abilities of higher command came as early as the rank of *commander*.[128]

Admiral Chester Nimitz, the senior naval commander in the Pacific during the Second World War, also possessed a rounded education and career. Nimitz interspersed myriad sea and shore duties with graduate school and the War College. Nimitz became a

[128] James O. Richardson and George C. Dyer, *On the Treadmill to Pearl Harbor: the Memoirs of Admiral James O. Richardson as told to George C. Dyer* (Washington: U.S. Govt. Print. Off., 1973), 65, 75, 177-178. Richardson was truly a bridge between the old and the new navies. He contrasts his early training in bayonet tactics with the advanced training he would later receive on battleship fire control systems. He also described changing attitudes toward advanced education. In 1909 one of his captains declared that advanced education was a ‘waste of time’. Despite the words of advice from his captain, the young Richardson persisted and became one of the first line officers to attend the new graduate school in 1910.

leading expert on submarine diesel technology after studying in Germany, an educational feat he was able to achieve because of his foreign language skills. Contrary to popular perception, Nimitz was not narrowly specialized in submarines. Rather, he had alternated his service between surface ships and submarines and ultimately rose to command both types of ships. As he moved up in rank, he was broadened by alternating assignments in technical, personnel, and educational billets. Like King, Nimitz was something of an educator and took great pride as the 'plank-owning' (the first) commander of the NROTC unit at University California, Berkeley. Prior to becoming the commander of the Pacific Fleet after Pearl Harbor, Nimitz had held the highly influential post of the Chief of the Bureau of Navigation (personnel).[129]

Admiral William F. Halsey, who would become a leading carrier group commander of the Second World War, also conformed to the model of the broadly educated, 'well-rounded' officer'. Throughout his career he alternated between educational, over-seas, intelligence, and sea assignments, commanding numerous ships or squadrons along the way. He served on both large surface ships and experimental torpedo boats early in his career and served in two Naval Attaché' assignments in Germany and Norway. He would be among the few senior officers who, at a relatively advanced age, would qualify as an aviator and later command a carrier. Going beyond

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[129] E. B. Potter, *Nimitz* (Annapolis: Naval Institute Press, 1976). For a brief biographical sketch, see Naval Historical Center web-based biographical profiles. *Fleet Admiral Chester William Nimitz*, (Naval Historical Center, 10 April 2003, accessed 13 August 2007); available from http://www.history.navy.mil/faqs.faq36-4.htm.

the broadening requirements of the King plan, he would attend not only the Naval but also the Army War College. [130]

Admiral Ernest J. King conformed to the model of the generalist and 'well rounded' officer. King subscribed to and passed every correspondence course offered by the NWC and would attend the senior course at that same college. Furthermore, he would serve or qualify in all three platforms (surface ships, aircraft, command a carrier, and command a submarine base). He would serve in operations and engineering billets earlier in his career and in multiple officer educational assignments which culminated with duty as the President of the Naval Post Graduate School.[131]

Admiral Raymond Spruance who rose to four stars was also a generalist. He served in engineering billets, worked on early fire control systems, yet broadened out enough to be selected as the Navy's Deputy Chief of Naval Intelligence. He was both a student of and more than once served on the faculty of the Naval War College.[132]

Senior submarine and aviator commanders of the Second World War also conformed to the King plan. VADM Charles A. Lockwood, who graduated a decade after King and later gained fame as the commander of submarines in the Pacific war, was an integrative officer not unlike the four star officers who commanded the fleets. Prior to his duty aboard submarines, he served first on a surface ship and returned periodically to

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[130] E. B. Potter, *Bull Halsey* (Annapolis: Naval Institute Press, 2003). See also biographical sketch at Naval Historical Center website. Reference to his Army War College matriculation can be found at the Army War College Foundation website, www.awcfoundation.org.

[131] Thomas B. Buell, *Master of Sea Power : a Biography of Fleet Admiral Ernest J. King* (Boston: Little Brown, 1980); Ernest Joseph King and Walter Muir Whitehill, *Fleet Admiral King : a Naval Record* (London: Eyre & Spottiswoode, 1953).

[132] Thomas B. Buell, *The Quiet Warrior: a Biography of Admiral Raymond A. Spruance* (Annapolis, Md.: Naval Institute Press, 1987). See also biographical sketch on the Naval Historical Center website.

large surface ships as his career progressed. In his book on the early submarine navy, *Down to the Sea in Subs*, he described the importance for him to "round out" his career in the middle 1930s with an assignment to a surface ship.[133] VADM John Towers, an aviation pioneer who promoted to four stars after the war, had served aboard surface ships on multiple occasions and even commanded a destroyer.

Arleigh Burke, a URL officer with a sub-specialty as a 'design specialist' in ordnance technology and later destined to rise to CNO in the 1950s, also adhered to many elements of the 'well rounded' career. Burke subscribed to correspondence courses from the War College –though due to the disruption of the war buildup he never matriculated at the school--and attended graduate school at University of Michigan for a specialty in ordnance engineering. Potter, biographer of Arleigh Burke, described the assignment policy for Burke and other officers of his period as one of "...providing junior officers with broad training. Burke's seniors in ARIZONA continued assigning him a variety of tasks, duties as diverse as assistant engineer and ship's secretary, followed by duty in the gun's central control station, all the while taking the Naval War College correspondence course".[134]

The foregoing sampling of assignment histories provides strong evidence that the officers who achieved high rank conformed to the King model of integrative education and assignment. This list could well extend lower in the flag ranks, for the variation in assignment, the desire to 'round out' a career, was not unique to only the celebrated officers whose war records became the stuff of popular naval histories and biography.

[133] See Lockwood's chapter 15, 'Rounding Out My Career'. Charles A. Lockwood, VADM USN (Ret), *Down to the Sea in Subs* (New York: W.W. Norton and Company, Inc, 1967).
[134] E. B. Potter, *Admiral Arleigh Burke*, 1st ed. (New York: Random House, 1990), 35.

The practice of rounding out career, assignment, and education was widely adhered to in the inter-war period such that by the early 1930s most regular line captains had attended the Naval War College at least once.[135]

King's model of the broadly educated and ‘well rounded' line officer had become widely emulated by officers in the inter-war period. Even as war clouds gathered in the 1930s, the Navy continued to validate the model. In 1936, the General Board endorsed King’s model, explaining that “… all line officers should be so assigned to successive duties as to afford them a well rounded career in order to develop the requisite command qualities.”[136]

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Taking Stock: Promotion of Integrators to High Command:

One of the objectives of this research is to measure how officer development changed across generations, in particular, how and when the shift from the generalist model to that of the technical specialist (or techno-centric) model may have occurred. Unfortunately, detailed biographical information that was so plentiful for the commanders of the Second World War does not exist for many of the officers who rose to high command in later years. Therefore, detailed biographical comparisons across generations are not possible. But there does exist one useful metric by which to compare changes in officer models across generations: war college matriculation patterns for

[135] Joseph K. Taussig, "Secretary of the Navy Notes: Education in the Navy (Taussig Report)," *US Naval Institute Proceedings*, 56, no. 8, August 1929, 748.
[136] ‘Report of the General Board on the Selection and Promotion of Officers in the Navy, 28 Sept 1936, BG No 421 LDB. Records of the General Board, National Archives. As quoted in Chisholm, 699.

senior flag officers. Stated in another way, changes in the educational resumes of officers who rose to high command may provide insight about which model of officer development--the generalist or specialist-- had become dominant.

In this chapter we are concerned with officer educational patterns from 1920 to 1941. An assistant to Admiral J. O. Richardson conducted an analysis of flag resumes over a several decade period. His analysis demonstrated that over a two decade period from 1920 to 1941 the most successful officers in each year group showed an increasing propensity to conform to one of King's important educational requirements: attendance at the Naval War College. The share of flag officers who had attended the Naval War College rose steadily: in 1924, approximately 50% of flag officers had attended the war college; by 1930 the share had risen to over 63%; 1941 almost 98% (83 of 84 flags). [137] Thus, by the eve of the Second World War the officers who would lead America's fleets were a product of a system of progressive and integrative officer development that more or less conformed to the King Plan of 1919. The validity of the generalist model is further confirmed by the educational statistics associated with the most senior American admirals: 12 of 13 four star admirals (92%) who commanded in the Second World War had studied at the Naval War College.[138]

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[137]James O. Richardson and George C. Dyer, *On the Treadmill to Pearl Harbor: the Memoirs of Admiral James O. Richardson as told to George C. Dyer* (Washington: U.S. Govt. Print. Off., 1973), 109.

[138] United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002). See volume dated July 1945. The four star officers at the end of the war had following notable credentials: of the 13 full admirals as of July 45, fully half had taken the correspondence course in strategy and tactics, indicative of either their remarkable interest in the subject or fear of the inter-war promotion examinations. Two of the thirteen had attended the army war college; 12 of 13 had attended senior course at NWC; 3 of 13 had postgraduate degrees. A glance at VADMs show that 25 of 35 had matriculated at a war college, and if included the correspondence course, then fully 31 of 35 had one or the other form of non-technical education.

Despite its drawbacks and limitations, the King system succeeded in producing officers who would succeed in command. These officers were adequately specialized on a platform early in their career but progressively broadened in order to prepare them for the duties of higher command. The Navy's system of integrative education and development was robust and functioned at multiple levels: general education at the academy, more advanced education at the GLC and War College, varied assignments on multiple platforms, common service aboard large surface ships, and completion of general 'line' promotion examinations. The system inculcated into the American 'line' officer that delicate balance which Steven Roskill, a war veteran and historian, had argued was so difficult to attain, the "…balance between the essential need for professional competence in his own technical field and that broader understanding of human problems that can only be achieved from a wide… education." [139] In the Second World War, commanders produced by King's integrative system would distinguish themselves as America's most successful combat leaders. But the war exceeded in scale and technical complexity anything that King could have anticipated when he designed his generalist system of officer development. Though American naval officers were victorious at sea, it was an open question whether or not the King model of officer was validated by the war or whether it too was, like the pre-WWI model twenty years before, "overcome by events". We turn now to examine how the Second World War affected the education, assignment, and promotion of the next generation who would command.

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[139] Stephen W. Roskill, *The Art of Leadership* (Hamden: Archon Books, 1965), 32.

Chapter Three

Proliferating Machines, Operational Complexity, and the Lesson of Global War: the Need for More Integrative Commanders, 1941-1949

"From the beginning, however, there should be a broader education for the aspirants of all the services with a view of inculcating into the youngsters the general understanding of the uses and limitations of all weapons and services."
Admiral William F. Halsey, 10 December 1944[1]

"...each new weapon, if only because it is new, gives prestige to the officers skilled in its use that acts as an incentive for that group to seek special privilege, authority and autonomy... it becomes incumbent that the Navy establish a training and educational system which constantly emphasizes the importance of high command relative to any specialty."
Bureau of Personnel Study, 1948[2]
(recorder/member: CDR John S. McCain, Jr., USN, father of Senator John McCain)

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Summary

The King system of officer development not only survived the Second World War but was validated by the war experience. Neither technical specialists nor platform specialists displaced King's model of generalist commander. As a result of a

[1] William F. Halsey, Admiral, USN,"Future National Policy for the composition, command, training, and maintenance of the US Armed Forces (formerly TS), memo to ADM J. O. Richardson USN (ret), 10 Dec 1944", NARA RG 428-370-43-01, 2-3, box 4 (filed in Secretary of the Navy Sullivan personal papers).
[2] Report by board of 'line' officers, known by the name of the senior member. C. C. Hartman, RADM, USN, Bureau of Personnel,"Report of the Board to Study and Recommend a Program of Education and Training of Line Officers to Best Fit Them for High Command, dtd 8 April 1948", NARA, RG 24-470-54-25-6, Box 6. The board report and recommendations were endorsed by VADM Thomas Sprague, Chief of the Bureau of Personnel, an aviation innovator and hero of the Second World War. McCain was the recorder, and thus most likely drafted the actual report. He had distinguished himself in the war while in command of a submarine. His father, Senator McCain's grandfather, was a WWII carrier commander.

combination of historical accident, environmental factors, and conscious personnel policy, the war years did not narrow but, on the contrary, broadened the 'line'. Unlike the Army and Air Force experience, the unity of the Navy was preserved. A massive influx of more narrowly trained aviators helped tip the balance to the specialists within the Army Air Corps and fragmented the service, producing the specialist service which became the U.S. Air Force. In contrast, the massive wave of war-time naval officers did not narrow the navy along technical specialties but invigorated the model of the 'well rounded officer'. The environment of the war reinforced the need for commanders who were primarily operators rather than technical experts. In the Darwinian crucible of transoceanic, three-dimensional war, the most capable operators rather than the most technically-minded officers were promoted to command. The post-war analysis of combat also validated the need for the well rounded, operationally-minded ‘line’. No less than three post-war Navy studies validated King’s model of officer education and development. The post-war Navy leadership went further than the King model and added even more integrative requirements in an officer's education: inter-service and 'joint' education. The Navy’s commitment to breadth as opposed to specialization was not a ‘hold over’ from the old ‘surface’ officers of the pre-war generation. Rather, the new leaders of the Navy, combat aviation veterans, also endorsed the model of the 'well rounded officer'.

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Exigencies of War and Integrative Education

King's integrative and progressive educational system had flourished for fifteen years by the time Hitler occupied the Rhineland and Japan accelerated her move into mainland Asia. With the emergence of the German-Japanese threat, and with the failure to renew the naval arms limitations agreements in 1936, the Navy began an ambitious building and recapitalization program. The increase in shipbuilding coincided with a wave of technological innovations in communications, undersea warfare, aviation, and fire-control, all of which demanded the time and attention of increasing numbers of naval officers.[3] Officers of this period were themselves cognizant that new ships and changing technology were shaping the officer corps. LCDR Robert Carney, a future CNO, noted expansion and new technology were reshaping the officer corps to the "…improved armaments with their more numerous battle stations and increased shore activities."[4] The building program, however, was not matched with a commensurate expansion in the officer corps.

America's political leadership was determined to maintain the appearance of neutrality and thus delayed mobilizing for war. This meant, among other things, a tardy expansion of the officer corps which led to a shortage of officers.[5] At the same time,

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[3] William Michael McBride, "The Rise and Fall of a Strategic Technology: the American battleship from Santiago Bay to Pearl Harbor, 1898-1941" (Thesis Ph D --John Hopkins University, 1989), 284.
[4] Robert B. Carney, LCDR, USN, "Selection, Security, and Morale," *US Naval Institute Proceedings,* 61, no. 6, June 1935, 814.
[5] James O. Richardson and George C. Dyer, *On the Treadmill to Pearl Harbor: the Memoirs of Admiral James O. Richardson as told to George C. Dyer* (Washington: U.S. Govt. Print. Off., 1973). Richardson's title telegraphs the main theme of his work: that political leaders did not allow the Navy to properly, and in a timely fashion, prepare for war. Richardson apparently lost his job as fleet commander in part due to his confrontation with Roosevelt over delays in personnel mobilization.

technological-driven personnel policies internal to the Navy exacerbated the problem of officer shortfalls. As an example, when the Bureau of Aeronautics (BUAER) demanded the Naval Academy enforce more stringent visual acuity standards for midshipman, the result was a massive attrition in some academy classes.[6] Taken together, an expanding fleet manned by an inadequate officer corps meant that as early as 1936 a growing number of officers were diverted to ships, air stations and shipyards, while a declining number had the time to complete the progressive phases of King's system of education.

The approach of war necessitated changes in commissioning programs for both reserve and active duty officers. The rapidly growing fleet absorbed the depression-era officer surplus. To make up the shortfalls, the Navy increased the size of Annapolis classes and allowed reserve officers for the first time to serve in the 'line'.[7] The pressures of war and changing technology also influenced educational and physical requirements for midshipmen. As discussed in the last chapter, in the late 1920-30s, Admiral Hart and others had broadened the academy curriculum in the direction of the liberal arts and social sciences, adding more varied languages and the study of government and economics. As the likelihood of war increased, a more practical-minded

[6] A contributing factor in the shortage of officers had been the technologically-driven requirement of flight exams. The academy classes experienced severe attrition in 1937 when vision exam standards were raised, most likely in support of the more demanding aviation requirements, and resulted in the loss of almost 40% of the Class of 1940. With the outbreak of hostilities the Navy quickly realized its mistake and reappointed many of the midshipmen who had failed the eyesight exams. A member of an earlier class who was also denied his commission due to failure of an eye exam proved of great service to the Navy, and became one of the founders of the Navy Seals. This officer, Draper Kauffman, later promoted to flag and ultimately Superintendent of the Naval Academy. Leaders recognized the high attrition as a problem. See House Committee on Naval Affairs, Testimony of RADM Chester W. Nimitz on House Resolution 4368 to Shorten USNA Course from 4 to 3 Years Duration, 77th Cong., 2nd sess., 21 April 1941.

[7] Prior to 1940, NROTC officers could serve only in the staff corps, usually the Supply Corps. Faced with growing shortages of regular officers from Annapolis, NROTC officers were allowed for the first time to enter the 'line'. For discussion of NROTC expansion, see Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 1st- ed. (New York,: Whittlesey House, 1943), 101; Gene Martin Lyons and John Wesley Masland, *Education and military leadership; a study of the R.O.T.C* (Princeton, N.J.,: Princeton University Press, 1959), 50-53.

officer, RADM Sellers, took command of the academy intent on preparing midshipman for the immediate demands of war. RADM Sellers scaled back some but not all of Hart's expansion in the liberal arts and sciences.[8] Sellars explained: "I can say without hesitation that in my opinion success or failure in battle with the fleet is in no way dependent upon a knowledge of biology, geology, ethics, social science, the literature of foreign languages or the fine arts." [9] Sellars had a point: the senior officer ranks already brimmed over with academy and war college graduates, and a temporary tilt in midshipman curricula toward training was not an unreasonable course of action. And as it would turn out, this shift in emphasis was more rhetorical than actual, for Hart's major innovations—the expanded social sciences and language program—remained largely in place.[10]

Parallel with a shift in emphasis toward practical training at Annapolis, war preparations quickly made themselves felt at the graduate school and the war college, not so much in the curriculum—which remained fairly constant until the outbreak of hostilities—but in a decline in 'line' officer matriculation.[11] As war approached, those officers who had not yet attended the war colleges or General Line Course would, due to the exigencies of fleet expansion and global conflict, never participate in the broadening educational programs. The absence of these officers during the pre-war and war years

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[8] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 184.
[9] Jack Sweetman, *The U. S. Naval Academy: an Illustrated History* (Annapolis, Md.: Naval Institute Press, 1979), 191.
[10] Board of Visitors,"Report of the Board of Visitors to the United States Naval Academy", RG 405, Special Collections, USNA, Records of Boards and Committees, Board of Visitors, 1936-1977 Box 2.
[11] Donald Chisholm, *Waiting for Dead Men's Shoes: Origins and Development of the U.S. Navy's Officer Personnel System, 1793-1941* (Stanford, CA: Stanford University Press, 2001), 699-700. Chisholm ascribes the increased demand for specialized training as the main source of the pre-war decline in numbers of officers attending the post graduate school and the naval war college. Though exact data is lacking, it is reasonable to assume that most of these officers were being drawn away from the education pattern of the King plan to the more urgent task of building and organizing the tools of war.

produced a demographic-educational deficit that would over the next two decades work its way through the ranks of navy leadership.

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War-Time Officer Education: Expansion and Acceleration, but Balance

The pre-war period was a time of officer shortage, but the war brought a wave of reservists and clouds of aviators into the ‘line’. The massive influx of new officers into both the Army and the Navy forced the two services to reevaluate their priorities with respect to integrative officer education and more narrow technical training. While the Army reprioritized officer education to produce more narrow technical specialists, many of whom had served previously in the enlisted ranks, such was not the case in the US Navy. The war did require a rapid expansion in number of reservists, acceleration of education and advancement (assignment) of regular officers, and the rise of aviators to numerical superiority. [12] However, both the regular and reserve officer cohorts of the war years were far more broadly educated than is commonly appreciated.

[12] NAVPERS Annual Report," Navy Marines Corps Personnel Statistics, 30 June 1959", Naval Historical Center, Washington, D.C. as quoted in Spector, 259-261. Spector explains that the battles of 1942 and 1943 were fought by officers who had entered the service prior to Pearl Harbor, and were predominantly graduates of the Naval Academy, augmented by pre-war reserve commission programs. The expansion of officers that followed was massive: the officer corps expanded from 21k (3.4k aviator) in 1941 to 206k (37k aviator) by 1944. Over the period from 1941 to 1944 over 280k officers were added. However, the effects of reserve expansion on the unrestricted line, and those who command, were relatively modest. Most reservists were ‘short service’. In addition, through various means, the progressively educated regular (USNA) officers maintained firm control of the upper ranks of the profession well into the later years of the century.

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Undergraduate Programs: The “V” officers and Annapolis

The regular officers who graduated from the accelerated Annapolis program enjoyed a remarkably broad baccalaureate education. Annapolis graduating classes were expanded and accelerated, but unlike West Point, the source of regular Army officers, Annapolis adhered to a broader and more general academic curriculum. Similarly, the reservists who came in greatest numbers with the waves of 1942-44 proved to be a broadly educated and diverse group of college educated men. Naval aviation further broadened the officer corps with the emphasis it brought on yet another dimension of warfare. Most importantly, naval aviators did not align themselves with the narrow specialists but saw themselves as naval officers, a part of the parent profession first, and aviation specialists second. As Admiral Yarnell, a naval aviator wrote during the war: "Naval aviators are seamen as well as airmen and have always prided themselves on this fact."[13]

The outbreak of hostilities did compel the Navy to adjust the balance between two competing demands: that of practical training and that of a broader educational foundation gained from college. Though all the services (Army, Marines, and Navy) accelerated their respective officer programs, the Navy’s academic policy soon parted company with the Army and Marines. The Army and Marines radically deemphasized

[13] Harry E. Admiral Yarnell, USN (Ret),"Report on Naval Aviation, 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11, (Author has copy provided from duplicates made by William McBride).

education and placed a priority on specialized training of large numbers of men for the duration of the emergency. In the Army and USMC, "…education, as contrasted with training, was greatly curtailed or suspended altogether." [14] Furthermore, the Army and Marine Corps drew the vast majority of their officers from the enlisted men who had completed officer candidate school.[15] In contrast to narrow training, the Navy sustained a program that closely approximated a college education. [16] The relatively low numbers of former enlisted men who became officers attest to the college-centric concept of officer development in the Navy: only two percent of the war-time officer expansion derived from the enlisted ranks, the remainder entered via direct commission from civilian life or through the officer college training programs.[17] Thus, it was college programs—NROTC or its variants-- and not 'direct commissions' of technical specialists that flooded the 'line'.

NROTC, formally established in 1926, remained a numerically modest program for the first 15 years of its existence. The program was built originally around six universities: University of California, Berkeley; Georgia Tech; Harvard; Northwestern; University of Washington, Seattle; Yale. Beginning in the late 1930s as war appeared increasingly likely, the number of officer units expanded to encompass twenty-one more

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[14] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 100. Masland and Radway analyze the results of an army study on ground troop procurement. In particular, see Palmer, Robert R., *The Procurement and Training of Ground Combat Troops, Office* of the Chief of Military History, Department of the Army, Washington, D.C., 1948.

[15] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 261.

[16] Gene Martin Lyons and John Wesley Masland, *Education and military leadership; a study of the R.O.T.C* (Princeton, N.J.,: Princeton University Press, 1959) , 101.

[17] Bureau of Personnel,"Chart: Wartime Sources of Navy Officers, Report of February 1945", Naval Historical Center, Washington, D.C. and USNA Collection, Nimitz Library, Micro Room Books D773.U48 1976. Officer trainees from the enlisted ranks numbered 5,325, whereas officer trainees from civilian life numbered 84, 016. Total officers procured between 7 December 1941 and 31 December 1944 numbered 286,251 personnel.

colleges, essentially quadrupling the program. However, with this expansion, the total NROTC officers in these universities would approach only 7,200 and produce less than 1,500 additional naval officers a year.[18] By 1940 the Navy realized that NROTC, even when combined with an expanded and accelerated USNA program, still fell short of fleet needs. To facilitate rapid officer corps expansion, the Navy established the first in a sequence of officer programs that became known collectively as the "Navy College Training Program." The first accelerated program (known as V7) admitted qualified enlisted men (who already possessed a college degree) and assigned them to one of three Naval Reserve Midshipmen Schools, one of which was an old, deactivated battleship, *USS Illinois*, converted to a schoolhouse and moored on the Hudson River.[19]

With the outbreak of war, the demands for personnel far exceeded even the worst case projections formulated by the Navy's Bureau of Personnel (before 1942, known as Bureau of Navigation). Historians of the bureau vividly describe in a war-time report the inadequacy of preparations: "Despite the opportunities of 20 years of peace, the Bureau of Navigation (Personnel) made no plans for officer procurement which did not crumble before the realities of the Second World War emergency." [20] Personnel procurement was initially chaotic, and BUPERS frequently competed at cross purposes with BUAER.[21] In this confusion, however, the goal of a broad and well-educated officer

[18] Julius Augustus Furer, *Administration of the Navy Department in World War 2* (Washington: U.S. Govt. Print. Off., 1959), 285; Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 3rd ed. (New York: Whittlesey House, 1946), 115.
[19] James G. Schneider, *The Navy V-12 Program: Leadership for a Lifetime* (Boston: Houghton Mifflin, 1987), 1-3.
[20] Naval Historical Center (U.S.),"U.S. Naval Administration in the Second World War", USNA Collection, Nimitz Library, Micro Room Books D773.U48 1976. See page 1.
[21] Julius Augustus Furer, *Administration of the Navy Department in World War 2* (Washington: U.S. Govt. Print. Off., 1959), 382. Furer describes tensions between BUPERS and BUAER in procuring officers and personnel. In essence, BUAER was totally independent and sometimes worked at cross purposes. As a

corps was preserved, even before the Navy had developed the organization to ensure such an outcome, which it would do deliberately with follow-on programs. In those early desperate months, the Navy did not dictate officer collegiate curricula. Rather, the college degrees carried into the Navy by the first wave of ensigns were the results of thousands of individual choices made by students on college campuses scattered across the nation. The reservist officers who engulfed the regular line were thus almost by accident a varied and diverse group, with the common denominator being that they were *not* narrowly trained but rather educated to meet the general, broad standards of the American academy. As Schneider, the leading authority on the war-time programs explained: "The irregulars (those with prior college) were permitted to pursue their existing majors with little interference, thus demonstrating that the Navy firmly believed in the virtues of a liberal arts education in preparing men to assume the responsibilities of officers." [22]

By later 1942 and early 1943, the Bureau of Personnel had recovered the bureaucratic initiative and together with Bureau of Aeronautics developed a coherent and cooperative officer procurement program. The Navy remained committed to the idea that most officers would be college educated and dramatically expanded its program targeted at high school graduates. The Navy College Training Program (V12) built upon existing college facilities and faculty around the country, and eventually numbered almost 300 units, to include 121 colleges devoted to general line officer education, 136 to staff, and

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result, many good officer candidates were missed, and the disorganization was such that no records were kept in the first months of the war so that it was difficult if not impossible to find these men at a later date.

[22] James G. Schneider, *The Navy V-12 Program: Leadership for a Lifetime* (Boston: Houghton Mifflin, 1987), 61.

29 to aviation line officers.[23] Though the title of the overall manpower program included the phrase "training", the V12 program was most clearly a "college" program. As the Chief of BUPERS explained succinctly: "This is a college program. Its primary purpose is to give prospective naval officers the benefits of a college education…" [24]

The young men accepted into the program were directed for the most part to either the V12 program, which produced non-aviation line officers, or to the V5 program for what were designated "Naval Aviation Cadets". Between the two, the V12 was the more academic and the V5 the more physical in focus, at least initially. In the first months of the war, the Naval Aviation Cadets (V5) devoted minimal time (approx 3 months) in college level educational curriculum and fairly rapidly progressed through a "flight prep", Civil Aeronautics Administration course, "pre-flight" and finally "primary flight" training. However, by 1943 the program was modified to require all aviation candidates to complete up to four terms of the V12 level college course work.[25]

Reserve officer curriculum also remained remarkably broad and balanced. Masland and Radway observed the V12 program patterned itself on a college curriculum. Further, the curriculum was designed not by military officers, but by a group of distinguished academics, led by Dr. Alvin C. Eurich, a professor of Education at Stanford

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[23] Ibid. For list of actual colleges, see page 15.

[24] V12 Bulletin No.4, "Conference on the Navy V-12 Program, at Columbia University, May 14-15, 1943, June 7, 1943, 4, as quoted in Schneider, 57.

[25] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 3rd ed. (New York: Whittlesey House, 1946), 113. The length of formal education across the programs varied from a high of 12 four month terms for medical, 8 terms for engineers, 4 terms for Line (deck) and originally as low as 2 terms Line (aviation). Interestingly, the success of war-time accelerated college degrees did not alter the Navy's commitment to a longer four year degree. The aviation community initially hesitated in the post-war period, and for a few years allowed reservist aviators to enter flight training with less than a college degree. However, after some delay, even the aviators reestablished the full, 4 year college curriculum requirement. For discussion of this debate, see Admiral James Holloway, Jr., and his recollections of the Holloway Board deliberations of 1945, James L Holloway, Jr., ADM USN (ret) "A Gentleman's Agreement," *US Naval Institute Proceedings*, 106, no. 9, September 1980,71-77.

University.[26] Students studied college level English, history, mathematics, psychology, strategy, chemistry, engineering drawing, elementary heat and electrical engineering, (for engineers, physics), as well as more naval specific courses which emulated in large part the NROTC program, which was itself patterned after the USNA program.[27]

In further contrast to the approach taken by the Army, the Navy required academic institutions to maintain high academic standards of both instruction and examination, and as such, navy reserve midshipmen and aviation cadets were educated by tenured professors in rigorous academic programs.[28] That V12 broadened officers more than narrowed them was further evidenced by the range of professions into which its graduates would eventually, after military service, distinguish themselves.[29] As Ageton described the program, it produced a "…general education slanted toward technical knowledge together with considerable basic instruction in the Naval profession." He went further to conclude: "Taken together in conjunction with the regular college course, the course…produces a well-rounded, well-educated gentleman, trained for his duties as a naval Reserve ensign."[30] Though the reservists would indeed exert a greater influence following the Second World War than after the Great War, the regular line officers who had graduated from Annapolis remained firmly in control of the middle and upper ranks

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[26] James G. Schneider, *The Navy V-12 Program: Leadership for a Lifetime* (Boston: Houghton Mifflin, 1987), 59.

[27] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 3rd ed. (New York: Whittlesey House, 1946), 127.

[28] James G. Schneider, *The Navy V-12 Program: Leadership for a Lifetime* (Boston: Houghton Mifflin, 1987), 59.

[29] A list of graduates and their professions covers the range of technical to the liberal. Its most celebrated career navy officer is RADM Wayne E. Meyer, USN (Ret), better known as the 'father of aegis'. Other graduates have gone on to lead companies, and two became leading educators, two college presidents, from USC and Illinois, Dr. James H. Zumberge and Dr. John E. Corbally. See Schneider's list of graduates, page 331.

[30] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 3rd ed. (New York: Whittlesey House, 1946), 116, 121.

of the ‘line’.[31] Therefore, to assess the influence of war on the development of the 'line' requires an analysis of “regular” officer undergraduate education at Annapolis and programs at Newport.

The war necessitated an expansion and acceleration of Naval Academy classes, but the curriculum retained a remarkable degree of its pre-war balance. The Naval Academy classes were enlarged by almost 50% between 1937 and 1940, an earlier and much more significant expansion than that pursued by West Point. [32] The program was further modified with the classes of 1941-2 when the student body was expanded an additional 30% (to reach a maximum of 1200 with the Class of ’42) and the classes of 1941-42 were accelerated through their final months.[33] Graduation date for class of 1941 was moved to February 1941, the Class of ‘42 moved to December 1941.

To achieve a further increase in numbers of graduates moving to the fleet, the Navy compressed and shortened the midshipman program. Cuts in the curriculum were not taken lightly, but were carefully scrutinized by the Navy and Congress. The

[31] Harry E. Admiral Yarnell, USN (Ret),"Report on Naval Aviation, 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11, (Author has copy provided from duplicates made by William McBride). The massive numbers of young reserve officers may raise the question of dilution of the influence of 'regular' officers in naval aviation. As can be seen by the numbers, however, the reservist dilution of the regulars was largely confined to the junior officer ranks. The 'regulars' remained firmly in control and were the majority of those aviators at the ranks of LT and above. By October 1943, regulars were outnumbered by reservists in junior ranks: ensigns: 226 regulars vs 11000 reservists; Ltjgs 600 regular vs 7000 reservists; but regulars held the majority of senior LTs and field grade officers: LTs: only 1/3 were reservists; LCDRS: only ¼ were reservists. For further discussion, see Ronald H. Spector, *At War, at Sea : Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 222.

[32] United States Army, *US Military Academy Register*, vol. 1939-43 (West Point, NY: US Military Academy Printing Office, 1802-2006) and U.S. Naval Academy Alumni Association., "Register of alumni, graduates and former naval cadets and midshipmen," (Annapolis, Md.: The Association). The class size was also expanded and though still vastly outnumbered by the wave of short-service reservists, increased the number of ‘regular’ officers who would fight in the war and remain in the post-war period. And, in contrast to the Army, the Annapolis class expansions were significantly greater than that of West Point, which may explain in part why the Navy dominated the Army football team in this period!

[33] U.S. Naval Academy Alumni Association., "Register of alumni, graduates and former naval cadets and midshipmen," (Annapolis, Md.: The Association).

modification of midshipman education was of such importance that the head of Bureau of Navigation, Chester Nimitz, testified most of the day on April 21, 1941 before Vinson's famous Naval Affairs Committee, to ensure the Navy's plans survived intact on the Hill.[34] Congress concurred with the navy plans, and a three year curriculum was established beginning with the Class of 1943. Despite this time compression, however, the war-time curriculum still contained 88% of the academic elements of the prior four year course.[35] This achievement once again stood in contrast to the Army's approach to officer education in war-time. Not only did Army ROTC displace education with abbreviated technical training, but so did the Military Academy: with the outbreak of war the academic portion of a cadet's curriculum was cut by 25%, twice the academic reduction as was the case for midshipmen. [36]

To be sure, the Annapolis curriculum and faculty were not unaffected by the war. Professional courses were maintained current "up to the minute" and provided with the latest equipment. The academy received Anti-Submarine Warfare (ASW) simulators and placed particular emphasis on revolutionary breakthroughs in high frequency electronics. The Navy raised physical fitness standards and allotted time for 'hand to hand' combat training, tower jumps and diving through burning oil.[37] The focus of the professional

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[34] House Committee on Naval Affairs, Testimony of RADM Chester W. Nimitz on House Resolution 4368 to Shorten USNA Course from 4 to 3 Years Duration, 77th Cong., 2nd sess., 21 April 1941.

[35] Kendall Banning, Annapolis today, 6th ed. (Annapolis,: United States Naval Institute, 1963), 265. See also Sweetman, 1979, 195.

[36] US Military Academy Superintendent," Staff Summary of Letter dtd 11 Jan 1944 from Superintendent US Military Academy to War Depart; Subject: Return of the Four Year Curriculum", NARA RG 405, USNA Special Collections, Records of Superintendent, Curriculum 1939-1955, Box No 6, Folder No 8.

[37] "War Hits the School," *Shipmate*, no. 7, July 1942 and "The Academy at War," *Shipmate*, no. 10, October 1943. Note that "War Hits the School" is referenced in John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 41.

courses was on basic necessities that would make it possible for a junior officer to carry out his duties upon reporting to the fleet. But these changes had another, unintended effect: they reshaped the civilian and military faculty.

The effect of the war was to broaden the faculty. The regular officers who normally constituted a large portion of the faculty were called away to the Fleet.[38] As a result, a wide variety of civilian faculty members descended upon the academic buildings and offices of Annapolis, imparting to the war-time classes new and different outlooks. The new perspectives concerned not only the academic subject fields, but included new ways of looking at the larger world. And this influx of civilians and reservists exerted more than a temporary effect on instructional practices and faculty composition. Many of the ‘temporary’ faculty would remain on after the war.[39]

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War-Time Graduate School and Naval War College

In contrast to what happened in the First World War, the Navy operated the Naval Post Graduate School and War College throughout hostilities. Navy policy constituted a dramatic difference with the Army, which demonstrated again a lesser commitment to advanced education when it shuttered all of its advanced educational institutions for the duration of the war. Though the graduate school and the Naval War College remained

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[38] Charles Paul Sheppard, “An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974” (Thesis Ph D --George Washington University, 1974), 229. Apparently, a certain number remained after the end of the war and became leading advocates for curriculum improvements. Sheppard references interview with Edward J. Cook, Associate Dean, USNA, interview from 23 May 1972. Cook served as Secretary of the Curriculum Review Board of 1959.

[39] William E. Simons, *Liberal Education in the Service Academies* (New York: Published for the Institute of Higher Education by the Bureau of Publications Teachers College Columbia University, 1965), 98.

open, the student body and curriculum were modified to support the war-time requirements. As one observer noted, in the urgency of war the "… system of progressive education and training was no longer practicable." Warfare now required "… a vast assortment of new weapons and methods for which EDUCATION (stressed less as the day of action approached) and TRAINING (of increasingly greater importance) were required."[40] As a consequence, the work of the advanced schools took on a more practical flavor throughout the war years.

Naval Post Graduate School at Annapolis not only remained open but saw a reversal of the pre-war decline in enrollments. Between 400 and 700 officers were enrolled in the school in each year of the war. However, the curriculum and enrollment patterns were different, and most students took what would be considered more technical training courses than genuine graduate level classes.[41] Actual graduate level courses did continue, but these were focused not on 'line' officers but on producing technical specialists, many of which would be needed in the post-war years. For the mass of reservists, the General Line Course was expanded to aide in their integration into the larger Navy.[42]

It is also noteworthy that not all war-time training schools were necessarily technical in nature. The expanded navy training also included the study of military government, area studies, in particular language training. Initially, the Navy expected civilian specialists to fill many of these non-technical requirements, but as the end of the

[40] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 3rd ed. (New York: Whittlesey House, 1946), 105. Capitalization and parenthesis as found in the original text.
[41] Alexander Wolfgang Rilling, "The First Fifty Years of Graduate Education in the United States Navy, 1909-1959" (Thesis - University of Southern California, 1972), 174.
[42] Ibid., 175.

war approached, the military saw that regular 'line' officers would require expanded non-technical education. In addition to the focused war college course discussed below, the Navy also formed a school of military government and administration at Princeton and Columbia and educated some officers in the Army's civilian affairs schools. Thus, not only did the Navy maintain the graduate school and War College throughout the war, but it also established additional, non-technical schools to prepare officers for the unique requirements of global, cross-cultural operations.[43]

The decision to keep the Naval War College open was not a foregone conclusion, and the debate over this policy provides some insight as to Navy leaders' educational values. Chester Nimitz, Chief of Bureau of Navigation in 1941, and later five star admiral, asserted the need to keep educational institutions fully manned. He explained his rationale in a speech just days before Pearl Harbor: "No matter how badly officers are needed afloat--no matter how scarce they may be --it is during a period of personnel expansion that our schools and educational institutions must be expanded, rather than curtailed."[44] Nimitz' attitude stands in stark contrast to the views expressed later by Admiral Rickover when he faced manpower shortages in the Cold War, a contrast that will be discussed in later chapters. Nimitz' commitment to the War College was also at odds with Army values and priorities. Most Army educational institutions were closed

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[43] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 100-104.
[44] Chester W. Nimitz,"Speech on Education: Graduation Exercises Naval War College 2 Dec 1941", NARA RG-24-470-54-27-415 Box 72 (old BuNav Files of C.W. Nimitz), 1.

even before the war; for example, the Army Industrial College course was shortened in 1940, closed in 1941, and not reopened until in 1944. [45]

Though the Naval War College itself remained open, it could very well have been modified to focus on technical training for the new weapons of war, but it was not. Rather, Admiral Kalbfus, the war-time president, successfully argued that officers must understand the fundamentals of war: "There are fundamentals common to all, irrespective of whether the sphere of action has been land, sea, or air…..Technological evolution has always exerted great influence on methods of operation, but the extent of this influence cannot fully be understood and measured unless there be ability to sift technical details from fundamental truths…" [46] As war approached, the faculty was retained and the curriculum condensed, but the emphasis would remain on broader education in the art of war.

With the outbreak of war the Bureau of Navigation suspended the regular year-long courses and replaced them with abbreviated resident courses, a command course and a preparatory staff course. These courses provided a background of world politics, economics, and geography and were considered as equivalents for promotion examinations in tactics and strategy. The command course was focused at those "line" and staff officers with more than six years of service; the preparatory staff course was intended for junior naval reserve officers. Experienced pre-war NWC instructors taught the command course—essentially an abbreviation of the pre-war "senior" course—and

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[45] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 101.

[46] R.L. Conolly memo of 26 March 1951 transcribing Kalbfus to Secretary of the Navy, 15 January 1943, as quoted in John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 169.

carefully selected academy graduates taught the preparatory course. In the last two years of the war, the NWC adopted a "joint" component of education, which had been suggested by General Hap Arnold. Though the idea of the joint course did not originate in Newport, the Naval War College hosted numerous Army and Marine students as they learned about the naval service.[47]

Though the curriculum may have remained in balance, the relative dearth in 'line' officer matriculation did narrow the education credentials of several promotion year-groups. These lesser educated year groups would work their way through the ranks, ultimately producing in the Navy's high command a demographic deficit of war college graduates. The drop in wartime matriculation was compounded, as noted earlier, by the decline in junior officer attendance during the buildup for war in the later 1930s. War College President Kalbfus in a letter to the Secretary of the Navy noted the declining share of officers who had attended the college. The 1942 Register of naval officers at grade of CDR and LCDR numbered 2,510, but only 241 had attended NWC. Kalbfus interpreted these numbers to indicate a "…forced trend away from the guided and undisturbed study of war by those upon whom the burden of conducting war necessarily falls." Kalbfus further warned that without war college education the officers would be ill-prepared to lead, having instead attained "mere mastery of a particular technique, without the fundamental knowledge from which it emanates…"[48]

Though Kalbfus' warnings proved prophetic-- a demographic dip in formally educated officers in the higher ranks did emerge in the 1950s-- it is hard to imagine an

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[47] Ibid. , 174.
[48] Ibid. , 170.

alternate course that the Navy could have followed. The exigencies of war required most officers to be at sea and in the shipyards; the fall-off in attendance was the result of desperate times, not a change in attitude toward education. Stated in another way, reduced 'line' officer attendance at the Naval War College did not represent a fundamentally changed attitude toward officer requirements, but rather reflected the dire emergency faced by personnel managers. The fact that the college remained opened, in stark contrast to army practice, was a reflection of the Navy's commitment to integrative and non-technical education of the officer corps.

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The Effects of Operational Demands: the "Skipper Problem" and the Rise of the Seaman-Aviators

The war necessitated, in addition to educational adjustments, a disruption of pre-war promotion and assignment policies. Line officers remained assigned to sea duty or over-seas staff duty throughout the war. Few officers could be spared to return stateside even if the Navy had desired them to continue the pre-war pattern of alternating educational assignments and shore duty. Accelerated advancement aboard ship, and the attrition of certain types of officers in combat, exerted the greatest effect on the officer corps, especially in the submarine and aviation components. For surface ship officers, war-time assignment patterns aboard ship followed pre-war practice, but advancement came at an accelerated pace. In submarines, the exigencies of war tended to favor the assignment of younger and more operationally skilled officers in command. Assignment and promotion patterns of aviation officers to higher command would change significantly during the war and impart to the officer corps a broader range of experience to complement the 'black shoes' (surface officers) of the ‘battle line.’ Furthermore, the war disrupted promotion procedures. Promotion boards and promotion examinations that had been linked to war college course work, a key component of the pre-war development process, were temporarily suspended.

Almost immediately the logistical impossibility of sustaining the pre-war system of promotion boards and promotion exams became apparent. Prior to the war, the process for promotion included completion of statutory examinations. The pre-war BUPERS Manual explains at length the process for and importance of examinations as a means to determine those officers “best-fitted” for officer promotion.[49] The written exams, which included subject tests of strategy, tactics, logistics, international law, international relations, engineering and administration among others, were not taken lightly. With war, the written promotion exams were suspended.[50] Instead, officers were promoted based upon satisfactory fitness reports (in reality, the absence of a negative “do not promote” report) and time in rank. For officers above lieutenant commander, promotions were selected by a board, based on records in the officers file: board members listed those officers they felt “best fitted” for promotion, and those

[49] Navy Department Bureau of Navigation/Personnel,"BUPERS/BUNAV Manual", Naval Historical Center, general collections, call number VA 52.A65 See series of BUNAV manuals from 1922 through 1942. Though numbering of paragraphs varies, each had devoted a dedicated section to the logistics and content of promotion exams.

[50] Ibid., 331. See 1942 manual, Bureau of Personnel Manual, Chapter 4, pg. 331, ed., 1942, Washington, D.C.: Government Printing Office, copy in NHC collection, Washington Navy Yard.

officers who gained an adequate number of 'votes' were promoted.[51] In practice, however, promotions for LCDR and below were often effected as a block.[52]

For promotions to commander and captain, the Navy tried to preserve greater selectivity. In theory, these higher level promotions would require that a board of officers review the fitness reports. In practice, as Furer noted, the degree of scrutiny to which these reports were subjected was most probably low. The Navy could accept the lower levels of scrutiny because the promotions were temporary. Specifically, most if not all promotions between July of 1941 to June 1946 were, by regulation, "…temporary and subject to review and adjustment…" upon cessation of hostilities. [53]

There were other ways to promote officers during the war. What were known as 'spot' promotions were also widely used, typically made without regard to promotion status, seniority, and without a formal selection process.[54] The use of 'spot' promotions was not infrequently criticized in peace-time as vulnerable to political favoritism, and their use in war-time did not escape such criticism. Officers on the front line of the war complained that 'spots' often went to those in safe rear areas. A post-war study of 'spots' found that these coveted promotions were indeed concentrated ashore. However, a reason for this may not have been so much favoritism as the fact that such promotions

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[51] Julius Augustus Furer, *Administration of the Navy Department in World War 2* (Washington: U.S. Govt. Print. Off., 1959), 298.
[52] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 3rd ed. (New York: Whittlesey House, 1946), 432.
[53] Public Law No. 188, 77th Congress, approved 24 July 1941, referenced in BUNAV Circular Letter of 19 August 1941, quoted in Ageton, 1946, 432.
[54] "Spot" promotions were temporary promotions that would expire unless later confirmed by the statutory promotion boards. They did, however, possess the real and immediate benefits of increased pay, privilege, and status.

were used frequently to promote needed senior civilians who had minimal military or combat experience.[55]

The selection for high command, for flag, was not immune to the disruption of war. The traditional flag selection boards were suspended for four years due to the exigencies of war and a far-flung fleet, replaced by a system of votes based on service reputation among flags in the fleet.[56] The war-time process for flag promotions was susceptible to great subjectivity. As described by Furer, a mailing list was sent around the fleet addressed to approximately a dozen flag officers who then voted on the names. The rankings were then sent by the admirals back to Washington, D.C. where the Secretary of the Navy presided over a board of typically six persons, to include the Secretary, Admiral King, King's Chief of Staff, the Vice CNO, Chief of Bureau of Personnel, and Chief of Bureau of Aeronautics. When an officer gained three quarters of the 'yes' vote, he was then placed on the list for promotion to admiral. As for the long term effect of such a system, the consequences were unclear. But it is reasonable to assume that the crucible of war and urgent demands for combat leaders compelled the admirals in the fleet to vote for the operators and the fighters. Such a system, though operative for only a few years, no doubt promoted to flag a relatively large share of tactically and operationally innovative and aggressive officers of the 'line'.

Assignment patterns were also changed by the war. Aboard all three platforms-- surface, submarine, and aviation-- the war witnessed an acceleration in the speed at

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[55] Julius Augustus Furer, *Administration of the Navy Department in World War 2* (Washington: U.S. Govt. Print. Off., 1959) , 298.
[56] Julius Augustus Furer, *Administration of the Navy Department in World War 2* (Washington: U.S. Govt. Print. Off., 1959), 297.

which officers moved up to more demanding assignments. The surface navy's officer corps was the least effected by the war. This outcome may not come as a surprise since the surface navy was a mature and seasoned organization when compared to submarines and aviation. When war came, assignments and selection to positions of increased responsibility in the surface navy came rapidly, but despite the wave of reservists and new technologies of war, the regulars and pre-war officers remained in firm control of the profession.[57] The possibility of a regular officer rising from new ensign to XO of a small ship in three years was not unheard of. One instance of such a rapid rise was the promotion of young Elmo Zumwalt, a future CNO.[58] But the rapidity of promotion in the surface navy was due mostly to expansion. Losses were moderate, and the captains groomed in the pre-war period generally performed well. The submarine force, however, was marked by a different experience, and the effects of war carried with them long-term consequences.

Neither new technology nor the wave of reservists influenced the assignment patterns of the more senior submarine officers to any appreciable degree. Most of the officers who commanded in war had followed the King system of officer development: they had served in the surface fleet first, followed by selection to submarine school. At sea they proved readily able to master the latest technologies. While the submarines were improved in the war-- to include radar and better fire-control computers-- these

[57] The surface navy adhered to a policy of assigning reservists to smaller and lesser ships. In contrast, the Navy placed the regular officers aboard the larger ships. The larger ships provided a privileged position to be better experienced in the broader operations of the war, and better positioned to compete for promotion and eventually leadership in the post-war Navy. Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 263.
[58] Elmo R. Zumwalt, *On Watch: a Memoir* (New York: Quadrangle/New York Times Book Co., 1976). See section on war years. Clearly, Zumwalt's experience was not unique, but his example is especially significant in that he is one who rapidly accelerated through assignments and also rose to high rank.

innovations did not create a new class of specialist officers nor present an impediment for older officers as they rose to command.[59] The wave of reservists also posed no threat to regular officers from Annapolis. Despite the large numbers of reservists in the Navy, the 'regular' officers remained in near total control of the submarine community and held almost all submarine commands. Not until 1945 was the first reservist officer placed in command of a submarine.[60] It was neither the infusion of war reservists nor new technology that changed the submarine officer corps. Rather, the most influential factors that redefined what it meant to be a submarine officer were physical environment and changed combat doctrine. The immensity of the Pacific and the ethical-political decision to engage in unrestricted submarine warfare combined together to change operational conditions under which a captain commanded his boat. The change in operational conditions, which occurred in the crucible of war, created a Darwinian logic that culled from the force those commanders who could not adapt. Those who flourished in the crucible of war rose to command the submarine navy for the next two decades.

The officers in the pre-war submarine navy had trained to operate with the 'battle line' of large surface ships and had not prepared for unrestricted submarine warfare. Further, the officers in this earlier period were often deeply involved in the development and fielding of new technologies and were relatively less skilled in operations. When hostilities came, the Navy quickly abandoned pre-war plans and sent submarines not with the 'battle line' but on independent operations. One of the most crucial missions was to

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[59] Thomas B. Thamm, Capt, USN, ""Quiet Crisis in the Silent Service"," *US Naval Institute Proceedings*, no. 8 August 1971, 51-58. The author notes that the diesel submarine officer readily absorbed and adapted to the new weapons of the Second World War.
[60] Clay Blair, *Silent Victory: the U.S. Submarine War Against Japan*, 1st ed. (Philadelphia: Lippincott, 1975), 793. See also Ronald H. Spector, *At War, at Sea : Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 264.

interdict Japanese sea lines of communication where submarines sank combatants and merchant ships alike. The war cruises were dangerous and demanding and resulted in an exceptionally heavy attrition of pre-war commanders, running as high as 30% of all submarine captains in 1942 alone. But the high attrition of submarine commanders was not due entirely to combat deaths. The high attrition among commanding officers was quietly referred to as the “skipper problem”: the return of too many commanders from war patrols with few or no ‘kills’. Blair, author of several books of the submarine force, observed: "Over-caution was a command problem unique to submariners. A destroyer skipper, operating in formation with other ships, was not apt to find an opportunity to slink away if he were so inclined. But a sub skipper, operating far from direct supervision, in absolute command of his ship (and usually manning the periscope during an attack) could be as brave or as cautious as he wished and could fudge patrol reports to cover his actions. The over-cautious skippers were soon found out." [61]

The causes for the ‘skipper problem’ and subsequent high attrition were never conclusively identified, but environment appeared to play a role. The pre-war training, which had emphasized brief periods of operation with the battle-line, bore little resemblance to the prolonged submerged operations required of war patrol across the expanse of the Pacific. The physically draining, prolonged periods of submerged warfare may have been, in balance, too much for the older officers in command.[62] Others

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[61] Clay Blair, *Silent Victory: the U.S. Submarine War Against Japan*, 1st ed. (Philadelphia: Lippincott, 1975), 199. Blair observed that attrition peaked in 1942 at 30%, fell to 14% in 1943. After 1943 senior submarine leaders were hesitant to relieve many more captains because the leadership pool was by then severely depleted.

[62] Paul R. Captain Schratz, USN, *Submarine Commander: A Story of World War II and Korea* (Lexington, KY: The University Press of Kentucky, 1988), 72-73. Paul Schratz, a veteran of multiple patrols told of the ailments that afflicted the crews, ailments the older men would be particularly susceptible, including scurvy, due to the lack of sunlight

attribute the ‘skipper problem’ to the effects of years of pre-war indoctrination in what proved to be inappropriately conservative tactics. Pre-war doctrine required a captain to submerge his periscope at the first sight of aircraft and to conduct acoustic-only approaches to targets. Such doctrine did not prepare officers for the conditions they would confront in 1942-44.[63]

There was another explanation for the skipper problem: the unique conditions of transoceanic war had ‘selected out’ those officers most inclined to technical details of their machines and instead favored those more suited to aggressive tactical operations. Holmes, a scholar on the submarine force, explains that a technical bias among many officers was a significant factor in their ultimate attrition from command. According to Holmes, many older officers had been promoted up the ranks more on the basis of their capacity for technical work than on their ability to be tactically aggressive or innovative. Officers selected in the pre-war era on the basis of technical skill thus tended to be less apt in the tactics of unrestricted warfare and were replaced in war by the more tactically-minded officers.[64] Spector offers a more colorful explanation of the ‘skipper problem”: the pre-war process for command development was one based more on seniority, whereas the war would require a system that rewarded “reckless aggressiveness”.[65] Years later, differing opinions as to the value of commanding officers 'forged in war' would occupy central stage in debate over what type of officer was best suited to command nuclear submarines. Though questions about submarine officers would become particularly

[63] W.J. Holmes, *Undersea Victory: The Influence of Submarine Operations in the War in the Pacific* (Garden City, NY: Double Day and Company, 1966), 47-48.
[64] Ibid. 34-35.
[65] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 288-289. See also Charles A. Lockwood, VADM USN (Ret), *Down to the Sea in Subs* (New York: W.W. Norton and Company, Inc, 1967).

significant in the Cold War, it was the rise of the aviators that posed the most problematic questions about models of command in the Second World War.

Over the course of 3 ½ years of hostilities, senior aviation and fleet commanders engaged in a quiet debate as to what kind of officers were best suited to command at sea and to promote to the senior ranks in the Navy. By the last days of the war, the aviation-qualified officer, perhaps the most integrative and well-rounded officer in the fleet, would dominate the senior sea commands. Several factors facilitated the rise of the aviators: the combat environment and geography of the Pacific, the sheer number of aviators, and the willingness of aviators to lead an integrated Navy rather than seek their own specialized service. Unlike Army aviators, when the shooting stopped in 1945 naval aviators concluded that they were NOT platform specialists, but were leaders of an integrated fleet that operated in three dimensions.

At the start of the war, aviation was hardly a new technology. But what was new and unexpected was the large number of airframes required to fight in the open expanse of the Pacific, and the correspondingly large number of aviator officers required to fly these aircraft. All pre-war plans for numbers of personnel quickly proved inadequate as the demand for aviator officers exploded. Over the course of two years in the early 1940s, aviators would rise from a minority group to that of the majority of line officers: in June 1940 only 16% of line officers were aviators, but by June 1942 approx 72% of line officers were aviators (a ratio of 2.5 to 1 aviators to all other line officers combined).[66] With such a large percentage of the 'line' now made up of aviators, it was

[66] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 150-151.

natural and predictable that aviators agitated for an increased share of higher command posts. If a comparison to the Army Air Corps was considered valid, then a rebalance was certainly in order. Using army metrics wherein the share of general officers was determined by the aviator's share of the lower ranks, the aviator share of admirals should have been 28% instead of the 17% of admirals who were aviators. [67] Though increased numbers of senior command assignments and promotions would open up to aviators, it would be 'regular' line aviators, not reservist aviators, who would rise to command. [68]

The changing nature of war was also used to justify enhanced aviation assignment and promotion opportunities. Aviators had championed their community before the war, but upon the conclusion of the Battle of Coral Sea, a battle fought in the main by carriers and their pilots, aviators became increasingly vocal. After Coral Sea the leading architect of naval aviation, VADM John H. Towers, began to criticize the lack of aviation experience among 'line' commanders.[69] Towers recommended as early as 1942 that aviation-qualified officers should command *any* fleet detachment that included aircraft carriers. In the early years of the war, the Navy's leaders turned a deaf ear to his complaints. Tower's arguments gained traction with civilian leaders when a surface officer was blamed for tactical mistakes that may have contributed to the loss of the escort carrier USS LIPSCOMB BAY in 1943. Other officers began to join the chorus calling for more aviator command assignments and promotions. One carrier admiral,

[67] Ibid. 150-151, 220.
[68] Harry E. Admiral Yarnell, USN (Ret),"Report on Naval Aviation, 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11, (Author has copy provided from duplicates made by William McBride), page 7. In the last weeks of 1943 and early 1944, reservists made up only 8 captain and 26 commanders, as compared to 238 captain and 346 commanders of regular line aviators.
[69] William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 204. John Towers, one of the leading aviation pioneers, was the officer perhaps most responsible for the training and organization of the winning air fleets in the Pacific.

Frederick Sherman, went so far as to call for an aviator monopoly of all senior operational positions in the fleet.[70]

The Navy leadership responded to the growing criticism and asked retired aviator Admiral Harry E. Yarnell to investigate the complaints and concerns of the flyers. Yarnell saw his mission as two-fold: to produce recommendations that would make "aviation a more efficient arm of the fleet", but also to make recommendations that would ensure naval aviation remained part of the Navy, and not part of a separate service.[71] Yarnell made numerous recommendations to elevate aviators to positions and assignments of increased responsibility. However, his recommendations to narrow the development of aviator officers—to make them more specialists than broadly experienced officers[72]—brought a persuasive rebuke from COMINCH, Admiral Ernest J. King. King, author of the reigning model of integrative officer development, supported more aviator promotions. But King had conditions: the aviators would have to be 'broad-minded' and widely experienced, not platform specialists. King wrote: “All line officers, whether qualified as aviators or not, must be fitted for high command by being given instruction and experience in all arms.”[73] King used this opportunity to reaffirm the model he had worked so assiduously to establish, that of the 'well-rounded officer': “It is, however, a fact that officers of wide experience are those best fitted for high rank, and,

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70 Ibid. , 205. See also Spector page 221.

71 Ernest J. King, Admiral, USN,"First Endorsement dtd 29 Jan 1944 on the Report by Admiral Yarnell on Naval Aviation 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11 (Author has copy), page 1; Harry E. Admiral Yarnell, USN (Ret),"Report on Naval Aviation, 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11, (Author has copy provided from duplicates made by William McBride), page 1.

72 Yarnell called for an end to the practice of first assigning naval aviators to command large surface ships before they promoted to Flag rank. (see recommendation “m”) Yarnell report and King’s commentary.

73 Ernest J. King, Admiral, USN,"First Endorsement dtd 29 Jan 1944 on the Report by Admiral Yarnell on Naval Aviation 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11 (Author has copy)2, see also William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 207.

consequently, officers are given such opportunities as can be provided to diversify their duties, particularly in command."[74]

Under pressure from Secretary Forrestal, King assented to additional measures that enhanced aviators' status in the Office of the CNO and improved their assignment and promotion opportunities. King established a Deputy CNO for Air; tightened assignment criteria for command of aircraft carriers to favor aviators; and required every carrier group be commanded by an aviator or, alternatively, the chief of staff was required to be an aviator.[75] By the end of hostilities, aviation officers occupied favored leadership positions on the carriers, carrier groups, the fleet commands, and at the headquarters staff in Washington. Though the next CNO would be Nimitz, who was a surface and submarine officer, Secretary Forrestal limited him to a two year term so that an aviator might soon compete for the top job. Towers, the architect of naval aviation, replaced Spruance as Pacific Fleet commander in 1946, and aviator Admiral Marc Mitscher took command of the Atlantic Fleet. In the reorganized CNO's office, the new VCNO and 40% of the deputies would be aviators. Forrestal, himself an early naval aviator, declared in December 1945 that the "Navy is becoming an air Navy."[76] But as Yarnell observed, naval aviators saw themselves first as seaman and second as aviators. Naval aviator values, in contrast to Army Air Corps, reflected unity and integration, a reaffirmation of the essence of the inter-war officer development philosophy, rather than

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[74] Ernest J. King, Admiral, USN,"First Endorsement dtd 29 Jan 1944 on the Report by Admiral Yarnell on Naval Aviation 6 November 1943", Library of Congress, Manuscript Division, Papers of Harry E. Yarnell, Box 11 (Author has copy), page 6.
[75] William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 204-207.
[76] Clark G. Reynolds, *Admiral John H. Towers: the Struggle for Naval Air Supremacy* (Annapolis, Md.: Naval Institute Press, 1991) 514-515. See also William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: Johns Hopkins University Press, 2000), 209.

a narrow view of officer as specialist. This emphasis on unity and integration would become evident in the decisions the new leadership made in post-war officer education, assignment, and promotion policy.

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Post-War Officer Lessons Learned: Validation of Integrative Officer Development, 1944-45.

The war catapulted aviators to high command in the Navy, but these 'line' officers were not narrow platform specialists. They were a broadly experienced group, most of which had first served aboard surface ships, qualified as aviators, commanded surface ships, and then commanded at senior levels in the transoceanic, amphibious and carrier warfare campaign. The combat environment placed a premium on three-dimensional warfare, amphibious operations with the Marines, and joint operations with the Army and Army Air Corps. With the cessation of hostilities, senior leaders reflected on the war experience and pondered the implications for officer education and development.

A series of study boards interpreted the lessons of war as validating the essential tenets of the King plan of integrative officer development. The goal of officer development remained as before: to produce officers of the ‘line’ who were not narrow specialists, but men of breadth and versatility, able to integrate the many specialized capabilities of the Navy and then exercise sound operational judgment. Senior navy leaders concurred with the boards’ findings and moved quickly to reestablish, expand,

and improve upon the inter-war system of education. To navy leaders, including new aviation flags, the experience of the war necessitated an even greater broadening, to include the political-military education with which to better understand the world. Officers of the future were expected to have more "joint" education to facilitate closer and more effective cooperation among all the military services.[77] This reaffirmation of breadth as opposed to narrow specialization is found throughout navy discourse: in numerous studies from late 1944 to 1948; fleet commander dispatches; officer manuals and career management publications; curricular changes at educational institutions. Lastly, the Navy restored the pre-war promotion examination system which, at its core, adhered to and worked to sustain the goal of a 'general line officer'.

The Pye Report, 1944

As the prospect of victory neared, the Secretary of the Navy, Frank Knox, directed the establishment of a board to study officer education and professional development. He wanted to know what three years of war experience might mean for the post-war officer development system. An eclectic board,[78] chaired by VADM William Pye, reaffirmed the continued validity of the inter-war officer development policies and advocated the establishment of additional joint educational institutions with which to further broaden the naval officer corps.[79] The report anticipated the increasing clamor

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[77] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 104.
[78] The Pye Board included an eclectic membership, across a range of ages and ranks, and was widely read within the Navy bureau of personnel. Formed by Secretary Navy Knox, the board consisted of navy officers, marines, and a prominent civilian educator, Dr. F.B. Synder, president of Northwestern University. The report was parsed and studied in detail by the Bureau of Personnel, which then produced a digest in 1947.
[79] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 175.

for more technical specialists and drew a clear distinction between the technical specialist and the ‘line’ officer who would command. The board concluded: “For officers of the command branch, education and training in material is important but distinctly secondary to education and training for command."[80]

The board report was widely read and became a key reference for Bureau of Personnel post-war planning. The Navy’s personnel managers studied the Pye report closely and interpreted the lessons of war to reaffirm the need for progressive education and expanded ‘joint’ or inter-service education. A well-worn BUPERS digest and planning document summarized the key recommendations of the war-time study:

> “4 a. That all Naval officers have a more thorough knowledge of the employment of combat aviation, surface, subsurface, ground, and amphibious forces and means and methods of their logistic support.
>
> b. For increased attendance for officers in schools of other branches and services.
>
> c. Duty assignment for many officers with other branches of the naval service and with other services”.
>
> d. For a larger percentage of officers to be thoroughly and specially educated for the performance of operational staff duties, including joint staffs.”
>
> e. For a larger percentage of officers qualified in applied communications.
>
> f. That officers receive education for command at an earlier age.
>
> h. For stress upon the development of combat leadership. k. That 15% of the officers of the Line, 10% of the Marine Corps, and 5% of the Supply Corps and Civil Engineer Corps officers be at all times engaged in educational pursuits either as students or instructors of officer students.
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> 5. f. All commissioned officers of the combatant branches be required to take one period of post-graduate education (for line officers, this would be the General Line Course)

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[80] William S. Pye, VADM USN,"Report of Board to Study the Methods of Education Naval Officers, 1944", Naval War College, call number V411.U56, NWC Archives, RG 3 Box 2: File 5216: Pye Board Correspondence, 6-7.

g. Provide a command and staff course for officers during their first three (3) years in the rank of LCDR.
h. Provide a third educational period during the first three (3) years of service in the rank of commander comprising a NWC course....a certain number of graduate to continue at the National War college.

6. b. Combined Exercises: Joint exercises in amphibious and joint operations must be greatly expanded.
c. Exchange of Officers: Representative officers should be given tours of duty in other branches and services
d. Faculties: Provision should be made to obtain the best available teaching staffs both Naval and civilian.
e. Provide an allowance of officers for educational purposes in excess of those necessary to man the active ships and short billets, otherwise "catch as catch can" will be the basis of assigning officers to education al assignments."[81]

The Pye Report constituted a powerful endorsement of the integrative model of officer development. But it went further: the Pye Report was among the first documents to recommend the establishment of a "College of National Defense", which would bring together for educational purposes officers and civilians from multiple government agencies. The Joint Chiefs of Staff endorsed its own "General Plan for Postwar Education of the Armed Forces" in June 1945, which incorporated Pye's recommendation for the national defense college.[82]

[81] BUPERS-PERS122,"Digest of Pye Report of July 1944", NARA RG 24-470-54-25-6 Box 6.
[82] Chairman Joint Chiefs of Staff,"General Plan for Postwar Education of the Armed Forces", JCS 962/2 of 22 June 1945, as referenced in John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 180. For additional discussion of the Pye report, see John P. Lovell, *Neither Athens nor Sparta : The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 43; Alexander Wolfgang Rilling, "The First Fifty Years of Graduate Education in the United States Navy, 1909-1959" (Thesis - University of Southern California, 1972), 180-182.

Fleet Commander Perspective: Halsey's Top Secret Message

Pye was a traditional surface officer who served but a few months in the Pacific theater during the war. As such, some could argue that his report was not representative of those who had commanded the large, carrier-centered fleets of that theater. A recently released Top Secret document provides a fleet perspective on the issues of officer development. The perspective was that of Admiral William F. Halsey and preserved in a 3rd Fleet message sent by Halsey to the Chief of Naval Operations in the last months of 1944. In this extraordinary document that remained classified until the late 1980s, Halsey speculated as to the political and military contours of the post-war world and the challenge of inter-service cooperation. Second only to geopolitics and inter-service issues, Halsey addressed the question of officer development. Halsey devoted almost a full page of a six page message to the war-time implications for officer education and professional development. Reflecting on his experience of trans-oceanic war, Halsey strongly recommended the Navy cultivate the "broadly educated officer" who was capable of availing himself of expert advice when so required (the commander himself, by implication, should not be the 'expert' in any particular technology). Halsey recommended that the broadly educated officers be identified early in their careers, at least by the rank of LCDR or Major. A large share of officers not selected for eventual "joint command" should nonetheless, he asserted, be broadly educated to "inculcate in the youngsters the general understanding of the uses and limitations of all weapons and services." Halsey concluded: "By these means we may hope to build a more broad-minded group of young Americans from which commissioned personnel will be selected…..and after a period of years under close observation they would be further sifted to find those best qualified for the final training or grooming for joint or combined command and staff duties.” [83]

Halsey’s chief of staff, Robert Carney, a later CNO, and almost a generation younger than his four star admiral, most likely participated in the formulation of these recommendations. Carney’s participation thus lends a multi-generational endorsement to the document and its findings. Carney’s participation is further evidence that the war lessons were forward-looking rather than a type of thinking resident in only the older generation. Furthermore, Halsey’s message was apparently welcomed by senior leaders in Pearl Harbor and Washington. The CNO later in 1945 redistributed Halsey's message to the most influential and highly placed officers and civilians in the navy hierarchy, thereby acknowledging, it would seem, at least some agreement with its conclusions and recommendations. In short, this text offers compelling evidence that those officers commanding the most technologically and operationally complex organizations in the Navy interpreted their experience to validate the model of the 'general line officer'. Wars of the future were not to be fought by specialists in command. Rather, what was needed was a ‘line' officer broadly educated in all the facets of war and its machines, capable ultimately of leading a joint force of ground, air, and sea forces.

Holloway Plan, November 1945

Within days of the cessation of hostilities, the new Secretary of the Navy, James Forrestal, directed the Navy to further study the education and procurement of officers in

[83] William F. Halsey, Admiral, USN,"Future National Policy for the composition, command, training, and maintenance of the US Armed Forces (formerly TS), memo to ADM J. O. Richardson USN (ret), 10 Dec 1944", NARA RG 428-370-43-01, 2-3, box 4 (filed in Secretary of the Navy Sullivan personal papers).

the post-war period. The Navy convened a board that included relatively young officers and academic professionals: five captains, two commanders, the presidents of a liberal arts college and a technical school, and chaired by RADM James L. Holloway, Jr., a future Chief of BUPERS, four star admiral, and father of a future CNO. This analysis of war-time lessons as applied to officer education and professional development became known as the Holloway Plan. The Holloway Plan, like Halsey's and Pye's, recommended the development of a balanced and broad-minded 'line' officer corps. [84]

This highly influential report consisted of three parts: (1) the undergraduate education of midshipmen; (2) educational recommendations for integrating a significant number of reserve officers into the post-war Navy; (3) longer range plans for naval officer career patterns. While the Pye Board had rejected the continuation of non-Naval Academy undergraduate education, the Holloway Board did indeed make permanent a large NROTC component of the officer corps, though it would be the better part of a generation before NROTC officers would promote to command at the highest levels in the Navy.[85]

For both reserve and regular officers, the Holloway Board recommended less specialized, and more broad education at the undergraduate level, with more specialized training to follow commissioning (section 1, pg. 3). Most urgently, the Holloway Board

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[84] The Holloway Plan emphasized breadth and education, and the author later admitted the inspiration was the King Knox Pye Plan of 1919-1920. See James L Holloway, JR.. ADM USN (ret) "A Gentleman's Agreement," *US Naval Institute Proceedings*, 106, no. 9, September 1980, 75. The few copies of the report that remain are preserved in the general collections at USNA and the Naval Historical Center. See James L. Holloway, Jr., RADM USN,"Holloway Board on Naval Training, 29 September 1945", Naval Historical Center and USNA General Collection, V411.H65 1945.

[85] Alfred Pride, Admiral, USN would be the first NROTC officer to rise to four stars. He was an aviation pioneer in the First World War. It would be many years before other NROTC graduates would rise to the top, and not until 1994 would a non-academy graduate become Chief of Naval Operations.

pushed successfully for the reinstatement of the General Line Course at NPGS (section 3, pg. 4). The explicit goal was to broaden reserve and Naval Academy officers who had served in specialized assignments: "First in importance is establishment of a temporary General Line School (Course) to care for the pressing need to broaden the professional knowledge of the large number of transferred reserve and temporary officers and of Naval Academy graduates who, during the past four years, have served in specialized assignments." (section 2, pg. 2). But it is important to note that this General Line School was slightly different from that of the 1930s--though both sought to broaden naval officers for increased responsibility. This post-war version was intended to integrate and broaden a mass of specialized officers. In addition, it was intended that at least 30% of the GLS/GLC graduates would be further broadened by attending a senior 'branch school' of the Army or USMC (section 3, pg. 2). The major function of graduate education of 'line' officers was to broaden and gain knowledge in the weapons and operations of war and to develop a "common experience" which should be made available or required of all officers, both reserve and Naval Academy. The timing of education was also important and mirrored almost exactly that of King's plan almost a generation before: "Make assignments in numbers that will assure graduation from the General Line Course of all officers by the time they have completed seven years of commissioned service."[86]

The plan recognized the need to increase the number of specialist officers but recommended that the specialists (EDO and staff corps) be educated at specialized, civilian universities, *not* at the Navy's graduate school. The Holloway Plan argued for

[86] James L. Holloway, Jr., RADM USN,"Holloway Board on Naval Training, 29 September 1945", Naval Historical Center and USNA General Collection, V411.H65 1945, Part II, pg. 3.

the maximum use "...of facilities of civilian colleges for graduate education of specialist officers." But, perhaps most importantly, the Holloway Plan expressed great concern about the dangers of too closely mixing the specialists and the 'line'. The board explained that "… combination of the academic function of the schools for line and specialists officers is unwise…" and recommended that EDO and staff corps education remain separate from that of the General Line School. [87]

The Holloway Board's exhortation to maintain specialist education and line education separate remains unexplained in the 1945 report. However, in a later amplification of the Holloway Plan, the admiral himself revealed the reason: his goal, above all, was integration and synthesis in the 'line', and specialist education was, by nature, deleterious to the attainment of such a goal. Writing in 1947 in the Naval Institute *Proceedings*, Holloway stressed repeatedly the essential importance of integration and synthesis, and the institutions that would facilitate such goals. In discussion of the Naval Post Graduate School, Holloway states: "I regard its fundamental cornerstone to be the General Line School for all officers, regardless of sources, upon the completion of their fifth to eighth year of commissioned service." Graduate school and the GLC course were considered essential because it "...plays an important part in the over-all integration of officers from all sources." [88]

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[87] Ibid., quotes follow in succession, Part III, pp 3-4, paragraphs 13c, 9, 15h.
[88] James L. Holloway, Jr. RADM, USN "The Holloway Plan: A summary View and Commentary," *US Naval Institute Proceedings,* 73, no. 11, November 1947, 1297. Though the concerns with NROTC integration were of significant importance in this period, Holloway was concerned with the threat of fragmentation and over-specialization among the regular officers. This concern is evident in his statements he made while serving as Superintendent of USNA. He reiterated the need for general education as opposed to specialized education.

While his most immediate concern was the better integration of war reservists into the 'line', his desire for integrated education for command is unmistakable. The goal for overall naval education was not specialization but "Ultimate Synthesis", which he defined as: "Professional competence, particularly in the role of command and in association with operations, is a sine qua non in the Line officer. It is of paramount importance in the senior officer operating at policy level and exercising high command involving naval and military statesmanship and important administration." He went on: "From the springboard of professional knowledge and ability, our officers , particularly upon and after attaining command rank, must operate effectively in manifold areas in addition to the technical, tactical, or operational. To mention a few, there are personnel research, public relations, foreign commissions, legislative and congressional liaison, ...planning at high level involving historical, political, sociological, and economic perceptiveness of the highest order. All these are things to which a diverse intellectual input in to the Line of the Navy should contribute, though creation of a synthesis of thinking, expression, and experience which will serve to improve the capacity of the corps of officers as a whole. The Navy's extensive educational plan for officers is intended to combine and further develop professional competence, practical experience, and a capacity for original thought in attaining the over-all professional synthesis."[89] Holloway was calling for the continuation of the inter-war model, to sustain a policy of integrative officer development, an updated version of the 'general line officer'.

[89] Ibid., 1303.

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Post War Educational and Assignment Changes: Creating More Integrators

The Holloway Plan became a guiding document for the Navy, and numerous recommendations of the plan were adopted and remained in place decades later. The plan— in large part a restatement of the King Plan of 1919, modified for the inclusion of NROTC officers and joint education—was endorsed by the most senior officers in the Navy and was then widely communicated across the naval profession.[90] Holloway published the outlines of the plan in a major article in the US Naval Institute *Proceedings*.[91] Many of the board conclusions and recommendations were ultimately codified in the educational and professional development sections of the official BUPERS Manual of 1948 and later.[92]

The Holloway Plan was featured in Ageton's *Naval Officers Guide*. Ageton, an astute observer of naval officer policy, made a point not to clutter his books with more than the absolute minimum of BUPERS studies or official references. The Holloway Plan

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[90] The USNI text was preceded by an endorsement from Admiral Nimitz, 15 Sept 1947: "...I hope that it will be read by all naval personnel, and that it will be reprinted by newspapers and other media for the general information of the public as well." C.W. Nimitz, FADM, USN. Holloway credits the King plan as his inspiration. James L Holloway, JR. ADM USN (ret) "A Gentleman's Agreement," *US Naval Institute Proceedings*, 106, no. 9, September 1980, 75.

[91] James L. Holloway, Jr. RADM, USN "The Holloway Plan: A summary View and Commentary," *US Naval Institute Proceedings*, 73, no. 11, November 1947.

[92] United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002). Authoritative documents (in particular, the 1948 BUPERS Manual) and widely disseminated guides (Naval Officers Guide) refer to NROTC officers as "Holloway Plan Appointees." See Arthur Ainsley Ageton, RADM, USN (Ret), *The Naval Officer's Guide*, 4th ed. (New York: McGraw-Hill Book Company, 1951), 479.

was featured in all editions of Ageton's book from the 1940s until the early 1970s when, as will be discussed, an alternative model of officer development replaced it.

The *Naval Officer's Guide* from 1946 to 1970 depicted a line officer who was progressively educated, first in his line specialty, and then more broadly as he matured. In explaining the Holloway Plan, Ageton discussed the role of the General Line Course as a means to broaden officers who had transitioned from reserve to regular status. Ageton included in the text several graphs that communicated the importance of integration and synthesis in an officer's career. The commonality between officers was such that surface, aviation, and submarine trained officers shared a common educational sequence. All 'line' officers were expected to follow the same general educational progression, which included attendance at the General Line Course, post graduate school and war colleges.[93] Ageton went on to describe the values and goals of this 'navy university': "In the course of his career, every naval officer should continuously read and study to further his understanding of strategy, logistics, and naval, air, and land tactics and their application in the field of joint operations. …..He must be equipped to interpret correctly and without bias the lessons of the past in the light of new development and trends in the techniques of present and future warfare."[94]

Career guidance documents that carried the authority of the Navy and Defense department also conveyed the idea of the 'line' officer as broadly educated. The Bureau of Personnel Manual of 1948 stated in clear language the importance that all officers be educated to understand strategy, policy and joint-service operations:

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[93] Arthur Ainsley Ageton, RADM, USN (Ret), *The Naval Officer's Guide*, 4th ed. (New York: McGraw-Hill Book Company, 1951), 212.
[94] Ibid. , 213.

> "A thorough knowledge of our nation's policies and the correct conception of the strategy necessary to secure our national success are essential parts of the mental equipment for higher command. Every experienced naval officer should possess, as a necessary component of his technical knowledge, a thorough grounding in the principles and methods of naval strategy and tactics and of joint operations with other branches of the armed forces. Every commissioned officer should have sufficient knowledge to interpret correctly strategic dispositions, and the tactical decisions of our leaders. Education for supplying such knowledge and for the development of doctrine and good military character is necessary throughout our naval service."[95]

Navy policy was followed by navy action. Officer curriculum and programs were changed to match Holloway's recommendations. Colleges that offered permanent NROTC programs were expanded substantially from 27 in 1942 to a total of 52 with passage of Public Law 729 in 1946. This doubling of source colleges and the variation in curriculum available to prospective officers further worked to broaden the input to the officer corps.[96]

Undergraduate Policy: A Broad Foundation

The Naval Academy emerged from the war with a general education program that incorporated new course work in joint service cooperation and the study of new technologies, especially aviation. The Naval Academy leadership anticipated the end of hostilities and in 1944 began earnest preparations to a reinstate the four year curriculum. Explicit in their planning was the belief that Annapolis must provide a 'broad' and

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[95] Navy Department Bureau of Navigation/Personnel,"BUPERS/BUNAV Manual", Naval Historical Center, general collections, call number VA 52.A65 see 1948 edition, pg. D-1402. The wording is almost identical to the prewar editions, thus confirming that the lessons of the war were to vindicate much of the pre-war officer education and development policies. However, there is one wording change worthy of note: the addition of the reference to "joint operations" and the manner in which strategic knowledge was categorized, as a "necessary component of his (an officer's) technical knowledge." Thus, the Navy, in this important policy document and manual that was carried aboard every ship and station, continued to affirm the essentials of the well rounded officer. At the same time, the manual considered it necessary to couch strategic knowledge as part of an officer's "technical knowledge".

[96] Arthur Ainsley Ageton, RADM, USN (Ret), *The Naval Officer's Guide*, 4th ed. (New York: McGraw-Hill Book Company, 1951), 186.

‘general’ education: “The Naval Academy is but one link in the chain of naval education. It cannot produce a finished naval officer. It can only cover the fundamental, which must be expanded and enriched by experience and further study throughout an officer’s career.” The report went on: “The Naval Academy has no obligation, nor even the right, to educate individuals for other purpose. It is an institution for the fundamental education of naval officers.” The education of midshipmen to be specialists was strictly excluded from the vision of the undergraduate program, as the report concluded that “…*the education of specialists is a function of other branches of the naval educational system.*” The committee concluded that the objective of Annapolis was to “ …to give a broad , but functional, basic and professional education on which the graduate may found his further study and training as a naval officer…” Finally, the review explicitly endorsed, by name, the continued validity and authority of the King plan of officer development as conceived in 1919.[97]

Like King in the 1920s, Navy leaders in the 1950s continued to be wary of the tendency of specialization to creep into 'line' officer education. The Naval Academy Superintendent wrote in a curriculum review: “The emphasis remains one of judicious balance between the social-humanities, scientific-engineering, and the military-professional areas within the four year undergrad pattern. Specialization which would detract from the central purpose of a thoroughly integrated program of fundamental education and basic professional training has been carefully avoided.” He went on: “The

[97] Academic Board Special Committee,"Post-War Curriculum Report ", RG 405 USNA Special Collections, Curriculum Reviews 1944-1956, 1-2.

curriculum has long-range implications…to career considerations. It takes into account the broad development of the individual…"[98]

In the post-war period, the Naval Academy broadened the educational program with the inclusion of additional course work in the humanities and social sciences, to include the study of economics, 'elements of national power', psychology (course hours were doubled) and a course in public speaking.[99] Reflective of the educational shift toward greater integration was the addition of inter-service (Joint) training programs. "Jointness" was affirmed both in the curriculum and the activities of midshipman. The Navy and the Army instituted an ambitious exchange program between the midshipmen and cadets at West Point and Annapolis.[100] Midshipman professional education became even more integrated with the creation of a two week joint amphibious training known as "CAMID", for Cadet-Midshipman, which began in the summer of 1946 and apparently continued into the early 1950s. [101]

In this period the Navy devoted additional resources to aviation education and training. Secretary Forrestal handpicked the first post-war superintendent, aviator and former DCNO for aviation, RADM Aubrey Fitch, and charged him with expanding the academy's aviation program. Fitch in turn selected Captain Stuart Ingersoll as

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[98] James L. Holloway, Jr. RADM, USN "Forward to Curriculum Review of 1947, by the Superintendent of the US Naval Academy ", NARA RG 405, USNA Special Collections, Nimitz Library, Curriculum Reviews 1944-1956, pg 1.

[99] Ibid., 1.

[100] Arthur Ainsley Ageton, RADM, USN (Ret), *The Naval Officer's Guide*, 4th ed. (New York: McGraw-Hill Book Company, 1951), 181. See Ageton for discussion of inter-service cooperation. See also Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004); John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979).

[101] The concept of "CAMID" apparently first appeared in the Annual Report of the Superintendent, United States Military Academy, in 30 June 1946, pg. 22. See Lovell discussion, pg. 46.

commandant and ensured the next two commandants were also aviators. Fitch established a Department of Aviation in academic year 1945-46, but this independent 'platform' department lasted only a decade. By the later 1950s, aviation and aero-science courses became once again subordinate components of the engineering department and summer training program.[102] Though the academic component of aviation may have faded, aviators remained firmly engaged in the recruitment of midshipman to their program. Over the next thirty years, an aviator filled 12 of the next 15 commandant billets from 1947-1977 and worked assiduously to 'spread the word' about aviation. [103]

Aviators also debated the future of NROTC. Some reservist aviators wanted to continue the abbreviated V12/ V5 program adapted for peace-time. However, within a few years the aviators apparently recognized the benefits of a broadening experience at a four year college and adopted the NROTC approach to officer education. [104] In summary, in the post-war years aviators voted to support a broad-based officer program for the 'well rounded officer'. But the undergraduate commissioning programs

[102] Jack Sweetman, *The U. S. Naval Academy: an Illustrated History* (Annapolis, Md.: Naval Institute Press, 1979), 202-203. Plans were also made to establish a naval air station in the Annapolis area, but the station was never built. Without the airfield, possibilities for an expanded aviation program were limited. The expansion program was terminated in 1960. Aero-science courses reverted to the Engineering Department and practical training was restricted to the summer months.

[103] John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 47. Lovell notes that aviators very much wanted to spread aviation knowledge across the ranks and different communities of the navy. In contrast, as will be discussed in later chapters, nuclear engineers were generally hesitant to teach nuclear engineering or courses on reactor construction/operation at the Naval Academy. While this may have been due to classification issues, it seems plausible that this hesitancy to communicate more about the technology was a reflection of an emerging specialist mindset: nuclear issues were for nuclear specialists, to be taught and discussed only in nuclear schools.

[104] James G. Schneider, *The Navy V-12 Program: Leadership for a Lifetime* (Boston: Houghton Mifflin, 1987), 307. In the post-war austerity, Congress sent home a large percentage of reservist officers. Though aviation would for the foreseeable future remain the largest community of officers, as V5/V12 transitioned into NROTC, the number of reservists fell. The number of NROTC students rapidly declined to 24,000k, then to 14,000, and slowly drifted lower to a figure approximately double that of USNA. See also John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), appendix on personnel figures.

constituted but one phase in a 'line' officers educational development. For a more complete picture of how the war affected officer development, it is important to examine changes at the graduate school and war colleges.

Post-War Graduate Education and Senior War Colleges: More Joint

Consistent with the Pye and Holloway Plan recommendations, the Navy elevated the status of the Naval Post Graduate School in the immediate post-war period. The school expanded and moved from Annapolis to its own campus on the West Coast in Monterey, California. Perhaps the most knowledgeable scholar of the Navy Post Graduate School, Alexander Rilling, captured the significance of the post-war deliberations and policy actions: "It was apparent that formal education, in all of its existing forms, had become an integral and accepted part of the professional development of naval officers. The comments of all the study groups, and the fact that so many were formed were indicative of such acceptance." [105] The numbers and types of technical and specialized degrees also began to grow in parallel with the expanded graduate school. From a school dedicated to a single bureau in 1909 (steam engineering), the graduate school was soon to embrace a multitude of specialties and fields. The tension between integration and specialization loomed yet larger, but the 'line' voted once again in favor of integration.

The integrative and broadening function of graduate school was reaffirmed with the reestablishment and expansion of the General Line Course, an explicit requirement of

[105] Alexander Wolfgang Rilling, "The First Fifty Years of Graduate Education in the United States Navy, 1909-1959" (Thesis - University of Southern California, 1972), 179.

the Holloway Plan.[106] As discussed previously, the goal of the GLC was to broaden both reserve and USNA officers who otherwise had held specialized billets during the war. The graduate school continued King's practice of educating some ‘line’ officers with a degree in a ‘subspecialty’ outside their main field. In response to the proliferation of specialties in the post-war period, the graduate school increased its course offerings for EDOs and staff officers. The increased production of specialists in the EDO and staff corps was not, however, indicative of specialization creeping into the line. On the contrary, the increased specialist education (which Holloway wanted to be kept separate from the 'line') was to free more 'line' officers to pursue broadening education. It may have been that Holloway and his war-tested generation were coming to learn the lesson that CDR Chantry warned of in the 1920s: the 'line' officer was being spread too thin when he was required to develop both a technical sub-specialty and remain an expert operator and tactician.[107]

In the years immediately after the end of the war, the Navy moved decisively to reassert the importance of the Naval War College (NWC). The Navy's commitment to the continued importance of the NWC is evidenced in the fact that one of the Navy's most successful officers, a hero of the war in the Pacific, Admiral Raymond Spruance, became the first post-war president. Upon taking command, Spruance immediately faced the question of balance between specialization and integration: where to locate the curriculum on a spectrum demarcated by the technical specialists, on one end, and the

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[106] James L. Holloway, Jr., RADM USN,"Holloway Board on Naval Training, 29 September 1945", Naval Historical Center and USNA General Collection, V411.H65 1945. See section two of the report for discussion of the General Line Course.

[107] A.J. Chantry, CDR (CC) USN,"Ltr from CDR Chantry, Chair of Department of Mathematics, to Superintendent of the Naval Academy, dtd 11 August 1924, Subject: The Place of the Naval Academy in the Education of the US Naval Officer", NARA RG 405, Record of Superintendent, General Correspondence, Curriculum Studies, 1924-39, box 1, folder 1. See chapter two, section on "New Foundation".

advocates of joint integration on the other. [108] The ends of the spectrum, always distant, had grown farther apart with the development of the advanced technologies of war and the increased importance of 'joint' command.

Under Spruance, the war college worked to be inclusive of all warfare officers and specialists in the navy and also embraced inter-service education. [109] Not fully appreciated in later years is that the Navy was a leader in joint education in immediate post-war period. Though it would constitute a competitor to the NWC in some sense, the Navy supported the establishment of the National War College.[110] Within months of the end of hostilities, naval officers would in large numbers attend the National War College and the Industrial College of the Armed Forces (ICAF). Navy leaders reflected on their war experience and believed that 'line' officers should receive further integrative education, to include joint education. The typically parochial General Board of the Navy not only endorsed the National War College but in a 27 July 1949 memo to Secretary of the Navy recommended an expansion of joint education and that the service "…keep naval quotas filled with carefully selected personnel."[111] Navy policy and action implemented the recommendations of the post-war reports and studies. At least half of each promotion year group was expected to attend one of the war colleges.[112]

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[108]John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 179.
[109] Ibid., 184.
[110] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 130-134.
[111] General Board,"Ltr to Secretary Navy, 27 July 1949, Subject: Unification ", NARA RG 428-370-43-01-1 Box 4, SECNAV Sullivan papers.
[112] Navy policy was to assign approximately 47% of each promotion group to war college: 29% to NWC, 9% to National, and 9% to ICAF. For more detailed discussion of the ceilings and quotas, see Hattendorf, 1984, 201.

Post War Assignment and Promotion Policies

In addition to the study of officer educational programs, the Navy also examined the possibility that officer assignment patterns might require adjustment in the post-war period. Again, the Holloway Plan findings were particularly important. The Holloway Plan emphasized that officer assignments in the fleet were more than ‘work’. Officer assignments were considered critical to the professional development of an officer. The Holloway Board studied the practice of frequent assignment rotations and variation in billets and recommended the continuation of such a practice in the post-war period: "The opportunity for individual growth by experience in varied assignments is essential.” Holloway concluded that war experience showed that short assignments were ideal for purposes of officer development: “War experience has demonstrated that an officer can reach high performance on one assignment in about a year. While high ship efficiency can be attained when officers remain in billets for long periods, such assignments do not prepare an officer for wide responsibility. Professional development of officers is more important than excelling in ship competition." The board recommended tours of modest length in a variety of assignments, a combination that would broaden the officer. The board put its credibility behind such a conclusion and bluntly recommended: "Make short assignments to specific billets at sea a matter of Navy Educational Policy."[113] As will be discussed in later chapters, a differing opinion of the value of officer assignment rotation would prove to be one of the major points of contention between the King model and the Rickover model of technical specialization.

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[113] James L. Holloway, Jr., RADM USN,"Holloway Board on Naval Training, 29 September 1945", Naval Historical Center and USNA General Collection, V411.H65 1945 Part III, page 3.

While the Navy endorsed Holloway's plan to use assignments to broaden the 'line' officer, in some cases, in particular with carrier command, the post-war period saw a narrowing of experience. The practice of allowing surface officers to qualify as Aviation Observers, a qualification that allowed them to compete for command of carriers or carrier battle groups, had been terminated after the war. A large inventory of aviation experienced officers, almost all of whom had served on surface ships, made it less important for older surface officers to gain their wings.[114]

Aviators did not seek to make aviation operations an insular specialty. In this period all regular officers who aspired to become aviators had first to serve for two years on a surface ship. Aviator admirals also took steps to make aviation tactical knowledge accessible to all 'line' officers. The expanded aviation curricula at the academy and service schools attest to the desire of aviators to educate the non-aviators. Most telling was the fact that senior aviators continued to endorse the ideal of the integrative or well-rounded officer as the reigning model for the navy commander. The first aviator to rise to be the Chief of Personnel, VADM Thomas Sprague, on 30 March 1948, tasked one of his study committees to examine career structures that would ensure "…duty assignments

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[114] The assignment to command a carrier or group of ships that included an aircraft carrier was restricted to aviators, as it had been since 1921. However, in contrast to the 1920s there were now additional administrative barriers to preclude a reprise of Halsey/King pattern: surface officers were generally prevented from earning their wings. The effect of this policy was to ensure only aviation admirals commanded aviation battle groups. This restriction on battlegroup command would remain in effect until 30 years later when the son of the author of the Holloway Plan, the CNO Admiral James Holloway, III, USN, secured legislation that allowed surface admirals to command carrier battlegroups. For a discussion of this assignment policy, which he considered one of his most important actions, see James L. Holloway, III, ADM USN (CNO), *Aircraft Carriers at War: A Personal Retrospective of Korea, Vietnam, and the Soviet Confrontation* (Annapolis: US Naval Institute 2006).

which constitute a rounded career."[115] The first aviator CNO addressed the issue of balance between specialization and breadth and observed that the goal for which young officers should strive should be that of the "…all around highly competent combat officer…"[116]

In addition to officer studies and CNO endorsements, there remained yet another revalidation of Kings' model of officer development: the resumption of inter-war promotion examinations.[117] The return of the promotion examination communicated to junior and mid-grade officers that there existed a common body of professional knowledge which a naval officer should aspire to master. The promotion examinations further served to encourage the study of general tactics and operations. Like before, the exams also provided 'line' officers an incentive to attend the junior course at the War College.

The exam was almost identical to the pre-war exams and tested in the subjects of military law, international relations, strategy, tactics, and intelligence. Indicative of the

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[115] Thomas. L. Sprague, VADM USN,"Ltr from VADM T. L. Sprague, Chief of Naval Personnel, to RADM C.C. Hartman, dtd 30 mar 1948", NARA RG 24 -470-54-25-6 Box 6, Cover letter to Hartman Report.

[116] Department of Defense United States *Armed Forces Officer*, 1st ed. (Washington, D.C.: Government Printing Office, 1950), 39.

[117] The proceedings of Navy promotion boards have been for generations shrouded in secrecy, and very little has been written or recorded of its dynamics. The promotion examinations, however, are more widely discussed. Discussions of these exams can be found in numerous biographies. An especially colorful description of a pre-WWI exam is provided by Ernest King in his autobiography (1953). Descriptions of the examination subjects and examination logistics can also be found in BUNAV and BUPERS manuals, as well as in Ageton's Naval Officer's Guide. Information on the post-WWII period is more sketchy, but it is clear from BUPERS Manual and Ageton (1951, pg. 481) that they did resume. Several living flag officers also provided insight into the post-WWII practice of the examinations, to include VADM Lando Zech, Admiral James Holloway, and VADM Edward Waller. Piecing together their recollections, the exams appear to have been resumed on a wide scale following the war but were terminated by the later 1950s or early 1960s.

increased stature of aviation, there was added a section of "…aviation tactical, operational, and strategic aspects."[118] The inclusion of aviation as a subject for ALL officers is further evidence of the continuing importance of the generalist conception of 'line' officer. In guidance to promotion boards, general combat and overseas experience was valued over technical duty, at least in the 'line'. Evidence of this operational bias is found in a temporary provision in the promotion guidelines of 1945: only officers who had served *at sea* for at least two years in their current grade or have served *over seas* were eligible for promotion. By such a provision, officers who had remained in the United States, many of whom would have been in technical assignments, were culled from the pool of eligible 'line' candidates for promotion.

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Officer Development in the Shadow of the Bomb: Hartman Report of 1948

The expansion of the officer corps in Second World War and the rise to dominance of naval aviation produced a 'line' more broad and rounded than ever before. The concept of the well-rounded line officer survived intact and was even extended, evidenced by the broader qualifications of naval aviators on both ships and aircraft and the Navy's embrace of joint training and education. The 1944 and 1945 studies of the officer corps had validated the primacy of operational knowledge, not narrow technical specialization. Most importantly, the post-war studies had made an explicit judgment based on the lessons of combat: the well-rounded, generalist officer was revalidated as

[118] Navy Department Bureau of Navigation/Personnel,"BUPERS/BUNAV Manual", Naval Historical Center, general collections, call number VA 52.A65 see 1948. See also Ageton, 1951, 481.

the model for command. But an alternative model was beginning to emerge in the U.S. Army and the U.S. Air Force.

Naval officers, to include Ernest King, had long recognized the tendency of Army aviators to focus more on their machine than on their function within a larger organization.[119] The creation of the Air Force in 1947 posed two threats to the Navy. First, the Air Force might serve as a model for naval aviators and help precipitate the fragmentation of the Navy, a real concern in the late 1940s.[120] The second, more subtle threat was the possibility that the Air Force example would encourage greater specialization in the 'line'. It was feared naval aviators would begin to identify more with their platform, a shift in loyalties that would come at the expense of the larger Navy. The Navy studied the problem and devised concrete steps to counter the fragmentary effects of technological innovation. The Navy's post-war thinking on this subject was collected in a remarkable study completed at the direction of VADM Thomas Sprague, Chief of the Bureau of Personnel in 1948. The board chairman was RADM C. C. Hartman and the report typically referred to as the Hartman Report.[121]

The apparent instigator of the Hartman Report was VADM Thomas L. Sprague, a highly decorated aviator veteran. The actual report was produced by several officers, some of which were war veterans from varied technological groupings, to include a

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[119] Ernest Joseph King and Walter Muir Whitehill, *Fleet Admiral King: a Naval Record* (London: Eyre & Spottiswoode, 1953). See King's discussion of war-time conferences with the Army concerning joint operations. The issue of machine identification was a continuing theme, carrying over from the interwar period. King explains that Army Air Corps organized around the weapon, while the Navy focused around the function, a focus which was, in King's opinion, led to a more integrated view of warfare.
[120] Jeffrey G. Barlow, *Revolt of the Admirals: The Fight for Naval Aviation, 1945-1950* (Washington, D.C.: Naval Historical Center, 1994), 190, for discussion of Secretary of the Navy Sullivan assessment of the Air Force threat.
[121] C. C. Hartman, RADM, USN, Bureau of Personnel,"Report of the Board to Study and Recommend a Program of Education and Training of Line Officers to Best Fit Them for High Command, dtd 8 April 1948", NARA, RG 24-470-54-25-6, Box 6.

future four-star admiral and father of the US Senator, John S. McCain, Jr. These officers—CDR McCain and five captains—appear to have been chosen for their youth, and it is likely that none of them were much beyond the rank of lieutenant when the fleet buildup for war began in 1936. The Hartman report examined formal education, training assignments, and "duty assignments which constitute a rounded career." In designing the parameters of the study, the Navy leadership engaged squarely the threat posed by technologically-induced specialization. Sprague explicitly tasked the board to consider the following question: "…what training and education outside the specialty field are necessary at various stages of a career to insure that the specialty does not constitute a handicap to high command qualification."[122] The report acknowledged the tendency of social groups to organize and attempt to rise to dominance through their association with new technologies. As recorder, it was mostly likely CDR McCain who wrote:

> "This is not a new problem. The basic cause rests in the fact that new weapons either produce or tend to produce dominant groups of officers. During the 19th century the advent of steam engineering and the iron clad brought their troubles. At the turn of the century the torpedo boat threatened the battle line. From 1920 to 1940 the gun club was predominant. Now it is aviation and to a lesser extent submarines, and in the future it will be guided missiles, atomic energy or whatever else science introduces as a new weapon. The importance of each new weapon, if only because it is new, gives prestige to the officers skilled in its use that acts as an incentive for that group to seek special privilege, authority and autonomy. This is natural and normal. Therefore, it becomes incumbent that the Navy establish a training and educational system which constantly emphasizes the importance of high command relative to any specialty. Further, this system must insure an opportunity for the specialists to expand his knowledge of the naval profession as a whole as well as an opportunity for non-specialists to acquire

[122] Thomas. L. Sprague, VADM USN,"Ltr from VADM T. L. Sprague, Chief of Naval Personnel, to RADM C.C. Hartman, dtd 30 mar 1948", NARA RG 24 -470-54-25-6 Box 6, Cover letter to Hartman Report.

> knowledge of the new weapon this should obviate the contortions the Navy now experiences each time it absorbs a new weapon." [123]

Written three years after the dawning of the nuclear age, it is remarkable that the report essentially revalidated the King system, which was by this time thirty years old. The Hartman Report exhorted officers to seek a balanced career, distinct from a specialty: "This training and education must be such that as an officer advances in rank, he concentrates less on the specialized duties of the junior grades and more on the broad administrative and executive responsibilities of high command. In other words, his identification with any particular specialty or branch becomes less marked as he moves on in his career." [124] To effect such a goal, VADM Sprague recommended the continuation of the integrative education sequence outlined first by the King plan of 1919, reaffirmed by the Pye Report of 1944 and the Holloway Board of 1945.[125]

The authors recognized and were concerned about the increasingly powerful draw exerted by socio-technology communities associated with platforms. To counter the power of socio-technological communities, the board further recommended that officers in their later years come under the control of a technology-independent Career Planning Board. The Career Planning Board would be independent of platform community influence and would direct officers to broadening education and career assignments. This Career Planning Board would take control of officer assignments after the 18 year point. This board would have responsibility to assign officers for the benefits

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[123] C. C. Hartman, RADM, USN, Bureau of Personnel,"Report of the Board to Study and Recommend a Program of Education and Training of Line Officers to Best Fit Them for High Command, dtd 8 April 1948", NARA, RG 24-470-54-25-6, Box 6 text from chart #5.
[124] Ibid., text from chart #5.
[125] Ibid., supplementary part II, 1.

of the larger service, rather than allow specialized personnel officers to control officer assignments.[126]

The Hartman Board appreciated that any independent body could come under the influence of associations of officers, associations which by this time had come to form almost exclusively around technological systems. To preclude the creeping identification of board members with parochial interests, "…the membership of this board shall be so rotated that the periods of duty for the members are staggered. This provision is to obviate the possibility of one group of officers by continuous association over a long period subconsciously imposing their specific determinations on the naval service." [127] The desire to counteract the tendency of persons to identify with a group, and a technology, were direct echoes of the concerns voiced by officers in 1916 when the Navy reformed the promotion system. Officers feared in 1916 and in 1948 that 'promotion by selection' had a tendency to create factions in the service. The overall benefits of the merit system were doubted by at least some officers as late as 1944. William Pye raised the question as to whether the practice of 'promotion by selection' should continue in the post-war period. [128] The officers who developed the policy recommendations of 1948 realized the tendency of the 1916 Promotion Act to encourage resurgent 'technicism', or technocentrism, and sought to counterbalance this effect.

This board was remarkable for an additional reason: it was more vociferous in its advocacy of the generalist (integrative) and rounded officer than even the King plan a

[126] Ibid., 5.
[127] C. C. RADM USN Hartman,"Report of the Board to Study and Recommend A Program of Education and Training of Line Officers to Best Fit Them for High Command", NARA RG 24 -470-54-25-6 Box 6, page 5.
[128] BUPERS-PERS122,"Digest of Pye Report of July 1944", NARA RG 24-470-54-25-6 Box 6.

generation before. Specifically, the 1948 board recommended that attendance at the General Line Course, a course first conceptualized by King in 1920, was to be *mandatory*. To make such an educational course compulsory was unprecedented. The board was convinced that common educational experience would help develop an integrated rather than a specialized view of the ‘line’ and would break down barriers between socio-technological officer communities. The Board acknowledged that in 1948 the navy officer corps was still recovering from the disruption of war, and the GLC was currently fully subscribed as it absorbed many junior officers who had been narrowly specialized. But once the Navy had readjusted, then "... by 1954 all line officers, regardless of course of entry will receive the Line school course...." [129] This plan for compulsory integrative education was not just one of many recommendations that remained ‘on the shelf’ but might never be communicated to the fleet. On the contrary, the plan for compulsory, integrative education was conveyed to all commissioned officers in personnel bulletins and books. Ageton’s widely read *Naval Officers Guide* stated clearly that by 1954 the Navy’s General Line Course was to be mandatory for all unrestricted line officers.[130] This aggressive advocacy for integrative and broadening education is all the more remarkable when one considers that VADM Sprague was an aviator. And Sprague was not alone among the aviators. The leading aviation admirals were also strong advocates for integration. Admirals Radford, Gerald Bogan, and Daniel Gallery, and several senior surface officers continued to propound the philosophy "...

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[129] C. C. RADM USN Hartman,"Report of the Board to Study and Recommend A Program of Education and Training of Line Officers to Best Fit Them for High Command", NARA RG 24 -470-54-25-6 Box 6 see pg 2, of supplementary annex.

[130] Arthur Ainsley Ageton, RADM, USN (Ret), *The Naval Officer's Guide*, 4th ed. (New York: McGraw-Hill Book Company, 1951). 219.

that while naval officers were trained in at least one specialty, they owed their primary duty to the Navy as a whole and that they would some day obtain command.[131]

The Hartman Report proved to be prescient in its prediction of the rise of powerful new technological social groups. The board singled out atomic energy as a potential source of parochialism. But it did not anticipate that one of these groups might actually prevent the implementation of the Board's own recommendations. But that is what happened: the Hartman plan to make integrative education mandatory in 1954 was derailed. Instead, in 1954 a new technology emerged that caused the Navy's leadership to delay its quest for further 'line' integration. In 1954 the CNO Admiral Robert Carney issued a letter that questioned the validity of a generalist model of the 'rounded' or integrative officer. The rationale he gave for questioning the validity of the generalist model was the emergence of the atomic reactor championed by Captain Hyman Rickover.

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Taking Stock: Promotion to High Command

The model of the general line officer was validated in several post-war studies. The navy's commitment to the generalist model was further evidenced in promotion statistics of the high command. At the end of the war, the 'well rounded officer' dominated the ranks of three and four star admirals. Four years later, in 1949, the share of officers who had conformed to King's system had declined, but this 'demographic dip'

[131] Paolo E. Coletta, *The United States Navy and Defense Unification, 1947-53* (Newark: University of Delaware Press, 1981), 23.

resulted from the disruption of war preparations. Despite this 'dip', more than half of all four star and three star admirals had conformed to King's recommendations to attend the Naval War College.[132]

Some may argue that the generalist admirals who commanded the Navy in the late 1940s were a product of institutional 'momentum', that they were the residue of an earlier officer development system. There is some truth in this view, as promotion to flag comes necessarily late in a career. Decisions to broaden or specialize would have been made several years before selection to flag. Therefore, to ascertain whether or not officers actually believed the rhetoric about the 'well rounded officer', something else is needed. An examination of the later careers of mid-grade officers who attended the war colleges in the years immediately after the Second World War provides that evidence. Graduating war college classes in the immediate post-war period produced a high percentage of three and four star admirals. The classes of the National War College illustrate this point. The National War College was the least specialized of the war colleges, but in the years 1947-1950, it produced almost four dozen high ranking flag officers (three and four star admirals). Such a high promotion rate indicates the Navy directed its best mid-grade officers to the joint war colleges, just as the General Board had recommended. This close association between promotion to high rank and prior war college attendance is a clear indication that both navy leaders *and* younger officers

[132] United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002) . At the end of the war, of the 13 four star admirals, 12 of 13 had attended senior course at NWC. Of the three stars, approximately 75% (or 25 of 35) vice admirals had attended a war college. This share would fall to approximately 50% by 1949.

valued broad education.[133] The integrative and generalist model of naval commander was very much alive and well in the first decade after the Second World War.

The “technical specialists” would not displace the ‘generalists’ as a result of the Second World War. The environment of war, war-time expansion, and the lessons of war all reaffirmed the basic tenets of the pre-war system of officer education and development. King's system was validated by war. The environment of the Pacific War propelled to command submariners and aviators who were not technical experts but masterful and aggressive tacticians. The massive influx of war reservists both expanded and broadened the 'line'. Annapolis emerged from the war with a more highly qualified and experienced faculty and with the validity of the general education curriculum reaffirmed. The graduate school educated more specialists for the restricted line and staff corps, but the ‘cornerstone’ of the school was an expanded General Line Course for 'line' officers. The Naval War College under Admiral Spruance reaffirmed the importance of senior-level professional education as an essential part of a 'line' officer’s preparation for command. In this same period, the most integrative and joint institution, the National War College, became a popular destination for the best ‘line’ officers from all communities, aviation, submarine, and surface.

The Navy’s commitment to breadth as opposed to specialization was not a ‘hold over’ from the old ‘surface’ officers of the pre-war generation. Rather, the new leaders of the Navy, combat aviation veterans, also endorsed the officer model of breadth and

[133] *Directory of National War College Graduates*, (Washington, D.C: The National War College Alumni Association, 2003). The classes of 1947-1950 at the National War College produced three dozen (36) graduates who would, years later, rise to three star rank. This argues strongly that the best officers were encouraged to attend the most broadening of educational institutions.

balance. The first aviator CNO Forrest Sherman endorsed integrative officer development and cautioned against specialization when he wrote in blunt sailor language that: “We are not pushed willy-nilly into specialization…”[134] The Navy as an organization continued to hold to its integrated view of warfare and of the profession.[135] The 'generalists' privileged position would not remain unchallenged, however. The confluence of a deepening Cold War and the creation of nuclear machines offered an opportunity to a visionary technocrat, Hyman Rickover, to offer a new model of the 'line'.

[134] Department of Defense, *Armed Forces Officer*, 1st ed. (Washington, D.C.: Government Printing Office, 1950), 39.

[135] Paolo E. Coletta, *The United States Navy and Defense Unification, 1947-53* (Newark: University of Delaware Press, 1981), 23. Coletta explains: "While naval doctrine contrasted sharply with army doctrine, which emphasized concentration on a military specialty, it perforce had to wait until the Air Force developed its doctrine before tri-service comparison would be made." Ultimately, Coletta observed, "...the Air Force developed its doctrine along lines followed by the Army Air Corps... (in contrast) ...the Navy's ideal thus remained to integrate the various naval forces and train commanders to direct a unified Navy..."

Chapter Four

The Reactor, Rickover, and a Technocratic Philosophy of Command: the King and Rickover Systems Co-Exist, 1948-58

"Every experienced naval officer should possess, as a necessary component of his technical knowledge, a thorough grounding in the principles and methods of naval strategy and tactics and of joint operations with other branches of the armed forces… Education for supplying such knowledge and for the development of doctrine and good military character is necessary throughout our naval service."
Bureau of Personnel Manual, 1948[1]

"The system is based on the all around officer who can be shifted from post to post and is capable of doing each routine job well…"
"The system is designed for the 'operators'... the 'idea' men (technical experts) are left out in the cold, passed over and retired..."
Captain Hyman G. Rickover, USN, 1953[2]

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Summary

At the beginning of the Cold War, the Navy's high command continued to endorse King's model of the general line officer. In the 1950s, an Engineering Duty Officer, Captain H.G. Rickover, mounted an unprecedented challenge to the King model. In place of the 'generalist', Rickover promoted an alternative vision of 'line' commander:

[1]Bureau of Personnel Navy Department,"Bureau of Personnel Manual, 1948", Naval Historical Center, general collections, call number VA 52.A65, see pg. D-1402. The 1948 wording is almost identical to the manual's prewar editions, evidence that the Second World War was interpreted to validate pre-war officer education policies. However, there is one wording change worthy of note: the addition of the reference to "joint operations" and the manner in which strategic knowledge was categorized, as a "necessary component of his (an officer's) technical knowledge." Thus, the navy, in this important policy document and manual that was carried aboard every ship and station, continued to affirm the essentials of the well rounded officer, but considered it necessary to couch strategic knowledge as part of an officer's "technical knowledge".

[2] Rickover as quoted in Clay Blair, *The Atomic Submarine and Admiral Rickover*, [1st ed. (New York,: H. Holt, 1954), 210-211. Author inserted (technical experts) to clarify meaning.

a technical elite in command. On the face of it, Rickover seemed to have offered a reprise of arguments made by Melville and the Navy's old engineering corps of the late 19th century. But on closer inspection it appears Rickover's ideas did not originate with navy engineers. Rather, Rickover borrowed his technical elitist notions from activist engineer groups in New York City, most likely from a group known at the time as the Technocracy Movement. Rickover's adopted technocratic philosophy became uniquely powerful when he married it with one of the most important naval programs of the Cold War: the nuclear powered ballistic missile submarine. Rickover fought several philosophical battles against the 'generalist' model. In the face of considerable opposition, he created a highly unique organization that became the source of the most technically elite 'line' officers ever to command an American man-of-war. Despite Rickover's successes in the 1950s, however, the Navy leadership continued to support the 'generalist' as the preferred model for all 'line' officers, *including nuclear trained officers*. As recorded in classified documents, manuals, and official statements, the Navy continued to assign and educate officers in conformance with the model of the 'well rounded' officer. By the close of the decade, Rickover did not have the political capital, or perhaps the personal conviction, to displace this traditional conception of command. His reserve in the 1950s would, however, in the next decade be replaced by the ardor of a revolutionary.

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Rickover's Ideological Roots and the 'Discipline of Technology' [3]

There is little in his public record that would indicate that Rickover would become virulently antagonistic to the ideal of the 'well rounded officer." His espousal of the technical specialist did not originate in his naval experience or at the nuclear technical school that he attended at Oak Ridge in the late 1940s. Rather, Rickover's philosophy of technology, and his belief that technical specialists should lead, were rooted deeper in his intellectual development and experience at graduate school.[4]

Rickover's early career and broadening professional experience made him a paragon or model of the 'well rounded' officer. Rickover grew up with his family in Chicago, comfortable enough that he attended school regularly though he worked after school to supplement the family income. Chicago during his childhood was one of the fastest growing and most industrial of American cities, a fact which may have shaped some of his views on technology. There is, however, no direct evidence of this effect other than the fact that Rickover worked in one of the hi-tech organizations at the time: Western Union as a telegraph delivery boy where he became expert at Morse Code.

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[3] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis, MD: Naval Institute Press, 1990), 293. This phrase, "Discipline of Technology" is the subtitle of Duncan's book. It was meant to capture Rickover's philosophy of technology. Duncan explains that Rickover held a deterministic view of technology. Rickover believed that "technology will not yield to leadership", "you can't argue with technology." Duncan went on: "The discipline of technology means that the organization must adapt to the technology, and not the technology to the organization." The clear implication was that Rickover believed human activity, organization, and development were shaped in response to technological requirements. Technological systems occupied an elevated position as a determinant of officer requirements. An officer, in Rickover's philosophy, should be an engineer and technical expert.

[4] In discussions with both his son and close confidant, it was clear that Columbia University played a pivotal role in the development of Rickover's ideas of technology and of the heightened role of engineering and the specialist. Robert Rickover, (son of Admiral Rickover), Interview with the Author, 25 September 2007. Theodore Rockwell, Interview with the Author, 25 September 2007. Dr. William Stuart, (anthropologist who helped establish Rickover's foundation, Center for Excellence in Education) Interview with the Author, 26 February 2008.

Rickover in his youth was probably exposed to popular scientific literature that was filled with speculations of new and wondrous technologies. The possibility of space travel and nuclear energy were, for example, popularized to readers by H.G. Wells around the turn of the century. Rickover perhaps knew of these science-fiction speculations in his childhood, as he was a prolific reader, perhaps even something of a bookworm. However, Rickover was no young technical wizard: his interests were in literature and history; he was an eloquent writer at an early age; and his lowest scores on the academy entrance examination were in math, not strong indicators of a young technical expert in the making.[5]

At Annapolis Rickover could not avoid a significant exposure to mathematics and was, like all midshipmen, introduced to the world of modern machines and technology. His first year at Annapolis coincided with American participation in the First World War, a conflict dominated by machine systems at sea, in the air, and on the land. His studies at Annapolis were those of every other midshipman and had come by 1918-22 to include engineering subjects, a relatively new requirement that originated with the Amalgamation Act of 1899. His training, like those of his classmates, included summer-time cruises to Europe and the Pacific.

Rickover received his commission in 1922 and went to sea where his time aboard ship was consumed for the most part by the day- to- day demands of operating and maintaining machines, leaving little time for philosophical speculations. Many of his assignments were in engineering where, most likely, he came in contact with engineers, some of whom may have been veterans of the pre-amalgamation Engineer Corps. But it

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[5] Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001). See first chapter for discussion of Rickover's early life.

does not seem that Rickover in his early career was particularly enamored with engineering or technology. Rather, he published articles in *Proceedings* on non-technical subjects, translated the leading German U-boat tactical literature into English, and completed correspondence courses from the Naval War College. Furthermore, Rickover in his career interests showed a desire to dabble, to be a 'generalist': he served on surface ships and submarines and applied twice for flight school. The last time he applied for flight school was in the month before he matriculated in the engineering program at Columbia University.

In all, Rickover spent almost a half generation as a 'line' officer. After he was rejected for command of submarines, he did win command of a small surface ship, the USS FINCH. However, his command experience is shrouded in mystery, and it appeared that he was, perhaps by temperament, not suited for command in the 'line': he was relieved after a few short weeks. [6] Not long after his apparent failure in command, he turned to technology and the career of a specialist--that of the Engineering Duty Only officer. While anger and rejection may have dominated his emotions in the first years of his career as an EDO, they do not explain the powerful and coherent philosophy of technology that seemed to guide him for the next half century. It does not appear that Rickover, almost middle-aged when he became an EDO, would have been easily shaped by the EDOs around him. Furthermore, Rickover's philosophy of command--in particular, its aggressive overtones and the challenge it posed to the 'generalist'-- was

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[6] Though some may speculate that Rickover's personal and emotionally traumatic experience with the "line" may have colored his later officer policies, I find little evidence for this conclusion, with the exception of the recollections of VADM James Calvert. Calvert, one of the first nuclear submariners and later the first nuclear trained superintendent of the US Naval Academy, asserted that, indeed, "Rickover hated the Line." According to Calvert, Rickover would frequently harass Calvert as to his lack of substantive engineering knowledge or experience. James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007.

different than that of his contemporary EDOs. In contrast to Rickover, senior EDOs who were Rickover's contemporaries typically supported the reigning King model of officer development.[7] EDOs in the 1930s-1940s typically cooperated and worked closely with the 'line' and did not challenge their command prerogatives.

Nuclear machines and physicists do not appear to have awed Rickover. Rickover's experience with nuclear scientists came relatively late in life; furthermore, he was not particularly impressed with nuclear scientists.[8] Instead, an examination of the time-line of Rickover's education and intellectual development attests to an earlier formation of his beliefs. What Rickover believed about technology and the identity of those who would command was molded years before the 'nuclear age'.

The first documented evidence that Rickover was aware of and held opinions about nuclear technology came in 1933 while Rickover served aboard a diesel submarine, thirteen years before he would report to Oak Ridge. In a letter he wrote to his wife, he expressed a surprisingly well informed opinion concerning the possibility and ramifications of a future nuclear device. Instead of praising the military benefits of such a development, he feared the abusive ends to which human masters might apply nuclear technology.[9] This mature and somewhat liberal opinion concerning the inherent dilemmas posed by complex technology indicates that he had been exposed to fairly

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[7] Albert G. Mumma, *The Reminiscences of Rear Admiral Albert G. Mumma, U.S. Navy (Retired) / interviewed by Paul Stillwell* (Annapolis: US Naval Institute, 2001), 240, 249.

[8] Theodore Rockwell, Interview with the Author, 25 September 2007. Rockwell explained that Oak Ridge was not a formative experience for Rickover. Rockwell explained: "The teachers there were more scientists than engineers. Rickover did not have a particularly high regard for scientists. And his views of technology certainly were not formed by the scientists at Oak Ridge in 1947." Rather, Rockwell speculated that Rickover was most influenced in his professional philosophy of engineering, and high regard for theory not at the Naval Academy, but at Columbia University. In discussions with both his son and close confidant, it was clear that Columbia University played a pivotal role in the development of Rickover's ideas of technology and of the heightened role of engineering and the specialist. Robert Rickover, (son of Admiral Rickover), Interview with the Author, 25 September 2007.

[9] Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 51.

advanced thinking on the subject prior to 1933. It was doubtful he discussed such matters with the enginemen of his ships. Not an engine room but rather an engineering graduate seminar seems a more likely inspiration for such ideas, and Rickover enjoyed just such an intellectual experience in the late 1920s.

Rickover attended graduate school and took his masters degree from Columbia University in New York in 1929. It was this academic setting and his Columbia professors and associates that seem to have been the most likely inspiration for Rickover's philosophy of technology. Rickover's intimate family and friends speculated that Columbia University was the institution and the experience that most shaped Rickover's intellectual development.[10] It was at Columbia where he pursued and won a Masters of Engineering and Applied Science.[11] His choice of field concentration of electrical engineering placed him on the leading edge of engineering and science. Electrical engineering was in fact one of the first of the engineering disciplines to conform to the new 'school culture' of engineering, which displaced the older 'shop' traditions discussed in chapter one.[12] Furthermore, Rickover chose to live apart from other navy students at Columbia and made it a point to immerse himself in the college

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[10] Robert Rickover, (son of Admiral Rickover), Interview with the Author, 25 September 2007. He explained that his father valued his Naval Academy experience for introducing him to knowledge of the navy profession, but the senior Rickover certainly did not see the academy curriculum as shaping his intellectual views of engineering, technology, or much else. A close associate, Theodore Rockwell, also believed Columbia to be Rickover's most important intellectual experience. Theodore Rockwell, Interview with the Author, 25 September 2007.

[11] Columbia University Archives,"Columbia University Engineering Department 1929 Graduating Class Information", Columbia University, Engineering Department Archives, New York, NY. It should be noted that in the 1920s the master's degree was a "master's in engineering and applied science" rather than the degree today known as the "master's of science in engineering."

[12] Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967). The engineering profession was itself in a period of change early in the 20th century. The electrical engineers were among the earliest of the profession to embrace science and advanced education. Rickover, by his choice of Columbia, ensured he was steeped in the new, emerging 'school' and scientific culture of engineering. If had chosen a lesser university, the effects on his philosophy and what was to follow for the navy officer corps may have been substantially different.

culture. He met there a PhD student who would later become his wife. But Rickover was doing more than studying and dating while at Columbia. He was observing the intellectual ferment surrounding the emergence of a unique philosophy of technology.

In the later 1920s, there was springing up in Columbia an activist engineering political movement that appears to have shaped and influenced Rickover. This movement called for the creation of technical elite who would command machines and ultimately command political power. A review of available biographical sources, as well as a close reading of Rickover's writings and speeches, provide strong evidence that Rickover as a young graduate student was exposed to, and took as his own, the values and attitudes of an engineering ideology associated with what has been called the Technocracy Movement.[13]

At Columbia in the late 1920s and early 1930s, the 'ideology of engineering' and its aggressive variant, the Technocracy Movement, became highly influential in New York. The Technocracy Movement for a brief period commanded attention even on a national scale. These movements were especially active and influential around the time Rickover studied in New York City. Edwin Layton, a leading historian of this subject, described the period as one of philosophical ferment where there occurred almost a metaphorical "revolt of the engineers" in a quest for political power.[14] Engineers in remarkably large numbers adhered to an "ideology of engineering". Layton describes

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[13] The Technocracy Movement was an actual movement that came into existence in the late 1920s and early 1930s, and held considerable influence on a national scale during the Great Depression. For a discussion of the movement, see Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971); W. H. G. Armytage, *The Rise of the Technocrats: a Social History* (London,: Routledge and K. Paul, 1965); Joseph Dorfman, *Thorstein Veblen and His America* (New York: Viking Press, 1934); William E. Akin, *Technocracy and the American Dream: The Technocrat Movement, 1900-1941* (Berkeley: University of California Press, 1977).
[14] Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971), 55.

the ideology as a variant of Social Darwinism wherein the man with greater scientific knowledge possessed the comparative advantage. Layton explains engineers of the time believed that "…their scientific knowledge gave them a competitive advantage that insured their eventual triumph". These activist engineers believed that "… future society would be what the engineering profession willed it to be..." and that they were the "...agent of all technical change, and hence as a vital force for human progress and enlightenment."[15] Those who were not engineers, or were not particularly well-versed in a technical specialty, were of less consequence and certainly less qualified to lead or make decisions.

It may be difficult today to appreciate the power of these technocratic ideas, but at the time, they influenced minds at the highest levels of political institutions, and were thus well positioned to influence the mind of a young navy lieutenant. During Rickover's time at Columbia, engineers were, by Layton's account, near the pinnacle of their political influence. It was then that an engineer was for the first time elected to the White House (Herbert Hoover). The various engineering professional societies (e.g., the American Society of Mechanical Engineers, (ASME)) exerted political influence on a national scale. The society of electrical engineers (the predecessor of what became IEEE) was particularly vocal. Rickover, as an engineering student at Columbia, would almost certainly have been a member of an engineering society. Most significantly for Rickover's value formation, these societies were engaged in a debate about professional engineering values and the role of engineers in leadership positions.

An important and particularly radical outgrowth of the professional engineer associations was the Technocracy Movement, which emerged around the time Rickover

[15] Ibid., 56-57.

was a student at Columbia. The Technocracy Movement originated in Manhattan and found refuge in the engineering department of Columbia University, the same department and perhaps even the same building where Rickover studied as an engineer.[16] The leaders in this technical elite group were many, but three key figures in physical proximity to Columbia were Thorstein Veblen, Howard Scott, and Walter Rautenstrauch, the last an engineering professor on the faculty at Columbia.

It is reasonable to conclude that a young graduate student majoring in electrical engineering, living and studying in the same graduate department that gave refuge to the Technocracy Movement, might be influenced during this formative period by these ideas. Columbia University and Manhattan were home to the technocratic pioneers, the most famous of which was Veblen.[17] Veblen, the co-founder of the neighboring "New School of Social Research" and a source of inspiration for the Technocracy Movement, lived and lectured in New York City and worked with professors from Columbia who taught graduate students when Rickover was a student there. Veblen's associate and founder of "Technocracy Incorporated", one of several organizations associated with the Technocracy Movement, was Howard Scott. Howard Scott was closely associated with the engineers of Columbia's Engineering Department.

Another link between the Technocrats and Rickover's graduate school experience was Professor Walter Rautenstrauch of the Columbia Engineering Department, who was

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[16] Joseph Dorfman, *Thorstein Veblen and His America* (New York: Viking Press, 1934), 513.
[17] Thorstein Veblen, *The Theory of Business Enterprise* (New York,: C. Scribner's sons, 1932); Thorstein Veblen, *The Place of Science in Modern Civilization, and other Essays* (New York,: Russell & Russell, 1961); Thorstein Veblen, *The Engineers and the Price System* (New York,: A. M. Kelley bookseller, 1965); Thorstein Veblen and Stuart Chase, *The Theory of the Leisure Class: an Economic Study of Institutions* (New York: The Modern library, 1934). For a contemporary analysis of Veblen's relationship with the Technocracy Movement, see Dorfman. For an updated reflection on Veblen's broader influence, see Rick Tilman, *The Intellectual Legacy of Thorstein Veblen: Unresolved Issues* (Westport, Conn.: Greenwood Press, 1996).

also a pioneer in electrical engineering innovation. It was Rautenstrauch who helped propel the Technocrats to national fame. The source of attention was Rautenstrauch's work, his then famous "Energy Survey of North America" that was purported to hold the answer to the causes of the Great Depression.[18] Rautenstrauch eventually took on near celebrity status and was even provided large time blocks on New York radio to explain his theories of 'technocracy'.[19]

While direct historical evidence does not show Rickover became a card-carrying member of Technocracy Incorporated, it is reasonable to conclude that he might have read about their ideas and work. Rickover was in close physical proximity to the Technocracy Movement. Furthermore, the New York papers and magazines followed the developments of the Technocracy Movement and published the work of Veblen, Scott, and Rautenstrauch. The signature issues of the Technocracy Movement—the importance of the technical elite, the crime of waste and inefficiency, depletion of raw materials, and the danger of the 'money value' motivated businessmen – were carried in the New York press. Being an avid reader of the *New York Times*, Rickover most certainly read of these Columbia University celebrities. But in public, Rickover never claimed these men as his inspiration. It is reasonable to ask why, if Rickover had been influenced by the Technocracy Movement, he never spoke of them directly, at least in public? A possible answer to Rickover's silence is embarrassment. Eventually, powerful business interests felt threatened by the Technocracy Movement and attacked the leadership and

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[18] Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971), 227.
[19] Dr. Walter Rautenstrauch, "The Message of Technocracy Radio Broadcast, 2-215 pm on 9 January 1933," (United States: WABC, 1933).

undermined its credibility.[20] The leader of Technocracy Incorporated, Howard Scott, was eventually found to have inflated his resume (he had never earned the engineering degree he claimed). It would not be surprising that Rickover, the credentialed elite engineer, declined to admit to any inspiration derived from the layman Scott and the Technocrats from Columbia.

While Rickover enjoyed close physical and institutional proximity to the technocrats, such evidence is circumstantial. Mere proximity does not confirm inculcation of the technocratic ideas into Rickover's belief system. To ascertain Rickover's philosophical affinity for a technocratic philosophy, Rickover's later writing and speeches must be consulted. Rickover's writings provide strong evidence of the transference of the 'ideology of the engineer' into Rickover's own philosophy. Soon after his departure from graduate school, Rickover began to sprinkle in his letters to his wife, a PhD student still at Columbia, references to the issues and beliefs associated with the early technocratic authors. In the early 1930s Lieutenant Rickover wrote about the exhaustion of the world's energy supplies, a signature issue for the Technocracy Movement. He speculated in the letter that perhaps the depletion of cheap energy would serve a useful purpose by slowing the rate of industrialization and force mankind to return to a "sane" life. Remarkably, Rickover wrote as a young lieutenant of the possibility and dangers of nuclear energy: "To offset the possible decline in the available supplies of fuel, scientists are attempting to obtain sub-atomic energy. I sincerely hope

[20] Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971), 228.

they fail in this. It reminds me of Pandora's Box, where a great deal of misery was let loose..." [21]

Rickover echoed another technocracy theme when he wrote of the need to remake the nation's social structure. He went so far as to speculate that the Great Depression might serve a beneficial effect in clearing out the old business leadership and make room for something new: "I hope the Depression keeps up a little longer. We shall have a fine country if it does." [22] Voicing one of his strongest convictions, which reflected a central theme of the Technocracy Movement, Rickover criticized the business elites as inadequate to lead the nation: "I believe that business men are, as a rule, the most stupid group, from a large viewpoint. Money apparently warps peoples' judgment and causes them to have an unreal attitude." [23] All three of these topics to which Rickover of the 1930s addressed —energy, social reconstruction, and the failings of the business class—were signature issues for the Technocracy Movement.

In the intervening years between his graduate education and his rise to national stature, Rickover's identification with technocratic values seems to have grown stronger. In two of his nationally distributed books, *Education and Freedom*, published in 1959, and *American Education: a National Failure*, published in 1963, Rickover voiced several beliefs that reflect closely those of the early 20th century technocratic thinkers, Scott and

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[21] Rickover, letter of 16 March 1933, quoted in Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 51.
[22] Rickover, letter of 28 June 1935, quoted in Ibid. , 57.
[23] Rickover, letter of 14 July 1935, quoted in Ibid. ,57. Duncan observed that Rickover carried a low opinion or even contempt for businessmen throughout his life. Similar observations are found in Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982). Rickover seems to place the 'line' officer in the same category as the businessman. In Rickover's later work, *American Education: a National Failure*, Rickover suggests that engineers had eclipsed regular naval line officers in importance, and could replace the latter. See 182.   See also Hyman George Rickover, *American Education, a National Failure: the Problem of our Schools and What we can Learn from England*, [1st ed. (New York,: Dutton, 1963).

Veblen. Rickover writes like an early technocrat when he condemned the wasteful exploitation of resources, warned of a decline of Middle East oil and urged a philosophy of conservation, especially for fuels and metals.[24] The Technocracy Movement also focused early on fuel depletion.[25] Not coincidently, King Hubbert, the engineer who was made famous for correctly predicting "peak oil" in the United States was a member of the Technocracy Movement and had arrived at Columbia just months after Rickover had departed en route to the fleet.

Rickover in his public testimonies criticized consumerism, conspicuous consumption, and the duplicity of the engineer "…who chooses to engage in design of consumer goods." Rickover condemned American materialism, writing that "…the greatest of modern fallacies is that material possessions are the mark of a successful man." Rickover exhorted parents to do their duty and to practice less consumption as a model to children.[26] Rickover's statements about consumption and materialism parallel closely those of Thorstein Veblen. It was Veblen who in the first extensive social critique of modern American materialism, *The Theory of the Leisure Class,* had coined the phrase "conspicuous consumption."[27] Rickover gives a further clue to his philosophical roots when he posed a rhetorical question of the value of money: "what

[24] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959). For discussion of fuel depletion and concern for decline of raw materials see 37. For references that follow, see 57, 80, 82, 87, and 98.
[25] Joseph Dorfman, *Thorstein Veblen and His America* (New York: Viking Press, 1934), 510. See discussion of energy study conducted at Columbia University from 1922-1932, under Howard Scott, who was the founder or co-founder with Veblen of the Technocracy Movement. Though the Technocracy Movement would fade, Veblen's reputation grew in stature. His ideas were praised for their prescience by leading politicians of the day, Henry Wallace, Roosevelt's Agricultural Secretary, among them.
[26] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 45, 46, 59, 98.
[27] Thorstein Veblen and Stuart Chase, *The Theory of the Leisure Class; an Economic Study of Institutions* (New York,: The Modern library, 1934).

money value can one assign a book?"[28] Rickover's concern about the distorting value of money was also an important early 20th century technocratic concern. Veblen sounded a similar theme in his second most influential work, *The Engineers and the Price System*, writing: "Is pay to be the only measure of value of a job? No! Nothing material can ever give the intelligent man or woman such deep satisfaction as successful solutions of intellectual problems that challenge the mind." [29]

Rickover was known throughout his later career for his attack on business interests and spent his last years battling with corporate leaders.[30] He was highly suspicious of businessmen and doubted their capacity to protect the public good and make a profit at the same time. In his system of shipyard management, Rickover insisted on an independent, technical group of engineers (Naval Reactors Representative Office, NRRO)[31] who were wholly independent from business influence. Rickover's unique system of independent inspectors was so effective that in the wake of the Three Mile Island nuclear accident in 1979 the Nuclear Regulatory Commission adopted Rickover's system, which remains in place at all nuclear power plants in the United States. This idea of technician authority may not, however, have originated with Rickover but has roots that can be traced to the Technocrats. Veblen wrote in the early 20th century-- some forty years before the creation of 'NRRO" and three quarters of a century before Three Mile Island-- that engineers should be independent and should not accept managerial positions

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[28] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 58.
[29] Thorstein Veblen, *The Engineers and the Price System* (New York,: A. M. Kelley bookseller, 1965), 59. This book was first published early in the 20th century.
[30] Patrick Tyler, *Running Critical: the Silent war, Rickover, and General Dynamics*, 1st ed. (New York: Perennial Library, 1986).
[31] NRRO, the name for Rickover's highly independent inspectors. The abbreviation has taken on a power of its own, but generally stands for "Naval Reactors Representatives Office". For Rickover's philosophy of the NRRO officer, see H.G. Rickover,"Responsibilities of NR Representatives at Field Offices, RD:NAV:HGRickover: 2088, Reissued- March 27, 1962", (author has copy).

that would compromise their professional independence.[32] Veblen, like Rickover, elevated engineers to a favored position of leadership and asserted that engineering was the most important profession, "…because mankind's future may depend on the engineer's practice."[33] Veblen was praised in some corners of the world for his ideas of an independent leadership group, an 'engineerocracy'. [34]

Rickover was by the late 1950s well known for his attacks on the educational system.[35] Rickover routinely attacked professional educator's associations and justified his criticism on the basis of statistical output metrics, which he noted contrasted poorly with Russian education that graduated twice the number of engineers as did the United States.[36] Rickover argued in public testimony and his books that colleges should downgrade sports, especially at the US Naval Academy.[37] Again, Rickover's ideas echoed those of the Technocrats, especially Veblen.[38] Veblen opposed the role of businessmen in education, in particular, their prominent role in support of sports programs. Veblen called for an increased emphasis on technically educated engineers

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[32] Thorstein Veblen, *The Engineers and the Price System* (New York,: A. M. Kelley bookseller, 1965), 66.
[33] Ibid. , 81.
[34] Joseph Dorfman, *Thorstein Veblen and His America* (New York: Viking Press, 1934), 514-515. Veblen's ideas were praised by leading Soviet thinkers. The soviet writer, Bukharin, writing in *Pravda*, summarized Veblen's ideas of an engineering elite:"...the real leaders of industry are the engineers. He (Veblen) puts forth an original concept as a guide for the future, i.e., the ideas of engineerocracy, the rule of the engineers..."
[35] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 45.
[36] Committee on Appropriations, House of Representatives Report on Russia By VADM H.G. Rickover, US Navy, 18 August 1959.
[37] House Committee on Appropriations, Testimony of VADM H.G. Rickover on Nuclear Propulsion, 87th Cong., 2nd sess., 1962, 33.
[38] Rick Tilman, *The Intellectual Legacy of Thorstein Veblen: Unresolved Issues* (Westport, Conn.: Greenwood Press, 1996). See chapter 30, by Thomas Sowell, "Veblen's Higher Learning After Fifty Years", 599. See page 591 for Veblen's negative attitude toward sport's programs in institutions of higher learning.

and speculated on the desirability of a ‘Soviet of Engineers” as he denounced the American educational establishment.[39]

The close relationship between Rickover and the Technocrats extended beyond speeches and writing to manifest itself in his personal lifestyle and consumer choices both at home and in the office. Rickover's offices were Spartan, which might have been for 'show' to guests and his staff. But given that he infrequently entertained at home, his choice of living conditions for his first wife and son speak more strongly to the origins of his values in the technocratic philosophy of frugality, simplicity, and anti-materialism. As a Technocrat, it would come as no surprise that in the 1930s Rickover bought and maintained a simple farm in New England and had plans to return to the land should he fail to promote in the Navy, or perhaps should the economic system collapse in the Depression.[40] Veblen also owned a home in the country, a rustic mountain cabin, to which he returned in his retirement years after leaving New York. Even after he had become one of the most senior officers in the US military, Rickover shunned expansive flag quarters and chose instead to live with his family from 1940 to 1972 in the same relatively small apartment overlooking the Rock Creek Park in northwest Washington, D.C.[41] Rickover’s office at Naval Reactors was not characteristic of an admiral, but of a penny-pinching or lower-level bureaucrat-technocrat. It was adorned not with mahogany but with a government-issue desk, metal bookshelves, and worn out chair bought at a flea market.[42] According to his son, Robert, his father Hyman Rickover “dressed down in

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[39] Also see Ibid. 598. There is some evidence that Rautenstrauch also expressed interest or admiration for Russian and/or Soviet activities. See "Corporation (Technics International) Plans Revival of Russia," *New York Times*, August 5 1921.
[40] Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 60.
[41] Ibid., 71.
[42] Recollection of a person close to Rickover who requested not to be identified.

the extreme" and wore around the house old khaki trousers and a matching modest khaki shirt. [43]

Many of Rickover's life-style choices appear alien to his youthful upbringing. Though he struggled at first, like most immigrants, Rickover's father was eventually financially secure, politically connected, and came to own an apartment building and his own business in Chicago. Compared to the navy officers with whom Admiral Rickover spent most of his life, his tastes and habits were also alien. But his tastes *were* typical of members of the Technocratic Movement who, at the height of their influence, lived simply and wore simple, gray uniform-like attire.[44] Veblen, too, even in his last years chose to live in similarly spare conditions. Further, Veblen dressed in clothes so simple and coarse that "they would almost stand alone"…and wore the "heaviest of work-shoes, purchased from Sears, Roebuck, served him for everyday wear in the house. He bought much from the mail order houses, because he like the rugged utility of their goods" [45]

Rickover appears to have been deeply influenced by the many ideas and values of the engineering and technocratic movements of the 1920s and 1930s. But Rickover identified with four technocratic ideas that appear to have informed and guided his decisions and actions as a senior naval officer: the idea that technology drove history and that man must conform to its dictates; that the technical specialist should be elevated above those with lesser technical knowledge; that the world's energy sources were a great concern and required the best men to solve such a problem; and that the educational system should emphasize the study of science and engineering. The first of these ideas is

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[43] Robert Rickover, (son of Admiral Rickover), Interview with the Author, 25 September 2007.
[44] Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971), 228.
[45] Joseph Dorfman, *Thorstein Veblen and His America* (New York: Viking Press, 1934), 498.

a fatalistic acceptance that technology will drive history, that technology takes on the powers of God to define the conditions of life and death. Such a philosophy makes it a man's duty to conform to technology's requirements.[46] Francis Duncan, the admiral's biographer, spent years with Rickover and perhaps more than any other writer captured the essence of Rickover's values and beliefs. Duncan explains that Rickover elevated technology to a position of supreme if not ultimate significance in human activity.[47] Duncan defined Rickover's key philosophical conviction: "The discipline of technology means that the organization must adapt to the technology and not the technology to the organization".[48] The overtones of technological determinism in Rickover's rhetoric closely align to the discourse of the 1920s 'technocrats'.[49] To Rickover, technology was the defining, if not a God-like force of modern life.

The second value Rickover carried over into his navy reforms naturally follows from the first. Rickover held an elevated view of the technical specialist and held a low regard for less technical, less specialized persons, whether they were businessmen or naval 'line' officers. A generation after the apogee of the Technocracy Movement, a Vice Admiral Rickover would propound the philosophy of the technocrats when he explained: "The man of the future on whom we shall depend more and more is the technical expert.

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[46] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 46. Rickover described 'invention' as the determinative force in history; see 48-51 for discussion of the role of speed of technological innovation and the critical role this speed will contribute to victory in war.

[47] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis, MD: Naval Institute Press, 1990), 293.

[48] Ibid. , 293. Rickover's thinking also echoed early writers on the subjects of technology and science. Francis Bacon had written three hundred years before, that "...for nature is only to be commanded by obeying her." See Robert D. Friedel, *A Culture of Improvement : Technology and the Western Millennium* (Cambridge, Mass.: MIT Press, 2007), 163. Perhaps in Rickover's mind, technology came to represent the 'nature' of the artificial world.

[49] Stephen Edgell, *Veblen in Perspective: his Life and Thought,* Studies in institutional economics. (Armonk, N.Y.: M.E. Sharpe, 2001), 161. According to Edgell, Veblen might be counted among the technological determinists, who placed emphasis on the "character of science and technology" and the "requirement inherent'.

Today he is still subservient to non-technical leaders in government and industry, and his work is hampered and sometimes destroyed by men in whom is vested great power but who cannot understand the realities of the new, artificial, technological age. But the 'verbal' men are on the way out; the men who can handle the intricate mysteries of complex scientific and engineering projects are on the way in. That applies all the way down the line to the skilled workman on whose judgment, concentrated attention, and responsibility may depend the functioning of some new and gigantic piece of engineering. To put this in military terms: we shall need more technical sergeants and fewer martinets. In our naval nuclear program we have taken cognizance of this demand for a *different kind of man* and we have set up schools to train the officers and men who will run the new atomic navy."[50] Rickover's views were not original, but reflected his absorption of the values of Technocracy.[51] Veblen envisioned the engineers as the true leaders of the industrial age, "...the indispensable General Staff of the industrial system."[52] The similarities between Veblen and Rickover are strong, reflective of transference of values and beliefs from the New York elites to Rickover, who would then carry them back to the Navy.

The two additional values Rickover absorbed from the Technocracy Movement—the concern to solve the depletion of world energy resources and the need to make education more technical—also portended significant implications for how Rickover

[50] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 19.
[51] Stephen Edgell, *Veblen in Perspective: his Life and Thought*, Studies in institutional economics. (Armonk, N.Y.: M.E. Sharpe, 2001), 237. Veblen's views on engineers are paraphrased by a leading scholar of the movement: "Since the late 1890s Veblen had been concerned with the economic and political significance of technical experts, whom he regarded as the contemporary embodiment of the instinct of workmanship and therefore as a potential solution to the problem of the regular sabotage of industry perpetrated by the business class in their routine preoccupation with the 'pecuniary side' of economic processes."
[52] Veblen as quoted by Edgell, 140.

would spend his career and where he would seek reforms. As we will discuss, Rickover dedicated himself to these twin challenges: more than any other single individual, he was responsible for the American nuclear power system that exists today, and much of the modern naval educational and professional development system is also his legacy. His attacks on the 'generalist' model of officer and his later intervention in educational institutions reflect a philosophical coherence when one understands Rickover's source of inspiration. But the transformation of officer models would not have been possible without the benefits of a nuclear reactor organization that came under Rickover's control.

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The First Nuclear Reactor: 'Technocracy' Finds a Home

Rickover had not long to wait for an opportunity to put his technocratic convictions to work, and on a grand, world-changing scale. Rickover's early speculations about nuclear energy in the 1930s proved to be a decade too soon, but with the development of nuclear explosive technology and the obliteration of Hiroshima, scientifically engineered technology was on the march. Though the official Technocrats had been by this time discredited, their emphasis on the increasingly important role of technology and technicians was not out of step with post-war thinking. The highly respected Vannevar Bush, a senior scientist in the Manhattan Project, published several post-war works that highlighted the importance of science and advanced technology to the safety and security of America. Bush, like Rickover, sounded a deterministic tone, arguing that scientifically designed technology had defined the terms of battle in the

Second World War and would do likewise in the future: "Radar, jet aircraft, guided missiles, atomic bombs, and proximity fuses appeared while we were fighting (the Second World War); they *determined* the outcome of battles and campaigns, even though their *determining nature was not fully exploited in that contest*." [53] (my emphasis)

Rickover's war experience prepared him well for the age, for he had commanded not ships and men in battle, but a complex technical organization. Rickover became an Engineering Duty Only (EDO) officer in the late 1930s and spent the war years in the Electrical Division of the Bureau of Ships (BUSHIPS). After the war the head of BUSHIPS assigned him to study the nuclear applications in Oak Ridge from June 1946 to Sept 1947.[54] Though not officially authorized to lead anyone, Rickover as the senior man quickly took charge of the navy contingent, which included some of the best minds in the Navy: top graduates of Annapolis and later MIT graduates, Lou Roddis and James Dunford. Technical education, the study of the science and engineering of nuclear technology, dominated every waking hour.[55] It was, in short, a technocrat's dream assignment. In this job Rickover could assist the Navy in its immediate task of finding a means to tap nuclear energy for submarine propulsion. But he could also help mankind

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[53] Vannevar Bush, *Modern Arms and Free men: a Discussion of the Role of Science in Preserving Democracy* (New York,: Simon and Schuster, 1949), 3.

[54] Stuart W. Leslie, *The Cold War and American Science: the Military-Industrial-Academic complex at MIT and Stanford* (New York: Columbia University Press, 1993), 151. RADM Bowen, and not Rickover, was the first naval officer to envision a program to produce a nuclear powered submarine. Before the first successful nuclear detonation in the desert of New Mexico, as early as 1939, some in the Navy had begun to visualize the application of nuclear power to submarine propulsion. Dr. Ross Gunn, a civilian physicist at the Naval Research Lab, is credited in January 1939 as the first to envision the possibilities of nuclear power to propel submarines. There is, however, a general consensus that the submarine application of nuclear technology, and even the first civilian nuclear power plant, would have been severely delayed if not for the leadership efforts of Hyman Rickover. See Gary E. Weir, *Forged in War: the Naval-Industrial Complex and American Submarine Construction, 1940-1961* (Washington: Naval Historical Center 1993), 157.

[55] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974) . For detailed discussion of the selection of personnel to go to Oak Ridge, and the nature of those first steps into naval nuclear power, see 31-38.

solve a perennial problem: the acquisition of a reliable, and potentially limitless, source of energy.

As international tensions began to escalate in the late 1940s, the Navy decided to develop nuclear propulsion technology for the submarine fleet. Though a dark horse candidate, and disliked by many, the Navy selected Rickover to head a joint Atomic Energy Commission (AEC) and Navy program for naval nuclear propulsion in February 1949.[56] With his advancement, Rickover expanded his span of control to include the technical training and education of many more officers. As a consequence of Rickover's efforts, the world's first department of nuclear engineering came into existence at MIT, and the work produced by Rickover's officers laid the basis for MIT's first nuclear engineering curricula.[57] Rickover was not a passive participant in the emerging educational system, but closely monitored its development. Rickover kept a close watch on his people and drove his first officers through the MIT program with such haste that apparently upon graduation the officers rushed back to Washington before the university had time to produce the new engineering diplomas. As a consequence, these pioneering engineers received their academic certification under the title of a degree in 'nuclear physics', not nuclear 'engineering'.[58]

In August 1949, the Chief of Naval Operations established naval nuclear power as a formal program. He made this decision just weeks before the detonation of a Russian atomic bomb in September 1949. The program evolved rapidly and against a backdrop

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[56] Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992) see appendix for detailed timeline of milestones.

[57] Stuart W. Leslie, *The Cold War and American Science: the Military-Industrial-Academic complex at MIT and Stanford* (New York: Columbia University Press, 1993), 152. Leslie writes that seminars and papers conducted for Rickover's officers became "...the basis for a graduate course in nuclear engineering...." See also Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 340-341, 345.

[58] The author personally viewed John Crawford's diploma in "Nuclear Physics" from MIT.

of rising tensions. A few weeks after invasion of South Korea, the AEC authorized Westinghouse Corporation to begin construction of the Mark I nuclear reactor.[59] The Mark I reactor proved to be forerunner of all naval nuclear reactors and most civilian reactors in the United States today. Rickover was about to achieve one of Technocracy's goals: to solve the problem of fossil fuel energy depletion. But the Mark I was important for another reason: it became the point of departure for the transformation of naval command.

The Mark I was an engineering and scientific breakthrough: it was the first reactor to provide economical and reliable power through the control of nuclear fission. It was also a profoundly complex and dangerous machine that required highly knowledgeable and skilled engineers and operators. Though the subject of this paper is the officer corps, at this juncture a brief explanation of nuclear technology may help illuminate the problem Rickover and the Navy faced in determining the level of training and education required of the first generation of operators. Understanding this basic nuclear reactor also facilitates an understanding of later reactors, because their design and construction was to remain fundamentally the same for a half century.

Unclassified sources provide some idea of the technical demands faced by the early officers and engineers.[60] Rickover and his design teams made the nuclear reactor as compatible as they could with existing navy systems. The steam side of the plant (in contrast to the high pressure water side which circulates through the reactor vessel) is

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[59] Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 111, 116. See also Hewlett, Weir, and Rockwell.

[60] Randolph W. King and Prescott Palmer, *Naval Engineering and American Seapower* (Baltimore, Md.: Nautical & Aviation Pub. Co. of America, 1989), 278-282. Provides a technical discussion of the alternative nuclear technologies considered but not developed for wide application. See also basic description in Navy Department Bureau of Naval Personnel,"NAVPERS 10788-B: Principles of Naval Engineering", USNA Collection, GVTDOC D 208.11/2: EN 3/2/970. See pages 622-624 for discussion and schematics of nuclear, pressurized water reactors.

identical in many respects to non-nuclear steam plants aboard the ships Rickover served in the early 1930s. However, the two systems—the conventional and the nuclear—are closely coupled. For this reason, material failures or human mistakes in the machinery rooms outside the reactor compartment could result in damage to the reactor core and a subsequent release of fission products to the environment. The environmental significance of nuclear fission constituted the most profound difference between the non-nuclear and nuclear technology: mistakes on a conventionally powered plant might kill the engineer; mistakes in a nuclear plant might destroy a city. Furthermore, the reactor core remained a source of high levels of radiation even when not in operation. Consequently, once constructed and fueled, a reactor core required constant supervision until it was, after some 30 years of service, dismantled and the fuel removed from the ship for disposal. The dangers of nuclear explosion, melt-down, radiation, and long-term waste disposal were a new challenge for the Navy. Unlike their conventional brethren at sea, therefore, the new technology required more rigorous technical education, advanced training, and careful screening of officers and men to ensure their reliability.[61]

Once the U.S. Government funded the Mark I (later known as the S1W reactor), the responsibility for the timely delivery of the reactor and ship rested primarily with the corporate engineering organizations and shipyards. Rickover and his staff exercised a supervisory role over industry, but the training and preparation of the officers and men who would operate the reactor was left entirely to the Navy and Naval Reactors. Few if any responsible persons inside or outside the Navy disputed the need for the technician in

[61] Navy Department Bureau of Naval Personnel,"NAVPERS 10788-B: Principles of Naval Engineering", USNA Collection, GVTDOC D 208.11/2: EN 3/2/970. See chapter 24 for discussion of the reactor operation and construction, and note in particular, the discussion of the need for high-cost, scientifically trained personnel.

the engine room to be highly qualified and specialized. But the emergence of this specialized knowledge in the Navy had large and unintended consequences for the 'line'.

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The Clash of Philosophies:

Promotion to Admiral and Command of NAUTILUS

Naval nuclear power specialists enjoyed a privileged position from which to challenge the King model of 'line' officer. Unlike the last challenge to the King system-- the aviator pioneers of the 1920s and 1930s, many of whom came from the outside of the sea service-- Rickover's naval nuclear engineers originated *in* the Navy. Whereas Princeton and Yale, and many other colleges and flying clubs, quickly produced thousands of aviators for the Navy in 1917-8, nuclear engineers in 1954 could be found nowhere else but in Rickover's program. Nuclear engineers were in such short supply that their numbers bordered on extreme scarcity. An early report on the nuclear program attested to the uniqueness and scarcity of nuclear engineers: "...the board finds that the Atomic Energy Commission managers consider that the heart of their nuclear technical staff is made up of Naval Officers. They (the AEC) state frankly that there is no one who could replace them…" [62]

Given the uniqueness and scarcity of Rickover's first engineers, both Rickover and his officers enjoyed a significant degree of job security, and Rickover could thus challenge the parent organization with relative impunity. The nuclear specialists did not

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[62] H.C. Bruton, RADM USN,"Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", 20 August 1954", NHC 00 Files 1955 Box 11, Folder 7. See also Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 104.

need to challenge the Navy for more resources, for the Navy and Rickover were of a common mind in fully funding the program. Rather, the conflict in values centered on the type of officer who would lead the growing nuclear organizations and command the nuclear-powered ships that were then under construction. Rickover and his technical expert model of command thus came into direct conflict with the traditional King model. In the King model, the technical expert was to be subordinate to the 'generalist' officer, a position of inferiority which infuriated Rickover. The philosophical competition soon played out in two disputes: Rickover's own promotion to flag and the selection of the "line" captain of USS NAUTILUS.

The battle for Rickover's own promotion centered on a debate over the qualifications necessary to rise to senior command and the rank of admiral: was a senior leader to be broad and 'well rounded' or technically expert and specialized?[63] Rickover came up for promotion to admiral in 1951 confident of his selection. He was, after all, the head of one of the highest priority defense projects in the Navy and one of the leading specialists in a new field. Rickover was thus shocked when the board did not select him for admiral. He quietly awaited a second opportunity for the board to select him in 1952.[64] When in 1952 the board met with the same result, Rickover and his staff raised questions, agitated in Congress, and forced the Navy to justify the board's actions.[65] Rickover represented something new: he was a scientifically educated engineer who had

[63] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974) , 189. Hewlett describes the fundamental issue as the clash of officer conceptions: generalist vs specialist.
[64] As recently as 1949, Rickover had apparently concluded he would not promote to "flag" from his nuclear power assignment, and had made plans for an officer, Captain R. L. Moore, USN to relieve him in 1952. See H.G. Rickover, Captain, USN,"Ltr to RADM D.H. Clark, USN, subj: Additional Engineering Duty Personnel for Nuclear Propulsion Assignments, dtd 2 September 1949" (Author has copy).
[65] Editorial, "Navy Pressure to 'Slant" and Delay Article On Atomic Submarine Charged by Time " *Washington Post*, 18 February 1953, 13.

focused his professional activity over the past 8 years in the narrow field of nuclear power. He was also disliked. Rickover's opponents justified his failure to promote due to his lack of breadth. Rickover was not a "rounded officer", they explained, and thus not suited to rise to high command that selection to flag represented.[66] Not just 'line' officers, but senior Navy EDO engineers thought Rickover lacked the broad experience to be promoted to flag rank. One admiral, a senior EDO in command of BUSHIPS, VADM Albert Mumma, observed that Rickover "…was not a broad scale individual…" and "…Rickover was a vertical specialist, and he hadn't been broadened." [67]

The preference that "broadened" officers became flag officers was not unique to Rickover's situation, but was in 1953 commonly accepted as the model for admiral in the Navy. Various post-war boards and study groups had endorsed the professional model of the "broad scale" officer. But Rickover would not submit to the dictates of the old model and mounted an unprecedented challenge. It is possible that his protests were merely the manifestation of an over-sized ego, but he had little about which to be conceited. Until his specialized experience in nuclear power, he had had a rather unexceptional career. The one and only thing in his record that justified his challenge of the promotion board results was his status as a unique, highly specialized officer, the very qualities that others had used to deny him promotion.

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[66] Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992), 152. Rockwell summarizes the testimony of Admiral Wallin, Chief of the Bureau of Ships. Rockwell explains that the Navy system was biased to produce and promote the 'well-rounded officer': "Officers, being well-rounded individuals, rotate through various positions in the system. Rickover, they claim, just happened to be standing there when this particular bus came by. Any other officer of his rank would have done the same things he has done. And they have others of captain's rank who are ready to step in to replace him. Isn't that a comforting picture?"

[67] Albert G. Mumma, *The Reminiscences of Rear Admiral Albert G. Mumma, U.S. Navy (Retired) / interviewed by Paul Stillwell* (Annapolis: US Naval Institute, 2001), 240, 249.

To Rickover, the navy decision to oppose his promotion was to perpetuate an old concept of the officer corps, that of the 'rounded' officer. In this battle over identity of command, however, Rickover needed allies and he turned to Congress and the national press to make his case.[68] The press, guided by Rickover and his staff, framed his failure to promote as an issue of conflicting models of officer identity, of bias in favor of the rounded, operational officer at the expense of the specialist. The press reported that "…the Navy was expressing a deep-seated prejudice against technical specialists." [69] In contrast, the press explained, the Army and Air Force had embraced the specialists, "… they recognize that in a technological age specialization is so valuable and so unavoidable that the specialists cannot be barred from high rank."[70]

Rickover himself went on the record with reporters and criticized the Navy's preference for both the 'rounded officer' and the operational officer: "The system is based on the all around officer who can be shifted from post to post and is capable of doing each routine job well".[71] Rickover then condemned the operational-mindset of the Navy, stating that "The system is designed for the 'operators'…" He went to explain that the specialists he called 'idea men' are "… left out in the cold, passed over and retired..." He continued his attack on the Navy's operational mindset by drawing comparison between the Navy and large engineering firms. Rickover explained: "What is even worse

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[68] Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992), 146-47.
[69] Clay Blair, *The Atomic Submarine and Admiral Rickover*, [1st ed. (New York,: H. Holt, 1954), 196; Ronald Schiller, "The Strange Case of the Man Behind the Atomic Sub," *Look*, 17, no. 5, March 10, 1953.
[70] *Time* magazine article in 1952, as quoted in Clay Blair, *The Atomic Submarine and Admiral Rickover*, (New York,: H. Holt, 1954), 196.
[71] Ibid. Blair quote of Rickover interview during promotion fight.

is that you have the 'operators' dictating and choosing who the top 'idea' men will be, and what they will do. Contrast this to General Motors…" [72]

Rickover also cast the debate in terms of changing conceptions of engineering knowledge, a conflict between the 'shop culture' tradition and that of the 'school culture' that now was producing the technological elite, the scientifically educated engineer.[73] Rickover explained that what was also disturbing was "… that apparently there is no place in the Engineering Corps for the scientifically inclined engineer…"[74] Clay Blair who authored several articles and books on the nuclear Navy and submarines interviewed Rickover and recounted: "The Captain went on, time and again, to insist that somehow, the scientific and technical minds of the Armed Services must be freed from a complete military type of control."[75] In the detailed interviews with Blair which were then published before a national audience, Rickover sought to educate the public (and Congress) as to the deep historical roots of the dispute over specialists in the Navy. Rickover also challenged the practice of closed promotion boards that were immune to Congressional oversight.[76]

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[72] Rickover as quoted in Ibid. , 211.
[73] Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967). Calvert provides a discussion of the eventual rise to dominance of the 'school culture' of engineering over that of the traditional 'shop culture'. Rickover, as an electrical engineer from an elite Ivy League college, was clearly in the "school culture" tradition, which might explain why he pushed naval officers toward an engineering-science training regime.
[74] Rickover, quoted in Clay Blair, *The Atomic Submarine and Admiral Rickover*, [1st ed. (New York,: H. Holt, 1954), 210.
[75] Ibid. , 211. Rickover went in further detail to compare his plight with the creators of the *USS Monitor* of the Civil War, and with aviation pioneers in the inter-war period.
[76] Ibid. Blair explains in detail the public debate over Rickover's non-selection for admiral. Blair's work is important in that Rickover wrote much of Blair's prose, and thus the battle depicted by Blair may reflect to a substantial degree Rickover's own personal views. Rickover explained his failure to promote and in the process demonstrated a keen knowledge of the laws and history of promotion system. Rickover explained the particulars of the different engineering (ED) and "Line" classifications; he explains in detail the significance of the laws and reforms of 1916; he pondered aloud the question of the role of the specialist in the Navy.

Following the series of articles, Congress inserted itself into the debate and firmly sided with Rickover. Influential Congressmen threatened to block *all* flag officer promotions should Rickover's name not appear on a special promotion list. Faced with a Congressional inquiry into the entire Navy promotion system, the Navy bowed to political pressure in a desperate attempt to save the promotion system as it had existed since 1916.[77] A special board was convened in 1953, and the promotion precepts were written in a way that all but directed Rickover's selection. As Rickover himself would observe, the Navy was so desperate to select Rickover that it provided board members with precepts that practically ordered them to select a "125 pound Jew", which in effect meant: select Rickover.[78] But even strict precepts proved inadequate. The EDO (the engineering officers) officers on the promotion board ignored the precepts and refused to select Rickover. Faced with certain Congressional intrusion and the end of the promotion system as they knew it, the 'line' officers on the board banded together and at the 11th hour outvoted the intransigent EDOs. Rickover was only by the slimmest margins selected for the rank of rear admiral. [79] Admiral Rickover was thus a creation not of the EDO officers but of the 'line'.

His own battle for flag left Rickover wary of both the EDOs and operators of the 'line'. It was not lost on Rickover that his promotion to flag came through the intervention of Congress, not from support in the Navy. Furthermore, the Navy had used

[77] R.N. Smoot, RADM USN (Assistant Chief of Naval Personnel),"Memorandum and Aide Memoir for Rickover Case", BUPERS files, Pers-B-JTS 27 Feb 1953 (Author has Copy). Smoot's memorandum was used by navy flag officers to defend the decision NOT to promote Rickover. Behind the scenes, however, the Navy was being outmaneuvered. See Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992), 155. The Navy finally agreed to another promotion board after Congressman Yates introduced a bill proposing a profound change to the Navy's promotion system: the addition of civilians to the admiral selection boards.
[78] Rickover, as quoted in Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992), 156.
[79] Ibid. , 157.

the 'generalist' model to attack Rickover's credentials and in so doing implicitly rejected a technical specialist model of higher command. His ultimate victory, however, no doubt reaffirmed in Rickover's mind that he could leverage an expensive industrial machine program, popular with Congress, to gain support for what might seem to be unrelated personnel policies. But to Rickover, personnel policy and machines were closely linked. Rickover realized that this was not to be the last battle over promotions and selections. The privileged position of the 'operators' and 'well rounded' officers in the Navy would pose a continuing problem for him and his technical specialists.

Rickover and his engineers demonstrated the reality of a reactor-power plant system on 30 March 1953 when the Nautilus prototype achieved "criticality". By June of that same year, Rickover and his engineers demonstrated the endurance of the system with a sustained high-power operation meant to replicate, as much as possible, the anticipated demands of propelling a submarine across the Atlantic Ocean. With the most difficult scientific and engineering problems resolved, the social aspects of the technology now loomed large. In the Idaho desert a senior scientist and engineer could make decisions about the reactor; Rickover himself made the 'command decision' to steam at full power in June 1953. But reactors at sea would be under the command of an officer aboard ship. The question now: what kind of naval officer should command the nuclear ships at sea?

The debate struck very close to home for the 'line'. Command of a ship was the most jealously guarded of the 'line' prerogatives. The outcome of this debate would exert a shaping influence on the 'line' for generations to come.[80] Rickover vigorously asserted

[80] The officer who was eventually selected, Eugene Wilkinson, who later became the first nuclear admiral, would along with Rickover exert a profound influence on the navy. By Wilkinson's own account, he was

himself in the battle over the selection of the commanding officer, though he knew that his intervention as an "Engineering Duty Only" officer (EDO) had no precedent.[81] Such an intervention was however totally consistent with his fundamental philosophy of technology: the technical expert occupied a privileged position as decision maker. Rickover's intervention established the precedent that nuclear ship captains must carry impeccable technocratic credentials. In addition, Rickover's victorious battle with the 'line' would establish early his authority in matters of officer selection and assignment.

While Rickover's intervention as an EDO may have had no precedent, he claimed historical precedent for his *model*. As his biographers explained, his idea of an engineer in command "...was an idea stemming directly from the Naval Personnel Act of 1899." [82] Starting in the 1950s and continuing for three decades, Rickover would invoke Roosevelt's fateful exhortation that "Every officer on a modern war vessel…has to be an engineer…" [83] Rickover used the policy of Theodore Roosevelt and Secretary Long to justify the requirement that 'line' captains be scientifically educated nuclear engineers. Thus it was, more than a half century later, that the confusion of 1899 again influenced officer policy. It appeared to matter little to Rickover that nuclear engineering was a fundamentally more complex profession when compared to the practical engineers in the ships of 1899, the type of engineers Roosevelt knew. By the later 1950s engineering was qualitatively something new, it had become a profession of "…science and calculus and

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closely associated either through training, mentoring, or selection boards of approximately four dozen future navy admirals, who would eventually rise to lead the submarine force and the Navy. Eugene P. Wilkinson, VADM USN, Interview with the Author, 26 March 2007.

[81] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974) , 345.

[82] Ibid. , 348.

[83] H.G. Rickover, Admiral, USN,"The Role of Engineering in the Navy (speech entered into the record)", Congressional Record, pp 10313-10319 October 9, 1974, 10318.

higher mathematics…"[84] By asserting his right to compel ship captains to be engineering experts, Rickover threatened to invert the priorities of the King plan: instead of operations and integration, it was specialized technical knowledge that defined the 'line' commander.

Informed and guided by his engineering ideology, Rickover nominated for command of USS NAUTILUS his former protégé and a one time math and physics teacher, CDR Dennis Wilkinson. Wilkinson was an accomplished engineer who had held substantive design responsibilities in the naval reactors program but also had a competitive operational record. While Rickover advocated for his protégé, the 'line' was at a disadvantage because it had not reached a consensus as to the qualifications of their candidate. Many in the 'line' were unconvinced that the qualifications of the first nuke ship captain had to be particularly "nuclear" in an academic or technical sense. As a consequence, 'line' officers initially divided their support among three candidates: Ed Beach, Dennis Wilkinson, and Enders Huey.[85] Ultimately the senior submarine 'line'

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[84] Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967), 279.

[85] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007. Crawford explained that what appeared to matter most to Rickover was a technical education and the strength of the personal relationship between the candidate and Rickover. Rickover had worked with Wilkinson for years. Neither Beach nor Huey were as close to Rickover. Beach was from an old navy family, and had political connections. Enders Huey, who is less well known, had a distinguished career, but was more tactician than an engineer. Enders P. Huey graduated from the U.S. Naval Academy (Class of 1941) and was first assigned to the light cruiser USS RICHMOND (CL-9) stationed at Pearl Harbor. He was aboard the RICHMOND when the Japanese bombed Pearl Harbor in December 1941. Huey attended Submarine School in New London, CT, in 1942, and subsequently served on submarines in the Pacific Theatre. After the war he participated in Operation Crossroads at Bikini Atoll. During his career in the Navy, submarines, education, training, and executive management figured prominently. He served as directorate, individual training; and as commander of the naval training center in Orlando, Florida. He retired with the rank of captain. Huey was awarded the Silver Star and Bronze Star with combat " V" for his performance in the submarine war in the Pacific.

admiral threw his support to Beach, a highly decorated WWII veteran. But Beach was not an experienced engineer as was Wilkinson.[86]

Commander Submarines Atlantic (COMSUBLANT), the senior submarine line officer with oversight of most submarine matters, along with senior line officers at the Pentagon, argued that the commanding officer had to be first a submariner of accomplishment, and need not have a rigorous background in nuclear physics or engineering. The Bureau of Personnel, up to that point the organization most responsible for personnel assignments, cast the tie-breaking vote and supported Rickover's choice. By doing so, the Navy established the privileged position of an EDO, Rickover, to determine the selection of a ship captain. When the Bureau of Personnel supported Rickover's candidate over the objections of the senior operational commander, COMSUBLANT, it set a precedent that has endured to the early 21st century: the head of a technical organization, Naval Reactors, not the senior operational submarine commander, chooses who can be submarine officers and who is awarded command.[87] An EDO, a technical specialist, so empowered posed an unprecedented challenge to the 'line'.[88]

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[86] Clay Blair, *The Atomic Submarine and Admiral Rickover*, (New York,: H. Holt, 1954), 210.
[87] James Calvert, *Surface at the Pole* (New York: McGraw Hill Book Company, 1960) ; Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis, MD: Naval Institute Press, 1990), 245; Clay Blair, *The Atomic Submarine and Admiral Rickover*, (New York,: H. Holt, 1954); Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 348.
[88] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007.

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The Path Not Taken: The Bruton Plan for the “Well-Rounded Nuke"

By the middle 1950s, thoughtful senior officers realized that nuclear power posed a potential challenge to the long tradition of the Navy's 'well rounded officer.' As early as 1947 Rickover had requested complete control of the training, assignment, and education of all nuclear associated personnel.[89] But Rickover's request in the late 1940s concerned only a small number of specialists working on a theoretical project and was not seen as a challenge to the education and development of the 'line'. By the middle of the 1950s, however, the possibility of nuclear ships was no longer the subject of study groups or science fiction, but was taking physical form in NAUTILUS. The battles over Rickover’s promotion and Wilkinson’s assignment to NAUTILUS foreshadowed future conflicts if an approved personnel policy was not developed. To smooth the selection and training process for the anticipated wave of nuclear officers, the CNO ordered his staff to study the personnel requirements of nuclear power and make recommendations. The debate that Rickover had begun to frame in his own promotion battle was echoed by Admiral Carney, Chief of Naval Operations. Carney identified the *key* issue as the reconciliation of the traditional knowledge required of the 'well rounded officer' with the specialized knowledge associated with nuclear technology. Carney went so far as to

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[89] H.G. Rickover, Captain, USN,"Memorandum to Chief, BuShips, dtd 20 August 1947, Subj: Assignment of Oak Ridge officers and Education of Additional Officers", NRD (Naval Reactors Division Archives) Copies provided from C.H.Scmitt, 21 May 1980, in response to FOIA request from Norman Polmar (Author has copy). This is perhaps the first documentary evidence where Rickover demonstrated his desire to exert complete control over officer education: "The officer who is in charge of nuclear power matters in the Bureaus of Ships should coordinate the efforts of the students at the various laboratories to the end that a singleness of purpose is maintained. This officer should also arrange for the continued education of all personnel assigned to this duty. The field of nuclear knowledge is expanding at so rapid a rate that such continued organized education is essential."

speculate that nuclear technology might in fact require the Navy for the first time since 1920 to reassess the appropriateness of a rounded career. Carney wrote to his personnel chief:

> " For: Admiral Holloway, In the course of my general sponsoring of nuclear power for Navy ships, I have become increasingly aware of the fact that some special policies may be necessary with respect to the personnel, officer and enlisted, concerned with the design, installation, operation, and maintenance of nuclear power installations. Specifically, I must conclude that in this field which is not only highly complex, but which is changing and advancing with startling rapidity, there is a requirement for a continuing and uninterrupted attention to the subject matter by the personnel involved. Any hiatus in employment on nuclear assignments would appear inevitably to involve a loss of touch with the art which is unacceptable in view of the current rapid development. *If this assumption is correct, than there must be alteration of the concept of the 'well-rounded career.'* ….In view of the foregoing, you are directed to conduct a comprehensive study of the personnel situation involved in the navy's embarking on a nuclear-power program." [90] (my emphasis)

Admiral Holloway responded to the CNO's memo by assigning RADM H.C. Bruton to study the question of nuclear power and the implications for the 'well rounded officer' career path. The group consulted available references on nuclear technology and organizational structures and met with staff from the Army Reactors and Air Force Reactors offices. Most importantly, Bruton's staff interviewed a substantial cross-section of the Navy's leadership as well as middle and lower level nuclear officers. The Bruton Report provided a rare snapshot of the expert opinion on nuclear personnel policy *before* Rickover gained near complete control of its policies, pronouncements, and recorded history. [91]

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[90] Robert B. Carney, ADM, USN, Chief of Naval Operations,,"Memorandum dtd 2 July 1954 from CNO to Chief of Naval Personnel, Admiral James L. Holloway", Naval Historical Center (NHC), 00 Files 1955 Box 11, Folder 7.

[91] H.C. Bruton, RADM USN,"Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", NHC 00 Files 1955 Box 11, Folder 7. This report is important also as evidence of the means by which a changing conception of officer models was transmitted widely to the Fleet. While the report reaffirms the preference for "well rounded officers", it does acknowledge the uniqueness of

The Bruton Report calls into question the conclusions of the leading historians of nuclear power, those whom Rickover allowed access to his personal files but who were also susceptible to his persuasive influence. These historians, especially Richard Hewlett and Francis Duncan, suggested that the Rickover model of officer--the de facto specialized nuclear 'line' officer-- was from the outset the one and only model considered by senior navy leaders. These historians further contended that the senior navy leaders agreed with Rickover's interpretation of the Act of 1899 and Amalgamation: that commanders must be engineers.[92] A close reading of the Bruton Report leads to a

current circumstances that necessitated the temporary departure from the accepted norm. The report endorses the value of specialization but reaffirms the preference for breadth. The report included a draft letter that went out to each officer that explained the Navy's need for repeat nuclear assignments, but assured the officer that such specialization would not prejudice his promotion prospects. Furthermore, the report included a draft letter for the Secretary of the Navy which was to be sent fleet wide, explaining the value of nuclear power and the need for the officer to specialize, at least temporarily.

[92] Hewlett and Duncan reference the Bruton Report, but apparently they did not read it fully or purposely minimized its significance. The two authors omit important caveats voiced by both the CNO and the Bruton Report. See Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 349. Hewlett's history of nuclear officer development is incomplete and may border on the misleading. A lengthy quotation of Hewlett's analysis is warranted to insure accuracy: "Holloway was well aware that the Navy could not stand still in a changing world. He also had the breadth of vision to recognize what Rickover was accomplishing. Holloway accepted the principle that the Navy had established in 1899: that all line officers aboard a ship should be eligible for command. He would not have agreed—even if it had been suggested—to giving special training to engineering duty officers so that they could serve aboard ship as reactor operators. Because these officers could not have succeeded to command afloat, he would have considered such an arrangement a step backward. Consequently he accepted the view that ultimately all line officers aboard a submarine had to be nuclear trained." (see pg. 349) Several substantive problems arise with this very important section. First, VADM Holloway played a key role in the initial decisions of the reformed officer corps, yet Hewlett provides no references for this definitive paragraph: no interviews, no documents. Further, Hewlett fails to note that Secretary of the Navy Long, an architect of the Naval Act of 1899, stated unequivocally that a policy of amalgamation was a unique solution valid only so long as circumstances or environmental factors would necessitate. In other words, the Act of 1899 was not an act in perpetuity, but situational specific, a product of the times. Further, Hewlett states Holloway and Rickover agreed that for any line officer on a ship not be able to succeed to command would be a step backward, and an unprecedented anomaly to current practice. However, Hewlett neglects to note that in the case of the aircraft carrier since 1945 surface line officers were excluded from the ranks of commanding officers. Thus to train EDOs as engineers not eligible for command would not have been a radical departure from a practice already observed in the carrier fleets. But most importantly, Hewlett neglects the strict limits Carney and Holloway placed on Rickover's preference for the narrowed specialized career of nuclear officers: it was to be a temporary measure, to sustain during the period when the technology was changing with great "rapidity." Hewlett has, in effect, glossed over a most important series of exchanges and documents and by so doing implies that both naval law and seasoned sailors supported the narrow specialization that was to come. The documents do not support such a conclusion. On the contrary, Carney and Holloway agreed to specialized

somewhat different conclusion: the CNO (Carney), the Chief of Naval Personnel (Holloway), and the many officers who participated in the study were not persuaded that the Rickover model of a narrowly specialized, nuclear trained 'line' officer was the only way to man the engine rooms and command the nuclear reactors at sea. Not only 'line' officers but also nuclear specialists in the middle 1950s considered alternative solutions: to establish a separate corps of nuclear specialists OUTSIDE the 'line' (EDOs), or, to allow 'line' officers to be nuclear-trained, but NOT at the expense of a 'well rounded' career.[93] In the end, the board recommended that 'line' officers be nuclear trained, but the board was clear that 'well rounded' educational and career requirements were to be suspended only *temporarily*.

King would have been pleased with the outcome of the Bruton Report because the board recommended that the nuclear officer be 'well rounded': “…this board is convinced of the validity of the well-rounded career…"[94] The future commanders of nuclear ships were to be broadly educated and experienced, not narrowly trained in nuclear power. In addition, the report made clear that the preference for the 'well rounded officer' was not the opinion of just Bruton or a small minority, rather there was “…complete unanimity of senior as well as junior officers of the Navy, line and staff, on

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nuclear assignments but only on the condition that such specialization was temporary in nature. For both Carney and Holloway, the nuclear trained officers were ultimately to revert back to the King model of the well rounded career. Thus the emergence of the highly technical and specialized nuclear officer corps is not adequately explained as the product of senior officer consensus in the middle 1950s. Rather, the events and decisions of the later 1950s and early 1960s were critical factors in the development of the nuclear officer corps.

[93] H.C. Bruton, RADM USN,"Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", NHC 00 Files 1955 Box 11, Folder 7, see page 20. The uncertainty as the continued viability of the EDO community may have been a relevant factor in the board’s decision against a narrow nuclear or EDO specialist group aboard ship. One can speculate that if the EDO community had been more healthy and robust—or the engineering corps still in existence—Navy leaders and even Rickover might have considered a different path, perhaps more akin to the British approach. But in the late 1950s the viability of the EDO community as an independent body was unclear, and had been recently recommended for termination by the Under Secretary of the Navy William B. Franke.

[94] Ibid., 14.

at least one point: that the *breadth of view* point coupled with the judgment indispensable to the top executive and his naval counterpart, the flag officer, can be developed only through a lifetime of *wide* experience in his profession."[95] The 1954 report also made clear that departures from a rounded career by nuclear officers, if departures proved necessary, should be only *temporary*. Specialization would be allowed only until such time as adequate number of additional officers could be trained and educated. This report is all the more remarkable when one examines the composition of the board and the list of those interviewed: numerous nuclear engineers were among those who drafted the report. Admiral Bruton's recommendations, completed on 10 Aug 1954 and endorsed and forwarded by VADM Holloway to CNO Carney with but minor alterations, directed that nuclear officers specialize only temporarily, that "…the proven concept of the well rounded career must, for the people involved, be modified temporarily as a rigid consideration in assignment, rotation, and promotion."[96]

The most important fact to take away from this report is that, quite simply, the Navy of the middle 1950s recognized the challenge of nuclear technology but concluded that it could be accommodated *within* the model of the 'rounded officer' or integrative officer. The scientifically engineering technology of the reactor was indeed unique and brought with it some special requirements, but the board members did not see it as necessitating a permanent change in the nature of the officer corps. The senior leaders, and participating nuclear specialists, expected that when adequate numbers of nuclear officers had been trained, they would as a group revert to the King model of education and development. It should also be noted that when the board explained its rationale for

[95] H.C. Bruton, RADM USN, "Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", NHC 00 Files 1955 Box 11, Folder 7, see page 13.
[96] Ibid., 14.

merging nuclear expertise into the 'line', it invoked not the Act of 1899--that all 'line' officers must be engineers-- but expressed their desire to preserve unity in the officer corps. The board concluded: "…for the unanimous opinion of all officers interviewed that further fragmentation of the Navy is distinctly undesirable..."[97] The concern with fragmentation of the naval officer corps, not the primacy of engineering in the 'line', was the reason the Navy decided to train URL officers and not EDOs to man the engine-rooms.

It appears that in the first years after the Bruton report, when Rickover constructed his system of quality control and nuclear training schools, he had reconciled himself, at least temporarily, to the continued dominance of the King model. As will be explained below, most of his training innovations were designed to offset or ameliorate deficiencies in the larger Navy that might have threatened his capacity to safely operate his reactors. And though he was guided by an elitist technocratic philosophy, he *did* allow his first generation of officers to pursue broadening education and variation in assignments outside nuclear power. But before these officers were allowed to broaden out, they first had to survive the rigors of the most highly controlling[98] and demanding system of technical training and personnel management the Navy had ever seen.

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[97] H.C. Bruton, RADM USN,"Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", 20 August 1954", NHC 00 Files 1955 Box 11, Folder 7, see page 20.
[98] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974) , 351. Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis, MD: Naval Institute Press, 1990), 243. See Duncan for a discussion of why the quest for such tight controls. Rickover believed in a technical philosophy of supreme control of as many variables as possible, a philosophy he implemented with unmatched success. Rickover ridiculed the management theory of 'span of control', according to which "no supervisor can supervise directly the work of more than five, or at the most, six subordinates whose work interlocks." While Duncan is addressing the functioning of the immediate NR HQ staff, his observations also shed light as to another reason the program exerted such tight controls over 'line' officer education, assignments, and professional development.

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Nuclear Officer Assignment and Training Policy, 1955-58

The Bruton Report gave Rickover *temporary* authority to control all officers who were nuclear qualified or sought nuclear qualification. So empowered, Rickover moved aggressively to fashion his ‘line’ officers into a scientific elite. To gain maximum control of nuclear officers, Rickover would use to his advantage two important omissions in the Bruton Report: first, the absence of a clear statement as to the scope of officer career modifications necessitated by nuclear power, and second, the absence of any end-date by which time nuclear officers would revert to the model of the 'well rounded' career. The Bruton Report used ambiguous language to describe how nuclear officers should be prepared for duty: “While the traditional pattern of the well-rounded career remains, in the opinion of this board, sound and thoroughly valid, the board feels that it must be modified, judiciously, and as an interim measure, in the interest of the ensuring success of the nuclear power program.” [99] It was, however, unclear what “…modified judiciously..." meant in actual practice.

The meaning of temporary or ‘interim’ was also ambiguous. The need for temporary specialization would end when “…nuclear power operational knowledge has become relatively common.”[100] But the report did not identify the magic number of nuclear officers that would assure a ‘common’ availability of knowledge. It was clear, however, that more was better. Thus the board recommended Rickover take action to generate an excess inventory of nuclear trained officers that would help expedite a return

[99] H.C. Bruton, RADM USN,"Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", 20 August 1954", NHC 00 Files 1955 Box 11, Folder 7, page 18.
[100] Ibid., 18.

to a traditional career path: "That a *greater* number of personnel, officer and enlisted, technical and operational, be educated and trained in nuclear power than the needs of the present and immediate future indicate." [101]

The navy leadership and Admiral Bruton realized such ambiguity was dangerous. The supply of nuclear officers could be manipulated such that the Navy never achieved a surplus of nuclear officers. Without a surplus, nuclear officers would *never* return to the old career path of the general line officer, the well-rounded model. Concerned by the prospect that one man might exercise a disproportionate influence over the officer corps, the board recommended and Chief of Personnel concurred in 1954 to terminate RADM Rickover's authority to select officers. Under the Bruton Plan, as early as 1955 the responsibility for nuclear officer selection should have shifted from Rickover to a board of officers, only one of which would be a representative from Rickover's organization.[102] But these approved plans to terminate Rickover's selection authority were never enforced. As a result of several contingent events, Rickover would remain the ultimate selection and assignment authority of nuclear officers for a generation, that is to say, 28 more years.

Laying the Foundation: Rickover's Training and Selection System

Rickover began to chip away at the Navy's conception of the 'line' by redefining in strongly technical terms what the nuclear 'line' officer should be. He did so by

[101] Ibid., 45.
[102] James L. Jr. Holloway, VADM USN "From Chief of Naval Personnel to Chief of Naval Operations, 1 Sept 1954, First Endorsement on the Report of the Senior Member, Board to Study the Personnel Aspects of Nuclear Power Utilization in the Navy of 20 August 1954", Naval Historical Center, Operational Archives, 00 files 1955, Box 11, Folder 7, page 3.

establishing far more rigorous academic and technical standards than the Navy had ever seen. He also established a new precedent of personal interviews that in most cases discounted an officer's service record and instead judged the applicant on his ability to think and reason through several technical questions. These techniques and standards were first applied in the meticulous selection and screening of officers for NAUTILUS, which can now be seen in hindsight as the precedent for Rickover's technocratic system of officer selection and training that followed. But at the time, it was unclear that *NAUTILUS'* high personnel standards would be applied to the leadership of an expanding nuclear fleet. A key issue was whether the nuclear officer would be, like Rickover, scientifically educated or would be an engineer more in the tradition of the ‘shop culture’, with practical experience similar to the steam ship or diesel navy.

There existed in the Navy a large pool of officers who were engineers in the old tradition, those who had been trained in the engine rooms first as enlisted men and then promoted into the officer ranks as Limited Duty Officers (LDO). Senior navy leaders proposed manning the new reactors with officers of this type and even considered an expanded program to tap promising junior enlisted men for officer rank followed by nuclear training.[103] Rickover, who was a product of an advanced and elite technical education, was immediately hostile to the idea of shop-engineers managing his reactors. To him, the requirement that his officers be scientifically educated was a core value that the larger engineering profession had adopted earlier in the 20th century.[104]

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103 James L. Holloway, Jr., VADM USN (CNP),"Ltr to CNO, Subject: Shortage of Nuclear Officers 15 March 1957", NHC 00 Files 1957 Box 12, Folder 11. Discussion centered on personnel shortages and the option of manning nuclear reactors with Limited Duty Officers (LDO) or in combination with enlisted men commissioned in the “Seaman to Admiral” program.

104 Monte A. Calvert, *The Mechanical Engineer in America, 1830-1910: Professional Cultures in Conflict* (Baltimore,: Johns Hopkins Press, 1967). See also Blair, 1954, 210, for Rickover’s opinion on the place of scientifically educated engineers.

To ensure that only those with a capacity for scientific training would enter his program, Rickover maintained a high bar for selection. The technical rigor of the nuclear program was from its inception something qualitatively new for the navy 'line'. While the earliest nuclear officers—Roddis, Dunford, Crawford and others—were accomplished EDOs with advanced technical degrees from MIT, some 'line' officers believed they would be held to a less rigorous scientific and technical standard. Rickover quickly dashed such 'hopes' when he demonstrated with the selection of Wilkinson and the first officers of *NAUTILUS* that technical requirements of even the 'line' were very high. Nuclear instructional courses exemplified the new level of technical rigor. Former diesel officers were required to study six days a week, twelve hours a day, to master the subjects of advanced mathematics, chemistry, physics, electrical engineering, heat transfer, fluid flow, reactor engineering principles, radiological control and so on.[105] Some officers, not familiar with the technology, criticized the level of engineering as "needlessly academic".[106] Officers were concerned that Rickover's rigorous scientific and academic standards might exclude a large percentage of the existing body of fleet officers. From the outset, Rickover used the requirement of high grade point averages in college to exclude many diesel submarine officers. Criticism of this practice, at least in the early years, was arguably invalid. In the first years of nuclear power, the technology was on the edge of the frontiers of science and engineering. The early operating procedures were scanty compared to what came later and relied to a remarkable degree on the knowledge of the operator. In this context, criticisms of Rickover's program as overly academic appear ill-informed. Rickover was creating a new machine without precedent. He

[105] Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982), 294-300.
[106] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 353.

needed in those early years a cadre of 'line' officers who were also capable of being scientific engineers.

Even if an officer possessed high grade point averages and test scores, he had to survive a series of interviews, including a personal interview with the admiral himself. Rickover personally interviewed every officer who entered his program and turned down more officers than he took, including many with superb military records as reflected in their fitness reports. Senior navy leaders questioned the value and purpose of his personal interviews.[107] However, a close examination of the context of the time offers evidence that Rickover was perhaps more justified in this method of selection than is commonly appreciated. Rickover's early practice of personal interviews and his rejection of many officers with superlative fitness reports were most likely necessitated by the poor condition of the officer reporting system of the 1950s. The Navy's system of evaluating officers had deteriorated in the post-war period, especially in the submarine force.

In a large bureaucracy like that of the Navy, an honest and accurate reporting system became critical to the efficient assignment of officers. When Rickover began building his elite cadre of officers, he discovered that the Navy fitness report and selection system had lost its capacity to report honestly the performance of officers. One retired four star admiral reflecting on this problem in the 1950s noted that submarine officer reports were among the least accurate and the most inflated.[108] Not surprisingly,

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[107] See Duncan, Polmar, and Rockwell for discussion of the more colorful aspects of the interview process. While other scholars have devoted considerable attention to the sometimes rough treatment Rickover meted out to young officers, this author and nuclear trained officer considers the issue irrelevant to our purposes. If naval historians made it there business to record every time a senior officer roughly treated a subordinate officer, very little else would be written. The Navy is a demanding and dangerous profession, and Rickover was hardly unique in possessing a rough manner.

[108] Harry Depue Train, ADM USN, Interview with the Author, 2 November 2007. Admiral Train explained that surface officer fitness reports were relatively objective, but that submarine reports were the most

Rickover and his staff found many officers unfit for the program despite a service record filled with superb fitness reports. The problem of inflated reports grew so troublesome that one CNO of this period would chastise an assemblage of his flag officers as to the gross deficiencies in the officer evaluation system.[109] This tendency toward grade inflation had apparently been going on for years and had thus compromised years, perhaps decades, of fitness reports. The misleading nature of the reports became all too obvious when the fitness report was contrasted with several hours of personal observation by Rickover and his interview team.[110] Faced with a suspect system of officer reports, Rickover's interviews appear in a different light than is commonly portrayed. Another challenge that confronted Rickover in the early years and helped shape his personnel program was the growing shortage of line officers, good or bad, anywhere in the fleet.

Nuclear ships were manpower and officer-power intensive, requiring significantly more personnel than diesel boats. The NAUTILUS had been manned in a time of relative personnel surplus, a condition that changed over the next few years. The surplus in personnel that existed in the first half the 1950s was replaced in the later half of the decade by severe shortages.[111] Fleet personnel levels reflected the shortage: in five years,

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inflated. James L. Holloway, III, ADM USN (CNO), Interview with the Author, April 26, 2007. Admiral Holloway recollected occasions in the 1950s when he felt compelled to challenge other officers who routinely inflated fitness reports. Crawford and Wegner also confirmed the unreliability of fitness reports was one of the early reasons for Rickover's insistence on lengthy series of interviews.

[109] George Anderson, ADM, USN,"Personal Papers", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Boxes 40, 43, 51-53, 15 Feb 1962, MFR by Kidd of Anderson's remarks at CNO Conference. Admiral Anderson bluntly chided his audience about 'grade inflation' and observed that not every officer deserved the opportunity to compete for admiral, and that serving flags must begin by "…pointing out deficiencies as they came to our attention." See also Crawford letter of 5 March 2007.

[110] John W. Crawford, Jr., Captain, USN, Ltr from Crawford to Hagerott, 5 March 2007. Observation of grade inflation also confirmed in interview with Admiral James Holloway, III, on 26 April 2007.

[111] Arleigh Burke," Personnel Situation in the Fleet, CNO Memorandum 7 Feb 1958", Naval Historical Center, CNO 00 files, 1958, Box 11, Folder 16.

manning had fallen from a navy 94% manned in 1953 to only 81% manned in 1958.[112] In an environment of personnel shortage, Rickover was compelled to compete aggressively for officers but had at the same time to be especially careful to identify and reject poor quality officers whom the system, loath to lose any more bodies, had failed to screen out. In addition, the diesel force numbered well over a hundred boats in this period and for several years competed with the growing nuclear fleet as an equally viable career alternative to nuclear submarines.

Rickover's problem of personnel was further complicated by inconsistent support from the senior ranks in the early years. Navy senior leaders who eagerly supported the construction of the hardware (reactors) were less supportive in matters of personnel and training, and not infrequently resisted elements of Rickover's manning plans.[113] Facing Navy-wide personnel shortages, the Bureau of Personnel did not accede to Rickover's early requests for additional manpower. In response to one of Rickover's cogently and persuasively argued requests for extra personnel, the Chief of Personnel, in violation of his own earlier endorsement of the Bruton report, which recommended over-manning in the field, wrote to the CNO that nuclear training resources were adequate and, in current circumstances, the Navy "cannot afford overtraining in any field." [114] The shortage of

[112] James L. Holloway, Jr., VADM USN (BUPERS),"Memo to Asst Secretary of the Navy, dtd 22 Nov 1958, Subject: Current Active Duty Strength Levels", NHC, 00 Files, 1958, Box 11, Folder 16, Personnel.
[113]James L. Holloway, Jr., VADM USN (CNP),"CNP memo to CNO 20 Dec 1956, Subj: Training Facilities at Nuclear Reactor Testing facility, Idaho Falls, ID, " NHC 00 1957 Box 12 Folder 11. See dispute over Rickover's request for additional support at the remote training and testing site in the Idaho desert. As the Navy staff declined Rickover's request, the VCNO was warned of Rickover's possible response to the rebuff. Most interesting is covering note penned by the VCNO who dismissed Rickover's requests with the note: "So What!" See CNP memo to CNO 20 Dec 1956, Sub: Training Facilities at Nuclear Reactor Testing facility, Idaho Falls, ID, NHC 00 1957 Box 12 Folder 11.
[114] James L. Holloway, Jr., VADM USN (BUPERS),"Chief of Naval Personnel to Chief of Naval Operations, memorandum dtd 12 Feb 1957", NHC, 00 Files, 1957 box 12 folder 11.

officers and men at this early stage in the program no doubt contributed to Rickover's penchant to carefully and jealously control the assignment of his personnel.

There existed, however, another means to mitigate the manpower shortages and, at the same time, possibly minimize human error: the use of more automation in the engineering plant. Though faced with shortfalls of quality personnel, Rickover refused to pursue increased automation of his engineering plants. There were apparently two reasons for the rejection of automation. Rickover was an officer himself shaped and matured in the machine age where he had minimal, if any, exposure to modern computers. To Rickover, automation was anathema, and he had grounds for his bias: computers and automated systems in the later 1950s were perhaps good enough for the Census Bureau and payroll companies but were a risky bet when wagering the safety of a nuclear reactor pier-side in a large city.

Rickover's distrust of computers and automation was not, in the 1950s, unique. Arthur Norberg in his study of computer technology noted that military personnel in the 1950s were sufficiently fearful of automation that overcoming such a bias was a high priority in early computer programs.[115] Boslaugh in his detailed study of the Navy's first mobile digital computer network also records substantive officer resistance to automation.[116] But whereas the remainder of the Navy eventually embraced automation-

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[115] Arthur L. Norberg, Judy E. O'Neill, and Kerry J. Freedman, *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986* (Baltimore: Johns Hopkins University Press, 1996), 11, footnote 27.
[116] David L. Boslaugh, *When Computers Went to Sea: the Digitization of the United States Navy* (Los Alamitos, Calif.: IEEE Computer Society, 1999), 397. According to a survey conducted in the early 1960s, 19 out of 20 officers polled resisted the idea of an automated command and control system on their ship.

-in the surface navy, computers were sometimes given control of entire weapon systems[117]-- the nuclear program resisted automation for a generation.

Rickover inculcated into his staff and wrote into the organizational principles an aversion to automation. While a bias against greater automation may have been well advised in 1955, the validity of this bias was undermined as computers proved increasingly more reliable. Yet, this early aversion to automation tended to manifest itself in design characteristics of the technology (e.g., continued reliance on manual valve operations) that in turn perpetuated higher levels of officer and enlisted manning for years to come.[118] The failure to simplify and automate nuclear technology thus invalidated one of the key assumptions of the Bruton Report: that lower quality officers could be relied upon to operate a mature technology as compared to a technology in its 'break through' stage. Bruton had written: "Especially in operational field….the trend is toward simplicity (the more difficult 'break through' may have already occurred) with the result that new personnel of generally lower quality than those now in the field should be able to carry on." [119] Without the benefits of automation, the program faced greater difficulty in attaining an officer surplus. The officer surplus was the essential condition stipulated in the 1954 study, without which a return to the 'well rounded career' would be delayed indefinitely.

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[117] Perhaps the best example of the non-nuclear navy's embrace of computers and automation is found in the surface navy, in particular, on AEGIS cruisers and destroyers where the option exists that a captain can turn over to the computer program complete control of missile systems, known as "auto-special".

[118]Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 308. Duncan quotes the "Principles of the Naval Nuclear Propulsion Program", issued in March 1979: "Use simple systems design so that reliance was placed primarily on direct control by trained operators rather than on automatic control." That Rickover's early bias against automation could shape for generations the attitude against automation is not unique. Such a trans-generational phenomenon known as "historical lock-in" or "path dependence" has been well documented. For the earliest articulation of the ideas of "path dependence" see Paul David and his very accessible work on "QWERTY". See Paul David, "Clio and the Economics of QWERTY," *American Economic Review*, 75, no. 2, 1985

[119] H.C. Bruton, RADM USN,"Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", 20 August 1954", NHC 00 Files 1955 Box 11, Folder 7, see page 32.

Rickover may have resisted automation due to his unfamiliarity with the technology. He was old and approaching retirement on the first day NAUTILUS put to sea. But such an explanation may not do justice to the admiral's bureaucratic intuition, especially as it relates to the issues of officer corps reform and social power of an organization. Rickover, an officer who had observed the rise to power of aviation and the eclipse of the surface navy, could not have failed to notice that part of the aviators power emanated from numbers, not so much numbers of planes, but numbers of pilots. Automation of reactor technology would reduce the number of officers and men who could then rise to senior ranks and to command. Though POLARIS will be discussed in more detail later in this chapter, at this juncture a comparison of the nuclear program with that of the POLARIS missile program may help to illustrate the inverse relationship between automation and social power.

The POLARIS nuclear missile program in the 1950s and early 1960s was briefly considered by naval officers to be the more important and sought-after career experience than nuclear power.[120] But POLARIS was highly automated and consequently required relatively few officers and men to maintain and operate the system. In contrast, nuclear power was the most man-power intensive of the submarine technologies, even more so than the older diesel technology it supplanted. Therefore, in relative terms, it was not POLARIS but nuclear power that rapidly generated officer billets and produced greater social power within the Navy. The more manpower intensive technology required more operator officers and thus generated more officers who were then available to promote to command. The technology with the greatest number of officer progeny had a greater

[120] To be a Weapons Officer on a POLARIS boat was considered at one time a coveted post and beneficial to a career, but the appeal and value of such assignments gradually declined over time. J.A. Sagerholm, VADM USN, Interview with the Author, 11 July 2007.

likelihood to shape the institution to better meet the needs of the parent socio-technical community (nuclear power, less so POLARIS). Eventually, POLARIS officers were eclipsed by nuclear trained officers, and the separate community of missile officers was terminated in the 1980s. While there is no written record of that, Rickover made an explicit connection between labor-intensive technology and social power; this line of thinking and strategizing remains a possible consideration in the admiral's policy that limited labor saving innovation in the reactor plant.

With each new reactor the numbers of nuclear trained personnel, without the offsetting benefits of automation, increased at a rapid rate. In addition, the number of nuclear trained officers grew quickly because almost a third of all nuclear submarines, the ballistic missile submarines, to be discussed later, required two full crews. With each new submarine reactor, Rickover had the opportunity to select and then shape one or two new commanding officers, men most likely destined to be future leaders of the Navy. Rickover continued to solidify the precedent he set with Wilkinson: that he, the Engineering Duty Officer, would select the future 'line' commanders. Like Wilkinson, the captains who followed had to demonstrate a high propensity and capability to master scientific engineering principles. Most of the first generation of nuclear captains who followed Wilkinson— Calvert, Anderson, Zech, and Peet—were among the most talented and the most technically capable officers in the fleet.[121] They were the 'first generation' of Rickover's maturing system of training and selection.

[121] Wilkinson was an engineer and had personally completed reactor core calculations at Oak Ridge; Calvert and Zech possessed top intellects, one a former medical school student and the other a son of a doctor; Peet, the first surface officer, was a top student and graduate of MIT. The pattern of scientific and engineering excellence was solidified with the selections that followed.

Building the Walls: A Technocratic Training Organization Matures

The training experience of the first officers was informal, though demanding and highly technical. During this early time the number of officers required in the program was comparatively few and as such the officers could be accommodated in close proximity to Rickover's office spaces. James Calvert and Lando Zech, future vice admirals, and William Anderson, a future congressman, studied within ear-shot of Rickover and met frequently with the admiral, bringing along not golf clubs but bundles of physics and engineering books.[122] As the program matured, the training demands on these officers grew progressively more formalized. Ray Peet, the first surface nuclear officer, who entered the program after Calvert and Zech, qualified at two nuclear prototypes and spent a year with Rickover's staff, followed by several months in a conventional engineering plant.[123] Not only in their selection but also in their rigorous training, Rickover mentored, monitored, and shaped the future leaders of the navy.

Given the unprecedented manner in which the EDO Rickover selected, assigned, and shaped the future leaders of the navy, it is puzzling that at this early juncture the Navy's leading line officer, the CNO, did not intervene to curtail Rickover's growing influence over the 'line'. The Bruton Report as early as 1954, endorsed by Chief of Naval Personnel, recognized the danger of Rickover's personnel practices and recommended he be removed from the selection process of nuclear officers. But the Navy's senior line community did not act to limit Rickover's selection authority, and on

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[122] James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007; Lando Zech, VADM USN, Interview with the Author, 3 August 2007; William R. Anderson, CDR, USN *Nautilus 90 North* (New York: The World Publishing Company, 1959); James Calvert, *Surface at the Pole* (New York: McGraw Hill Book Company, 1960).

[123] Raymond Peet, VADM USN, Interview with the Author, 12 July 2007.

the contrary, in 1958 a CNO directive further solidified Rickover's unique position. The failure of senior 'line' officers to intervene held portentous consequences and requires explanation.

Admiral Carney, the CNO at the time of the Bruton Report, was several years senior to Rickover and had taken a relatively slow approach to the development of nuclear power. Carney, however, served a short tour as CNO and was replaced in 1955 after only two years. Therefore, Carney had only a few months in office following the completion of the Bruton Report in 1954 to take action against Rickover. As such, he had not the time or perhaps inclination to strip Rickover of his authority to select commanding officers as was recommended in the Bruton Report. Admiral Burke, Carney's relief, was one of the most junior CNOs on record and was selected for the top job in part due to Burke's enthusiastic embrace of new technologies. Burke was on record as an enthusiastic supporter of nuclear power. In less than a month after he took the helm as CNO in August 1955, Burke announced that all future submarines were to be nuclear, thus marking the beginning of the end of the independent diesel force. In testimony before Congress a few months later, Burke described nuclear power as the most revolutionary innovation since steam, and he insisted that for both submarines and surface ships nuclear power was "…not only warranted but mandatory."[124] For whatever reason, Burke did not act on Bruton's and Holloway's recommendation to limit Rickover's authority, but instead appears to have become one of his most enthusiastic supporters, at least initially.

[124] Burke, as quoted in Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 267. For discussion of decision to terminate diesel construction see page 265.

The development of the POLARIS submerged-launched ballistic missile, carried by a nuclear submarine, raised the stature of both Rickover and his program. Burke's enthusiasm for nuclear submarines, and by extension, those who could deliver and man them, grew stronger when the Soviets shocked the world with the launch of SPUTNIK in October 1957. Burke apparently was present at the National Security Council Meeting in November 1957 when the Army Science Advisor proposed to the President that he accelerate POLARIS submarine construction as a counter to the Soviet missile breakthrough evidenced by Sputnik. The planned number of Polaris submarines was increased modestly a few days later. [125] The SPUTNIK crisis further played a role in solidifying Rickover's position in the Navy and in personnel matters. Just days after SPUTNIK shocked the nation, Rickover's reactors went 'critical' at the civilian nuclear plant in Shippingport, PA. Shippingport, Rickover's creation, was of such importance that President Eisenhower portrayed the event as a symbol of American technological strength.[126] Perhaps influenced by Eisenhower's enthusiasm for naval nuclear reactors, in the first days of January 1958, Admiral Burke solidified Rickover's control of nuclear personnel. Burke issued several CNO and BUPERS directives that granted to Rickover near complete authority over the selection, training, and assignment of personnel for

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[125] G. S. Patrick, RADM, USN (Director, Atomic Energy Division),"Nuclear Shipbuilding Program, Memorandum for Files of Mtg 26 November 1957 between Burke, Felt, Rickover, Mumma, and Patrick, " BUSHIPs Papers, Conversion Program, 1957 June-Sept, Box 87 (Author has copy) See also Hewlett, 1974, 313 for recollections of NSC meeting; 314 for discussion of JCS deliberations which resulted in recommendation to increase POLARIS submarine production by one.

[126] Stuart W. Leslie, *The Cold War and American Science: the Military-Industrial-Academic complex at MIT and Stanford* (New York: Columbia University Press, 1993), 158. Leslie provides a discussion of Eisenhower's Atoms for Peace, and the key role played by Rickover. Fortuitous timing made Shippingport especially significant. Rickover's reactor achieved criticality at Shippingport, PA on 2 December 1957, during the depths of Eisenhower's public affairs crisis following SPUTNIK. The launch of nuclear ships also provided the Eisenhower Administration more Cold War bragging rights. See Duncan, 1990, pp. 2-3 for discussion of the timing of both LONGBEACH keel laying and Shippingport start up, both reported to Eisenhower.

nuclear ships.[127] Political contingency and a young, perhaps impressionable, CNO had thus undone the recommendations of the Bruton Board. Rickover's position as the sole selection authority for nuclear ship captains and young officers was now all but permanent. Only the admiral's health and his statutory retirement at age 62 could remove him from his privileged position in the nuclear navy. Burke would come later to regret his failure to limit Rickover's authority in personnel matters.[128]

With the 1958 CNO and BUPERS directives in hand, Rickover now moved more aggressively to find and better train personnel for his reactors. To sustain the building rates of the nuclear program, it became evident he needed a more efficient system for training nuclear officers. The nuclear training program he created became one of the nation's most important technical training institutions in the second half of the 20th century. This system of schools would eventually train the bulk of all nuclear engineers and technicians, as well as the operators of naval reactors, a vast number of whom would go on to populate America's civilian power industry. As important as it was to the construction and operation of most nuclear reactors in the United States, the Navy's nuclear engineer training program had an additional effect. As will be discussed later, this system of schools would take priority and precedence over tactical schools, graduate education, war colleges, and would exert a shaping effect on undergraduate education of Navy and Marine Corps officer alike. The creation of this technical school system did not come easily and proved to be a bureaucratic battleground.

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[127] Chief of Naval Personnel to Distribution, Personnel and Training Aspects of the Nuclear Propulsion program, BUPERS Instruction 1540.38, December 31, 1957, as referenced in Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 345.
[128] David Alan Rosenberg, Interview with the Author, 15 June 2007. Rosenberg is recognized as one of the leading experts on Admiral Burke. Burke apparently in conversation with Rosenberg conceded he had made a mistake in not retiring Rickover. Admiral Zumwalt, a future CNO, would also observe that Admiral Burke was the last CNO who "…could have stopped Rick". Elmo R. Zumwalt, Interview with Norman Polmar, 4 April 1979.

There was at first general agreement that the development of nuclear 'line' officers required two training phases: a theoretical classroom phase of approximately six months followed by a more practical, hands-on phase also of six months duration. The classroom phase did not provoke controversy. Rickover's staffing of the technical school was accepted without dissent by the 'line'. It was the second phase, the practical training phase, that proved to be a point of contention between the major tactical organization, COMSUBLANT, and the major technical organization, Rickover's Naval Reactors.

At issue was the proposal to conduct the practical, hands-on nuclear training course at the Submarine School in New London, CT, the most tactically oriented submarine base in the country. The plan also proposed that simulators would substitute for training on an actual reactor. Rickover saw the contest over location and simulators as an early battle for control of the minds of his young officers. His opponents in the battle were the tactical-minded, diesel-submarine veterans of the Second World War. Rickover's rival was the senior diesel veteran commander, the admiral in command of COMSUBLANT, RADM George C. Crawford, USN.[129] Convinced of the high stakes, Rickover rejected the use of simulators (though this practice was soon to be common place in much of the rest of the Navy) and instead trained his officers and men on actual nuclear reactors in locations removed from New London, a practice that persisted to the end of the century.[130] To further isolate his young officers from early exposure to fleet

[129] Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982), 296-297. According to Polmar, Rickover saw the submarine school of New London and other sub bases (e.g., Charleston) as "social clubs" with an educational process based on tradition and lore. When COMSUBLANT, RADM George C. Crawford, USN, began preparations to train nuclear officers in 1954, Rickover moved to formalize his training process, the first steps of which were taken while the crews for *Nautilus* and *Sea Wolf* were in training. Agreement was reached in later 1954 to shift nuke training away from Crawford. See also Hewlett and Duncan for similar renditions of the issue.
[130] Jack Crawford, Rickover's deputy, no relation to RADM Crawford, explained that an additional, though not widely appreciated, reason for Rickover's insistence on prototype training was monetary. By

influences, Rickover moved his theory school (nuclear power school) from New London to Mare Island in late 1958.[131]

Rickover's creation of an independent training organization that answered only to him could be interpreted as a power-play directed against the tactically-minded diesel officers. It was that, but it was also something more. In the 1950s there was another reason that Rickover sought isolation from the non-nuclear fleet: he feared that his program would be infected by what he saw as corrupted training and manning standards. By contemporary standards of the early 21st century, the larger Navy's training and personnel policies at mid-century were substandard. An indicator as to how low the Navy's training standards had fallen is found in the policies advocated by the highest ranking officers in the Navy. Policies proposed by both the CNO and VCNO in early 1958 are illustrative of the poor conditions and standards in the fleet. Faced with severe manpower shortfalls, the VCNO, Admiral Felt, suggested as a remedy a deliberate policy of mediocrity: Felt suggested the Navy provide lower quality training to officers and men. The admiral's rationale was that higher quality training made the officers and men more appealing to civilian industry, which then lured the officers away. To Felt, high quality training resulted in reduced retention and more personnel shortfalls. Not to be outdone by his Vice, the CNO suggested that many ships be purposely undermanned. The savings in personnel would then enable the Navy to fully man a small number of ships or squadrons. The fully manned ships would be expected to operate at higher standards and

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conducting training at the prototypes, the program was able to spread the financial cost of reactor operations across training and testing budgets.

[131] A second nuclear power school followed in Bainbridge, MD, in 1962.

could then serve as ‘elite’ examples for the remaining units to emulate.[132] These proposals would be anathema to a nuclear engineer in the midst of creating a new engineering organization. Upon hearing of such proposals from the CNO, Rickover no doubt further resolved to isolate his program from larger fleet influences, and to develop the manning and training programs that he was convinced were not only desirable but essential to the safe operation of a dangerous new technology.

Rickover’s personnel selection, assignment, and training organization matured rapidly in the 1950s. The design of Rickover's training organization and screening process were informed by a technocratic philosophy, but they also responded to identifiable deficiencies in navy personnel, evaluation, and training policies. When Rickover identified a navy deficiency, he acted to correct the flaw or to shield his program from its effects. Given his aggressive nature, it would seem logical that if he had detected a deficiency in the Navy's educational system he would have early in the 1950s intervened at the Naval Academy or at the graduate school. Moreover, Rickover's nuclear system was a knowledge-based and education-dependent organization, much more so than the skill-based technology of naval aviation. As such, it might be expected that Rickover’s program would have made early demands on the Navy’s collegiate educational institutions. However, for most of the 1950s, while his program was small in size, Rickover made modest demands on graduate education and refrained from any significant intervention at Annapolis. As a consequence, both undergraduate and graduate institutions of the Navy continued to prioritize as their main mission the general education of unrestricted 'line' officers.

[132] CDR Baxter CNO-Staff,"Minutes of Meeting Between CNO, VCNO, and BUPERS to Discuss Personnel Shortages, dtd 21 Feb 1958", NHC 00 files, 1958, box 11, folder 16.

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Nuclear Power and Collegiate Education: Indifference and Detachment

From 1949 to 1958 the Naval Academy curricular debate is best characterized as conventional and sedate when compared to what was to come in 1959-69 when Rickover began to intervene. In the 1950s, before Rickover became actively involved in the academy's affairs, there existed no powerful organizational or technological driver for change. There were minor additions to the curriculum in support of a series of technological innovations, to include radar navigation, updated fire control computers, and avionics equipment. But the last major technological driver--aviation-- was by the 1950s a source of conservatism. No other technological innovations, important as they might prove to be in the fleet or industry, exerted any appreciable effect on the general pattern of officer education at the academy. Perhaps not coincidently, none of the post-war technological innovations were manpower intensive, with the exception of nuclear power. But in the 1950s, the number of reactors remained small, as did the demand for nuclear engineers.

The lack of curricular change in the 1950s should not be interpreted, however, as a lack of curricular awareness on the part of naval officers and faculty at Annapolis. Annual Board of Visitors reports and three internal curriculum reviews conducted between the end of the Second World War and 1959 carefully evaluated the academy and found its program generally satisfactory. The lack of substantial change was not a sign of neglect, as later engineering educators would charge, but more a sign of satisfaction with a program of general education.[133] This sense of validation was articulated by the chairman of the English and History and Government Department, Capt J.F. Davidson, a future superintendent, who wrote on 26 Feb 1953 of the curriculum:

> "The basic concept of a prescribed curriculum for all midshipmen, except for the choice of language, is sound; it has not yet been impugned by any informed group who have examined it, including the Stearns-Ike Board and the Annual Board of Visitors. In the past three decades minor alternations and additions have been made but no revolutionary one has been contemplated. Very much as a Liberal Arts College provides the foundation for later specialization in the Schools of Medicine and Surgery, so the Naval Academy provides the educational background for the future naval officer who gets his specialized training at sea and in the various post graduate schools of the Navy and of civilian life. The basic training at the Naval Academy should be such as to equip the officer to understand the world about him, human and material, as specialized training and living experience come to him in the succeeding years …"[134]

By the late 1950s aviation technology, the former motive force for change, was all but spent as an instigator of curricular change, and some of the aviation-inspired changes had in fact been rescinded. The failure of aviation to permanently shape educational programs is perhaps not hard to explain: the human demands of naval aviation operations had been from its origins in 1920s more skill-based and physical than they were curricular or scientific. But by the middle of the 1950s, aviators and educators alike were coming to the conclusion that an aviation-centric focus was approaching the end of its usefulness. The head of the Aviation Department, Capt R. Weymouth, wrote to the Secretary of the Academic Board on 31 October 1957: "It is my opinion that the Aviation Department, as a separate entity, has about finished its usefulness to the Naval Academy

[133] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 241. Sheppard notes that Dr. Folsom, the leader of the Rickover inspired review committee in late 1959, accused the academy of being complacent in its attention to curricular matters.

[134] J.F. Capt USN Davidson,"Head of Dept of English, History, and Government to Secretary of Academic Board, dtd 26 Feb 1953, " RG 405, USNA Special Collections, Curriculum Studies, 1948-57, box 2, folder 11).

because of the gradual absorption into the Academy as a whole of the educational material and professional outlook on naval aviation for which the department was designed to establish. It appears to be time to revamp the academy organization *along unified lines which assure a balanced regard for all facets of navy line endeavor*."[135] (my emphasis)

While the curricular importance of aviation was declining at Annapolis, the influence of nuclear power was throughout the decade modest and almost transparent. The Bruton Report of 1954 recommended relatively minor changes to the Naval Academy curriculum: the addition of a nuclear simulator; modification of the internal combustion engine course to include additional hours of nuclear engineering; additional hours in fundamental chemistry of the atom; and the addition of high school physics as an admission criterion. All the recommendations with the exception of the physics requirement were endorsed by the Chief of Bureau of Personnel.[136] A few years later in 1956, the faculty, not naval reactors, proposed one additional course devoted exclusively to nuclear engineering.[137]

In the absence of any particular technological driver, the academy leadership and faculty nonetheless initiated a detailed curriculum review in early 1957. The timing of the academy review was, in hindsight, fortuitous. After the review had been started, the

[135] R. Weymouth, CAPT USN,"Head of Aviation Department to Secretary, Academic Board, 31 Oct 1957, Subj: Curriculum Review, 1957-58", RG 405, USNA Special Collections, Curriculum Studies, 1938-57, box 2, folder 12, page 2.

[136] H.C. RADM USN Bruton,""Report of the Board to Study Personnel Aspects of Nuclear Power Utilization in the Navy", " NHC 00 Files 1955 Box 11, Folder 7, page 39; James L. Jr. Holloway, VADM USN "From Chief of Naval Personnel to Chief of Naval Operations, 1 Sept 1954, First Endorsement on the Report of the Senior Member, Board to Study the Personnel Aspects of Nuclear Power Utilization in the Navy of 20 August 1954", Naval Historical Center, Operational Archives, 00 files 1955, Box 11, Folder 7, page 3.

[137] W.T. Shields,"Memorandum from Head, of Aviation Department, W.T. Shields, to the Superintendent, US Naval Academy, dtd 2 Mar 1956", RG 405, Special Collections, Curriculum General Correspondence and Special Topics 1923-1962, box 5, folder 1.

Soviet satellite SPUTNIK humiliated the United States in October 1957. In the search for a scapegoat, the politicians focused not on the military program managers and scientists, but on educational programs. In an effort to correct perceived educational deficiencies, Congress passed what became known as the National Defense Education Act of 1958.[138]

Despite the panicked finger-pointing and the calls for a curricular revolution in engineering and science education, at the Naval Academy a general calm was observed. The calm was perhaps attributable to the long traditions of the institution, and the simple fact that naval officers had been on the leading edge of technological innovation longer than perhaps any other national institution, save the Army and West Point. Not surprisingly, then, the Naval Academy's review *did not* recommend a curricular shift toward science and engineering at the expense of broader, general education. Rather, the academy review recommended an increased emphasis on educational fundamentals and a balance slightly more *favorable to foreign language and the humanities*. This plan would, however, by the end of the decade come into direct conflict with the needs of the reactor and the technocratic philosophy of Admiral Rickover.

Graduate School and War College

It was entirely reasonable that Rickover and his program could make demands on academia. Rickover and his reactor specialists had in the first years worked closely with a small number of graduate institutions, in particular, MIT. But this active and close cooperation would soon fade. Rickover's relationship with graduate school programs

[138] Barbara Barksdale Clowse, *Brainpower for the Cold War: the Sputnik Crisis and National Defense Education Act of 1958* (Westport, Conn.: Greenwood Press, 1981).

might be best described as an inverse relationship: as nuclear power grew in stature, as the nuclear training schools and reactor fleet expanded, the relative value attached to education at the graduate level declined.

The Bruton Report of 1954 had explored several alternative sources for advanced nuclear degrees at civilian universities but determined the nation's university system was inadequate, with the exception of MIT. The Bruton Study recommended instead a substantive role for NPGS, to include the lion's share of degrees in the field of naval nuclear engineering. If experience with previous naval technological innovation was any guide, the NPGS might well have become a major center for the study of nuclear power.

With time however, the relationship between Nuclear Power and the Navy's Graduate School deteriorated, a pattern at variance with other technologies that emerged at mid-century.[139] Instead of a closer relationship between nuclear technology and graduate schools, Rickover began to oppose lengthy academic graduate education in nuclear engineering and disparaged the graduates from such courses as "poorly educated". Rickover described the nuclear studies at NPGS as so ineffective that after two years students gained about as much new knowledge as "…could be put into a thimble."[140] Without Rickover's support, the nuclear field at NPGS declined, and its graduates gradually faded from the forefront of nuclear power leadership. By the middle 1960s, the trend was clear: the nuclear programs at both NPGS and MIT received less support from Rickover, and the education of the prospective nuclear EDOs shifted toward

[139] NPGS did indeed play a critical role in the other profound technological development of the mid century, that of the digital computer network. Many of the navy's pioneers in the field—especially those associated with the first mobile computer network NTDS—attended or even taught at the university. Some of the leading computer pioneers of the century, in particular, Gary Kildall, the developer of DOS, taught as an officer at Monterey.

[140] House Committee on Appropriations, Testimony of VADM H.G. Rickover on Nuclear Propulsion, 87th Cong., 2nd sess., 1962, USNA General Collection, Y4.AP6/1: 36/5:62/pt 6 28-29.

industry sites, in particular, the Bettis facility.[141] Line officers attending the year long Bettis-type schools were also less likely to attend graduate school though they were sometimes encouraged to view their training as the equivalent of graduate school. But these training schools were not graduate schools but rather highly demanding training establishments.[142]

The reasons for the failure of NPGS or civilian universities to continue to play a substantive role in the field of naval nuclear power are unclear. Some officers close to Rickover attribute the declining role of graduate schools to Rickover himself, to his concern that graduate education required he cede some of his control over his officers.[143] Rickover's concern may not have been misplaced. Navy graduate school policy for line officers (URLs) changed significantly in 1959 with the adoption of a strict ‘pay back’ requirement for URL officers who attended graduate school. The strict 'pay back' requirement came about as a result of plans to drastically reduce the number of EDO

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141 Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992), 382. Rockwell discusses the decline in the quality of nuclear graduate engineering education. He explains that the earliest members of Rickover’s staff were educated at the best graduate schools. With time, and especially with the decision to shift EDO education away from formal graduate universities to Bettis, however, the community set into a pattern of long decline with negative consequences for development work.

142 Thomas H. Taylor, LCDR USN, "Nuclear Power Training," *US Naval Institute Proceedings*, 89, no. 7, July 1963, 133: “Time permits only a smattering of understanding for most students before a new subject must be undertaken. The course has been publicly described as being on the graduate level. It would be far more accurate to describe it as an outstanding training program, instead of an experience in graduate education.”

143 John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007. Crawford said that the idea to establish an accelerated school for the navy’s nuclear engineers (Nuclear Power School) did not originate with the staff but with Rickover himself. Apparently Crawford and other Navy MIT grads were not fully supportive of this idea, and argued that nuclear ED officers should complete graduate education at leading universities. Crawford expressed the opinion that the nuclear training became a substitute for rigorous graduate school. In considering why Rickover eventually rejected MIT as an educational option for his officers, Crawford concluded that it was ultimately an issue of control: Rickover could not control MIT. Rickover, according to Crawford, thought the MIT students were wasting time. As evidence of this attitude, Crawford recounted how Rickover sent some officers to investigate the navy officers studying at MIT to determine if they were wasting time. Crawford also speculated that Rickover wanted training on his systems as they existed at the time. Rickover was not interested in building a cadre of officers who could innovate in the nuclear field later in their careers.

officers in the Navy. As EDO officers were planned for reduction, the shortfall in technically trained officers was to be compensated by an increase in URL technical education. After graduate school the 'line' officers were then suppose to fill a technical billet related to their field of graduate study. With such a new system, Rickover faced the possibility that, should his scarce nuclear officers attend graduate school for two years, he might lose an additional two years service as these officers ‘paid back’ their educational debt somewhere outside his program.[144]

With regard to the upper level professional military educational institutions, Rickover in the early years appeared indifferent. The Naval War College and its joint equivalent, the National War College, remained isolated from the effects of nuclear innovation, at least in the 1950s. The curriculum at war colleges was modified to include unclassified discussion of the operational and strategic implications of both POLARIS missiles and the nuclear submarine. Officers from all communities in the Navy still considered attendance at a war college to be an important step for career development. In the 1950s nuclear trained officers continued to attend the war college at relatively high rates, though the nuclear officers constituted a small community throughout the decade.[145] A more useful indicator of the relationship between the war colleges and the nuclear program was the promotion success of nuclear officers who attended war colleges. When viewed in this way, the nuclear and King-models appear to co-exist.   A large share of the first generation of nuclear flag officers—Wilkinson, Zech, Calvert, Peet, Long, Shear,

[144] R.T.S. Keith, RADM, USNR,"Billet and post-graduate educational requirements in the specialty areas in the line of the Navy, Report of Board 1 October 1959", NARA RG 24-470-54-25-6 box 5
[145] Promotions and attendance rates by all officer groups at Newport, discounted for the diversion to NDU, was more or less constant in the 1950s. The numbers of officer graduates from classes 55-59 numbered six dozen, a decline from earlier years, but when NDU is accounted for, the numbers are roughly steady. For more detailed analysis of graduates and flag promotions, see U.S. Naval War College Register of officers, 1884-1970, held at the War College Archives.

Holloway—attended either the Naval or the National War College. Almost all of these nuclear officers matriculated at the war colleges *after* they had become Rickover's men. Thus it seems Rickover had been supportive, or at a minimum acquiesced, as the first generation of nuclear leaders 'rounded out' their careers by attending a war college.

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Nuclear Power and the Fleet: The King System Sustained, for now…

Rickover used the 1950s to build a small but highly effective personnel system of selection, assignment, and training that began to chip away at the traditional values of officer development and laid a foundation for a new model of the 'line'. As registered in personnel manuals and publications of this period, the 'generalist' model continued to occupy its privileged position in the Navy. However, there were at least some signs in the lower ranks that support for the old King system had begun to erode. Whether this dissent was in response to Rickover's agitation is, however, unclear.

An analysis of changing officer policy and attitudes is facilitated by the fact that the same publications examined in the immediate post-WWII period remained in publication and were updated to reflect changes in the later 1950s. These publications provide evidence that the model of ‘line’ remained within the outlines devised by King some forty years before. The BUPERS manual of 1959 edition continued to emphasize the need for service school education and the need to understand the full spectrum of service capabilities as well as those of the joint force, the Army and the Air Force. Though a new and revised edition was published in 1959, the words in the manual remained essentially unchanged from the 1942-48 editions. Line officers were exhorted to attain "…a thorough grounding in the principles and methods of naval strategy and tactics and of joint operations with the other branches of the armed forces…Education for supplying such knowledge and for the development of doctrine and good military character is necessary throughout our naval service." [146]

In addition to the BUPERS Manual, the widely read and navy-sanctioned *Naval Officer's Guide* and *Armed Forces Officer* both urged young officers to pursue a "rounded" and integrative career. The *Armed Forces Officer*, published initially in 1950 and republished in 1959, included a chapter entitled "Planning Your Career". The text acknowledged the need for specialists, but decisively advocated the 'well rounded' officer as the ideal type for which the young 'line' officer should aspire: "The health and progressive spirit of the services come of the many-sided officer who can make not one career for himself but three or four."[147]

Ageton's 1960 version of the *Naval Officer's Guide*, the fifth edition, endorsed as accurate and authoritative by the Chief of BUPERS, VADM Smedberg, continued to emphasize the need for a 'well rounded' or integrative career. The *Guide* described the need for joint and service college and the need for all officers to understand the strategic and policy issues that confronted political leaders.[148] The Navy went a step further and disseminated official policy documents that included graphical representations of the 'ideal' career path for which line officers should strive. "The Manual of Qualifications

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[146] Navy Department Bureau of Navigation/Personnel,"BUPERS/BUNAV Manual", Naval Historical Center, general collections, call number VA 52.A65, pg. D-1402.
[147] Department of Defense, *Armed Forces Officer*, 2nd ed. (Washington, D.C.: Government Printing Office, 1960), 37-39.
[148] Arthur Ainsley Ageton, RADM, USN (ret) and William P. Mack, CAPT, USN, *The Naval Officer's Guide*, 5th ed. (Annapolis, MD: US Naval Institute, 1960). See third chapter in officer education section, "Education for Command".

for Officers of the Line of the US Navy, 1100/1310" of May 1958 depicted all line officers following a path of progressive education punctuated by *three or four* periods of graduate school or war college.[149] This navy manual thus recommended an officer career, not of a specialized 'line' officer, but rather a path that mirrored to a remarkable degree the generalist model as presented in King's 1920 report and Holloway's report of 1945.

The Secretary of the Navy's Advisory Board on Education Requirements (SABER) also communicated its support for less technical and more general officer education. The SPUTNIK crisis prompted the Secretary to establish this board for purposes of evaluating navy educational programs. In the first years after SPUTNIK, the SABER members counseled a measured response to the 'crisis'. The board, made up of senior admirals and political appointees in the Navy department, did not recommend 'line' officers or midshipmen receive more technical education in response to SPUTNIK, but instead endorsed again King's system of 'rounded' and integrative education! The board expressed concern about the growing stature of science and advanced technology that threatened to overshadow traditional officer educational and developmental practices. The board members in 1959 and 1960 went so far as to counsel the Secretary of the Navy to guard against the current "…fetish of science…" and in the same report recommended he expand language training, not technical training![150]

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[149] BUPERS,"Manual of Qualifications for Officers of the Line of the US Navy, 1100/1310, May 1958", NARA RG 24-470-54-26-5 Box 30

[150] SABER,"Secretary of the Navy Advisory Board for Educational Requirements(SABER): Reports 3-7", Naval Historical Center, Operational Archives, Personal Papers of Arleigh A. Burke, Box 9, Folder: SABER.

A study of graduate education and officer specialties (sub-specialties) in 1959 also came to the same basic conclusions of the King report some 40 years before.[151] The report included a near replica of King's 1920 career plan and counseled the URL officer to set as his goal the development of those qualities of "broad command". Key steps in a career included: general duty on surface ships; specialization in one platform (aviation, submarine, surface); graduate education of one year to be completed between the third and seventh year of service; variety in assignment and eventually senior service college. This 1959 report endorsed the King plan, but it did something more that portended difficulties for the 'line'. The report recommended that more URL officers develop a technical sub-specialty so that they would be qualified to replace EDOs in technical billets. EDOs had apparently been slated for massive reductions, if not out-right elimination, and the 'line' was being called upon to 'take up the slack'.[152] To fill the anticipated shortfalls in EDOs, the URL 'line' officers were required to attend graduate school and then 'pay back' their education by a tour in a specialist field. This policy went further than the King plan, which had not required 'line' officers to serve a mandatory pay-back tour. A policy that required the URL officer to be both a seagoing commander, and at the same time acquire the technical education necessary to replace the EDO specialist, would prove all but impossible to enforce in the years ahead. The Keith

[151] R.T.S. Keith, RADM, USNR,"Billet and post-graduate educational requirements in the specialty areas in the line of the Navy, Report of Board 1 October 1959", NARA RG 24-470-54-25-6 box 5.
[152] The board which recommended a massive reduction in EDOs was known as the Franke Board of 1958. For a brief discussion of the Franke Board, see Albert G. Mumma, *The Reminiscences of Rear Admiral Albert G. Mumma, U.S. Navy (Retired) / interviewed by Paul Stillwell* (Annapolis: US Naval Institute, 2001), 191. For Franke Report, see William B. Franke, Under Secretary of the Navy, Chairman,"Report of the Committee on Organization of the Department of the Navy, 1958-59", US Naval Academy, General Collections, VA52.A184 Section H.

report stated in blunt language that a 'line' officer could not be a technical sub-specialist and also meet the emerging 'joint' education requirements.[153]

This new requirement that 'line' officers replace EDOs coincided with a subtle shift in the type of sub-specialties open to URL officers at graduate school. Whereas the pre-war and Holloway Report conceptions of sub-specialty were divided more or less equally between three types (the "design of material", "manipulation of material", or "operations"), the sub-specialty as described in the 1959 Keith report was associated with study in a scientific or engineering field.[154] This shift in sub-specialty priorities is indicative of a slight shift in the direction from operations to an elevated status accorded to technical specialty.

The rising profile of the new weapons and technical specialists began to be evident in the discourse of leading naval professional publications. Numerous articles that appeared in *Proceedings* in the late 1950s discussed atomic weapons and nuclear propulsion. Nuclear machines took on an increasingly high profile in personnel publications. The 1960 edition of the *Naval Officer's Guide* featured a POLARIS missile emerging from the surface of the sea. Line officers became aware of the proliferation of specialties in civilian industry and even in the Navy's own staff corps. In this period the

[153] The Keith Board recommended a strictly enforced concept of expanded URL technical graduate education followed by a two year pay-back tour in a technical specialty. The board conceded, however, that the technical education and pay-back tours would detract from the officers' preparation for command and would preclude most officers from meeting the new ‘joint’ education requirements. See summary page.
[154] R.T.S. Keith, RADM, USNR,"Billet and post-graduate educational requirements in the specialty areas in the line of the Navy, Report of Board 1 October 1959", NARA RG 24-470-54-25-6 box 5. This was a significant change, though the muddled meaning of the word “sub-specialty” obscured the significance of the shift. Disputes over the change in meaning would emerge again in the 1962 SABER board and provide Rickover a justification to push for changes to undergraduate education that would support this scientific-engineering conception of sub-specialty.

staff, or 'restricted line', witnessed a rapid increase in the number of new specialties.[155] Some lower ranking ‘line’ officers observed the specializing trend in science and engineering and began to question the 'generalist' model for the line officer in command. Perhaps foreshadowing the change to come was an article that appeared in *Proceedings* that questioned the capacity of King’s model of the generalist officer to command the new technologies. The barrage of negative responses to the article, which was titled “Is the Versatile (generalist) Line Officer Obsolete”, was evidence of both an emerging debate but also indicative of continuing strong support for the King model of the generalist.[156]

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Taking Stock: Promotion to High Command

The assignment and promotion system in the late 1950s still produced a ‘versatile’ or ‘well rounded’ line officer. Most non-nuclear and nuclear officers continued to be assigned to a wide range of billets. Command tours remained relatively short in duration, a practice consistent with the ideal career path as defined in the Holloway Plan. Official publications communicated a version of 'line' officer career that strongly resembled King's plan. The submarine officer career was among the most well rounded careers and

[155] Michael T. Isenberg, *Shield of the Republic: the United States Navy in an era of Cold War and violent peace*, 1st ed. (New York: St. Martin's Press, 1993), 459. Isenberg observes that the rate of specialization in the Navy was relatively slow until the late 1950s, at which time it began to accelerate markedly.
[156]W.D. Capt USN Brinckloe, ""Is the Versatile Line Officer Obsolete?" " *US Naval Institute Proceedings*, no. 6, June 1959; Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004), 130.

shared a common educational and assignment sequence with surface officers.[157] Remarkably, the first generation of nuclear officers also conformed to the pattern of the 'well-rounded' officer. Almost to a man, the first generation of nuclear flag officers attended either the Naval or the National War College.[158] Rising stars in non-nuclear aviation also continued to adhere to the King model. Indicative of this pattern was the career of Admiral Thomas B. Hayward, a non-nuclear aviator who rose to CNO. Hayward recounted that his aviator commanding officers had encouraged him to broaden his career by attending not one but two war colleges, which he did.[159]

Promotion examination procedures remained relatively unchanged during most of the 1950s. The promotion exam symbolized the existence of a body of knowledge that all line officers held in common. For example, the promotion examination for LCDR and above still required the study of tactics, operations, strategy, and international relations. But the traditional operational ethos of the 'line' was coming under pressure. A deliberate navy policy for planned reductions in the number of EDO officers would require increasingly more 'line' officers to fill technical billets. Beginning in the later 1950s, perhaps due to a looming shortage of EDOs, promotion boards for flag were encouraged to pay more attention to officers with technical sub-specialties.[160] There is no evidence, however, that more technically specialized 'line' officers were in fact selected for flag, or that they promoted to senior operational commands.

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[157]Arthur Ainsley Ageton, RADM, USN (ret) and William P. Mack, CAPT, USN, *The Naval Officer's Guide*, 5th ed. (Annapolis, MD: US Naval Institute, 1960), 390, for common surface/submarine career progression chart.
[158] For background on the nuclear officers, a variety of sources was consulted, to include personal interviews, official bios, the naval register, and USNA Alumni Association directory.
[159] Thomas B. Hayward, Admiral, USN (former CNO), retired, Interview with the Author, 24 January 2008.
[160] Alfred W. Pride, ADM USN (Ret),"Criteria for Selection to Flag Rank in the USN, Report of Board 20 February 1963", NARA RG 24-470-54-25 Box 6.

This study has used promotion to high rank to measure the relative success of two models of command: the 'generalist' and the technical specialist. The 'generalist' model was represented by the proxy of those officers who had attended a war college. Analysis of the pre-war period showed a steady rise in percentage of flag officers who had been generalists as measured by war college attendance: fully 98% of flag officers who commanded at sea in WWII were graduates of the NWC. This pattern persisted for the first years following the Second World War. In the 1950s, however, the number of senior flags who attended War College dropped off, falling to 30-50% of the senior admirals, varying slightly depending on the year.[161] This drop, however, is NOT indicative of a changed attitude toward officer education and development, but rather was the demographic echo of the disruptive effects of the lead-up to and combat of the Second World War. The officers rising to senior flag rank in the middle to late 1950s were the same officers who were precluded from attending the war college in the late 1930s and the first half of the 1940s. From 1936-1946 most 'line' officers could not avail themselves of a war college education. Most senior 'line' officers whose career progression was disrupted by the war were, however, hardly narrow technical specialists. Many had commanded or served on staffs in the Pacific and Atlantic fleets and perhaps learned more about command and integrated warfare than any generation before or since.[162] These officers could argue-- as perhaps they did in conversation with their

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[161] This analysis is based upon data contained in the Naval Register from 1949 to 1970. The register routinely recorded officer educational pedigree, to include attendance at the General Line Course or Naval War College, and later National War College. United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002).

[162] It is also reasonable to conclude that some senior captains who served in war-time joint and combined staffs did not feel they needed a war college education after they returned from the war. Admiral's Carney (Chief of Staff to Halsey) and Burke (Chief of Staff to Mitscher) come to mind. Both would have missed their opportunity for war college in the interwar period due to the build up, but would have had little reason

assignment officers-- that their war experience had broadened them and more than compensated for their lack of war college education.

The relative dearth of senior flag officers who had received a war college education proved to be a temporary condition. Evidence of this return to 'normal'-- that the educational changes wrought by war were temporary and did not portend a secular shift to a new conception of 'line' officer-- is found in the first years of the 1960s. At that time, the number of senior navy flag officers who had attended either the Naval War College or joint war colleges rebounded dramatically and approached interwar levels of matriculation: 90% of senior flag officers in the middle 1960s were war college graduates.[163]

Rickover had by the end of the 1950s constructed a highly effective system of technical training, selection, and assignment. But he had not yet redefined command to be that of the specialist or the engineer. For whatever combination of reasons, Rickover had supported, perhaps begrudgingly, the King model of integrative officer development. But Rickover's policy of accommodation would come to an end in the new decade.

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to think the war college in 1946-47 would have served a particularly useful purpose. Burke, it should be noted, did take war college correspondence courses before the war.

[163] United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002).

Chapter Five

USS THRESHER and the Culminating Battle of Philosophies: *"a different kind of man"* Takes Command, 1959-1965

"The man of the future on whom we shall depend more and more is the technical expert. Today he is still subservient to non-technical leaders in government and industry, and his work is hampered and sometimes destroyed by men in whom is vested great power but who cannot understand the realities of the new, artificial, technological age. But the 'verbal' men are on the way out... In our naval nuclear program we have taken cognizance of this demand for a *different kind of man* and we have set up schools to train the officers and men who will run the new atomic navy."
Vice Admiral Hyman G. Rickover, USN, 1959[1]

"The argument that these men (submariners) had spent years in command had no appeal to him, for these officers often represented an older tradition that had to be broken..."
Francis Duncan, Rickover's biographer, 1990[2]

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Summary

Rickover was an advocate of command by technical experts. In the 1950s, however, Rickover had been willing to abide King's model of the general line officer. His willingness to compromise diminished as his program expanded and his political stature grew. In the early 1960s, the size of the nuclear force greatly increased, and the Navy commissioned the first cohort of nuclear surface ships. A transformation of the 'line' officer corps followed not long after. But the nuclear technology did not itself compel or pre-determine the transformation of the officer corps, though the machines

[1] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 19.
[2] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 86. Author insertion (submariners) to clarify Duncan's meaning.

were an important tool in the process.[3] Rather, Rickover achieved the transformation through bureaucratic competition over officer education, assignment, and promotion processes. Rickover used various means to win control of the officers and break the old culture, to include highly selective interviews, changed training institutions, and tight control of assignments to submarines. Perhaps the most important of his tools was a purposeful policy of officer shortage, which was then followed by the infusion of large numbers of aviators and surface officers into the submarine force to dilute the traditional 'diesel' submarine culture. Senior 'line' officers belatedly recognized Rickover's culturally transformative plans for what they were and resisted Rickover's initiatives with respect to the diesel submarine officers. The future of the traditional submarine community was of such importance that the dispute could be resolved only at the highest levels of the Navy and Congress. The culminating clash came in the aftermath of the loss of a nuclear submarine, USS THRESHER. Rickover won the struggle and became unassailable as the leading architect of a techno-centric model of officer development.

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Strategic Primacy of the Nuclear Submarine: Accelerated Shipbuilding and Personnel Shortages

In the late 1950s, the Soviets shocked the world when it launched SPUTNIK, the world's first satellite. Almost as important as the satellite was the means of its placement

[3]Studies of professional military education as early as 1959 speculated that nuclear machines might prove to exert a significant shaping effect on the officer corps. See Gene Martin Lyons and John Wesley Masland, *Education and Military Leadership: a Study of the R.O.T.C* (Princeton, N.J.,: Princeton University Press, 1959), 226. Ron Spector, one of the leading American naval historians in this period, gives credit to nuclear power for changing profoundly the navy and submarine officer corps, but devotes only a few pages to explaining how Rickover effected this transformation. See Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 333-336.

into orbit: a vehicle capable of acting as an inter-continental ballistic missile. SPUTNIK was followed with other missile launches that further demonstrated the Soviet capacity to deliver Russian hydrogen bombs to the American homeland. These developments compelled American leaders to reevaluate a policy of "massive retaliation" that depended on vulnerable land-based systems and prompted a search for alternatives.   The Navy's nuclear-propelled and fleet ballistic missile submarine (known in abbreviated form as either the FBM or SSBN) provided a technology well-suited to a shifting strategy, that is, a mobile and therefore survivable missile platform.[4] The demands on the Navy and Rickover would grow when the new Kennedy Administration made an even larger fleet of nuclear powered ballistic missile submarines one of its key policy differences with that of the outgoing Eisenhower Administration. Symbolic of his commitment to the program, Kennedy, the former naval officer, made a point of traveling to sea to observe a missile launch from a nuclear submarine. *In remarks prepared for the President to deliver on the day of his assassination,* Kennedy was to invoke a 50% increase in POLARIS missile inventory as a sign of American technological and military prowess.[5]

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[4] Harvey M. Sapolsky, *The Polaris System Development: Bureaucratic and Programmatic Success in Government* (Cambridge, Mass.,: Harvard University Press, 1972). To place the SSBN program in the context of larger navy policy and action, see Robert L. Love, Jr., *The History of the U.S. Navy, Volume II* (Harrisburg, : Stackpole Books, 1992), 408-418.

[5] John Lewis Gaddis, *Strategies of Containment: a Critical Appraisal of Postwar American National Security Policy* (Oxford; New York: Oxford University Press, 1982), 218-222.   Gaddis includes a brief discussion of the significance of increased POLARIS submarine construction. For a discussion of Eisenhower's doubts about the need for a large POLARIS fleet, see Peter J. Roman, *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995). In contrast to Eisenhower, Kennedy was a particularly strong supporter of the ballistic missile submarine program. He went to sea on 16 November 1963, just days before his assassination, to witness a missile launch from USS ANDREW JACKSON. Kennedy later wrote in a letter to RADM Pete Galantin, the POLARIS lead project officer, that "Once one has seen a Polaris firing the efficacy of this weapons system as a deterrent is not debatable."   John F. President of the United States Kennedy,"Letter to RADM Galantin dated 19 November ", Kennedy Presidential Library, (author has copy) . See also digital collection for 22 November 1963, "Remarks Prepared but not Given". The proposed speech stated: "In less than 3 years, we have increased by 50 percent the number of Polaris submarines scheduled to be in force by the next fiscal year, increased by more than 70 percent our total Polaris purchase program..."

To counter what was portrayed as a 'missile gap', Kennedy planned to deploy hundreds more nuclear missile tubes, but to do so required more submarines, which in turn required an accelerated pace of reactor construction. The speed at which Rickover and his engineers fielded this complex system was unparalleled, and engineering histories noted that "…never has a naval engineering project of such complexity been accomplished successfully in so short a time."[6] By the early 1960s, the size of the nuclear submarine fleet would dwarf that of just a few years before (see Figure 5-1), bringing with it more political, technological, and human challenges. Rickover navigated the political challenges with great success. His building programs were popular both in the Pentagon and in Congress, and he used every opportunity to build his power base with each launching or commissioning of a nuclear ship.[7] The technical problems by the early 1960s were well in hand: NAUTILUS had been at sea for almost half a decade, and naval engineers had reached consensus that the pressurized water reactor was the preferred technology.[8] It was however the human challenge-- what type of man would command-- that proved most problematic for the admiral. With each new launching, the

[6] Randolph W. King and Prescott Palmer, *Naval Engineering and American Seapower* (Baltimore, Md.: Nautical & Aviation Pub. Co. of America, 1989), 278. The inventory of commissioned nuclear ships increased almost exponentially from the late 1950s into the 1960s: 1955-1, 1956-1, 1957-3, 1958-5, 1959-9, 1960-14, 1961-24. The increase in rate of production was even more pronounced: 1958-2, 1959-4, 1960-5, and 1961-10. See Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), appendix 2.

[7] Rickover used his nuclear construction program to build allies throughout the political power centers, from the executive branch, AEC, to Congress. To help garner political support, Rickover abandoned the traditional naming convention (fish names) and instead named the submarines after leading politicians, to include Senator Richard B. Russell and Congressman L. Mendel Rivers. Eventually Rickover would agree to follow the surface navy tradition of assigning city and state names (e.g., the LA Class and Ohio Class submarines).

[8] Gary E. Weir, *Forged in War : the Naval-Industrial Complex and American Submarine Construction, 1940-1961* (Washington: Naval Historical Center 1993); Norman Friedman, *Submarine Design and Development* (Annapolis, MD: Naval Institute Press, 1984). Duncan and Hewlett also examine the issue in detail, but tend to offer a less critical analysis than does Weir or Friedman.

personnel shortages grew more acute, a shortage worsened by some factors outside Rickover's control but some very much of his own making.

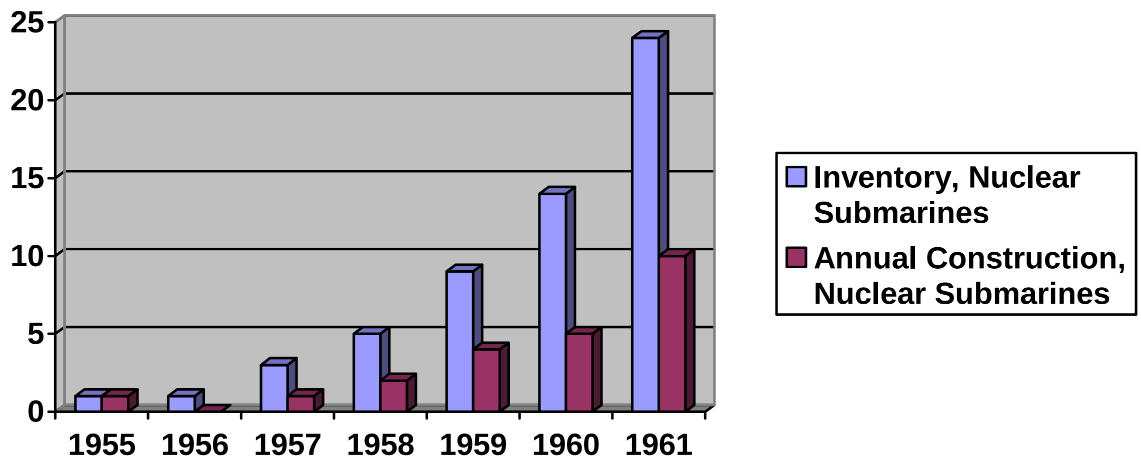

Figure 5-1: Nuclear Submarine Inventory and Annual Construction rates. Data from Polmar, 1978.

Just as the ship construction rates and manpower demands began to accelerate, an important group of Rickover's technical officers began to resign in large numbers: the nuclear Engineering Duty Officers.[9] This corps of officers had been crucial in the early years of the program. They provided the essential technical talent Rickover used to over-see the construction of the reactors and to develop the procedures for their operation. The nuclear EDOs were the elite of the Navy, combat veterans of the Second World War, but also the first nuclear specialists on the planet. These superb naval officers, graduates of both the Naval Academy and MIT, approached with confidence their flag 'promotion windows' in the late 1950s and early 1960s. When none were selected for promotion, in

[9] Theodore Rockwell, *The Rickover Effect: How One Man Made a Difference* (Annapolis, Md.: Naval Institute Press, 1992). See personnel appendix which lists all technical personnel, when they first entered the program and when they resigned. The loss of several highly qualified, relatively young officers is plainly evident in the late 1950s and early 1960s.

quick succession several of the top officers, including Captains Louis Roddis, John Crawford, and James Dunford, retired from the Navy and took their knowledge and expertise to the private sector.

The failure to promote these nuclear officers marked the beginning of a generation-long decline of the nuclear EDO community and a reduction in the availability of experienced nuclear specialists to support the growing nuclear organization.[10] The decline of this essential group of officers is a major theme of Theodore Rockwell's work, *The Rickover Effect*. The cause of the EDOs' failure to promote is not altogether clear, and a detailed discussion is beyond the scope of this work. The fault may in part reside with the larger EDO community that was reluctant to promote these nuclear EDOs because they were not "broad scale officers", the same argument traditional engineers and line officers had used against Rickover in his promotion battle for flag.[11] Part of the blame may reside with Rickover. Political leaders in the early 1960s had made plans for one of the retired nuclear EDOs to return to active service and to promote him to flag, if Admiral Rickover had been willing to retire.[12] A general decline in navy support of EDOs (nuclear and non-nuclear alike) may also have contributed to the attrition. Apparently some senior 'line' officers and the Secretary of the Navy questioned the long term viability or even necessity of the EDO community. These doubts were made public with the publication of the Franke Board report that in 1959 recommended a significant reduction in EDO officers and a compensatory increase in URL sub-specialists to make

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[10]Ibid.

[11] Albert G. Mumma, *The Reminiscences of Rear Admiral Albert G. Mumma, U.S. Navy (Retired) / interviewed by Paul Stillwell* (Annapolis: US Naval Institute, 2001), 249.

[12] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007.

up the resulting shortfall.[13] For whatever combination of reasons, the senior nuclear EDOs in the early 1960s were a shadow of their robust community of the 1950s. The effect of their failure to promote was not, however, limited to the EDO community. In the absence of nuclear EDO officers of flag rank, Rickover had to rely more on experienced URL ‘line’ officers. The decline of the EDO community may have further compelled Rickover to protect and control his ‘line’ officers because the ‘line’ would be needed to fill nuclear billets at sea and might be needed to fill more technical billets ashore.

A demographic wave of retirements from the Second World War generation of veterans also washed over the Navy in the early 1960s. Officers who first joined the Navy as young men in 1941-45 approached 20 years of service in the early 1960s, and with a booming economy on the outside, the number choosing to stay in the service fell rapidly.[14] Fortunately, there was a large pool of officers on which Rickover could call to meet the growing needs of the nuclear program: the diesel officers who manned and commanded the rapidly dwindling inventory of diesel submarines.[15] But Rickover would

[13] William B. Franke, Under Secretary of the Navy, Chairman,"Report of the Committee on Organization of the Department of the Navy, 1958-59", US Naval Academy, General Collections, VA52.A184. There appears in this period also a move by ‘line’ officers to reduce the numbers of EDOs in the Navy. See discussion of the Keith Board, which recommended a reduction in EDO officers, in Ralph Kirk James, RADM USN (ret), *Reminiscences of RADM Ralph K. James, USN* (Annapolis, MD: US Naval Institute, 1972).

[14] See Defense Advisory Committee on Professional and Technical Compensation, Highlights of a Modern Concept of Compensation for Personnel of the Uniformed Services, Washington : Gov Print Officer, March 1957, 4, as quoted in Morris Janowitz, *The Professional Soldier: a Social and Political Portrait* (Glencoe, Ill.,: Free Press, 1960), 17.

[15] In the late 1950s, the diesel fleet numbered over a hundred sea-going ships. Between the officers at sea and ashore, the number of diesel officers numbered in the thousands. Diesel hulls would decline by 60% between 1960 and 1970; nuclear hulls would increase in the same period 1000%, from 10 to 100 hulls. See Norman Polmar, *The Ships and Aircraft of the U. S. fleet*, 11th ed. (Annapolis: Naval Institute Press, 1978), 2.

call few, and the nuclear fleet would *not* become home to the mass of diesel officers and their culture of command.

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Rickover's Personnel Policy: Perpetuating Shortage to create Technical Specialization in the Submarine Fleet

The traditional submarine officers (diesel officers) seemed ideal as a source of leaders for Rickover's new fleet of nuclear ships. The traditional officers made up a relatively small, elite group of officers, highly decorated in war, and proficient in the complex and demanding technologies of the day, to include radar, sonar, advanced diesels. Why so many of these officers could not transition into a rapidly expanding nuclear program has so far defied satisfactory explanation.[16] Yet an understanding of these events is crucial, for the decision to prevent the transition to nuclear power of a large percentage of diesel officers is one of the most important personnel policy decisions in the history of the post-WWII naval officer corps. Though only a modest percentage of all navy 'line' officers was directly involved, the outcome of this bitter and contested policy debate created a submarine community of highly specialized, technical-expert officers who would later serve as an exemplar for the larger fleet.[17] The nuclear

[16] The history of the nuclear program by Hewlett, and the authorized biographies of Rickover by Duncan, devote minimal attention to the issue of the diesel officer. Polmar and Allen, in their unauthorized biography of the admiral, were perhaps overly critical of Rickover. This section will attempt to provide a dispassionate analysis of the diesel officer demise, and locate the events in the larger context of a dispute between two, fundamentally different models of the 'line' officer.
[17] Several officers interviewed recall an address by VADM James D. Watkins, then Chief of the Bureau of Personnel, at the Naval War College, during which he explained that the future fleet would be all nuclear. VADM Watkins further explained that non-nuclear surface and aviation officers would follow the example of what happened to the diesel officers. The 'lesson' of the diesel officer demise, even years later, continued as a powerful exemplar for line officers, both nuclear and non-nuclear.

submarine community established the primacy of a technical expert model and accelerated the diffusion of these values throughout the larger fleet.

Most members of the diesel community had known by 1955 that future submarine construction would be nuclear and not diesel.[18] Yet, the diesel submarine officers did not define themselves by their engines (though that is how the nuclear officers would refer to them) and thus they expected they would inherit command of whatever new kind of submarine was developed, including those that were nuclear propelled. Navy studies had in fact planned for the traditional submarine community leaders to assume responsibility for choosing the leaders of the nuclear navy: diesel officers and not Rickover would select the new nuclear submarine captains.[19] Fleet-wide shortages of officers and a rapid increase in nuclear hulls also favored the transition of large numbers of the traditional submarine officers into Rickover's program. Furthermore, the younger officers on traditional submarines no doubt comforted themselves with the knowledge that Rickover was an old man and would soon retire.[20] In the end, however, the traditional submarine officers did not gain control of the personnel selection process for nuclear command, and a large share of diesel officers did not transition to the nuclear navy as they had hoped. Rather, Rickover lived and served long enough to witness the near complete demise of

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[18] It was in 1957 that the first nuclear missile submarine, USS GEORGE WASHINGTON, began construction, and was also the year the last diesel submarine would be built in American shipyards. But as early as 1955 the CNO, Admiral Burke, had made the decision that all future submarines would be nuclear.

[19] The Bruton Report of 1954 decided against creating a new corps of nuclear specialists with which to man the new reactor spaces and instead recommended the transition of diesel officers to these ships. Also, this same report had recommended the selection authority shift from Rickover's AEC/Navy office back to its traditional home: the Bureau of Personnel and the Submarine Detailer who was a diesel officer.

[20] It was widely known that Rickover would reach mandatory retirement in 1962, and, under normal circumstances, be expected to relinquish control of his administrative position in the nuclear power program.

the traditional submarine, diesel-trained officer community. [21] How and why this occurred has been explained in several ways.

Some traditional submarine officers attributed their ultimate extinction to a personal bitterness Rickover harbored toward the ‘line’ and in particular the submarine community. Admiral Charles Duncan observed what he thought was this animosity, and recalled that Rickover “…would hardly communicate with the submarine desk in the Bureau of Naval Personnel because they were diesel submariners.” [22] Some alleged that diesel-trained submarine officers had attempted to discredit the nuclear program,[23] an action which may have then provoked Rickover to 'counterattack' against the traditional community. But an explanation that offers nothing more than score-settling is insufficient. Rickover had served several years on diesel submarines and knew first hand of the personal sacrifice made by this group of officers. In the early years of the program, all the officers he chose to command were experienced, traditional submarine officers. Finally, Rickover's ‘bitterness’ or score-settling as a causal explanation seems inconsistent when compared with Rickover’s long history of selfless service to the Navy and nation. Rickover's service, after all, brought him and his family little personal gain. And other scholars agreed. Something else was at work.

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[21] In 1960 diesels outnumber nuclear ships almost 10 to 1; by end of 1960s the diesel submarines would be in the minority, and rapidly approach single digits in the 1970s. Though the last diesel left service in the 1980s, the critical period of decision had passed by the end of the 1960s.

[22] Charles Kenney Duncan, *The Reminiscences of Admiral Charles K. Duncan, USN (Ret.)*, 4 vols. (Annapolis: U. S. Naval Institute, 1978), 479; William Wegner (Deputy to Rickover from 1963-1979), Interview with the Author, 17 July 2007. William Wegner, Rickover’s deputy for almost 15 years in the 1960s and 1970s, concurred that rivalry played a part; that the demanding and selective interviews combined with the high nuclear school attrition were in part aimed to reduce the influence of Commander Submarines Atlantic, a tactical commander who was also a diesel officer.

[23] Carl Lavo, *Slade Cutter: Submarine Warrior* (Annapolis: Naval Institute Press, 2003), 206-209. A highly decorated diesel submarine officer, working in public affairs, was accused of attempting to discredit or undermine Rickover and the USS NAUTILUS.

Rickover's biographer and a leading historian on naval nuclear power, Francis Duncan, attributed the mass retirement of diesel officers to technological fate or inevitability. Duncan explains fatalistically: "In a way, it was one more instance of individualism giving way before the imperatives of technology."[24] But such a determinist explanation is insufficient for two reasons. First, the Royal Navy operated nuclear submarines of the same reactor design as the American system and adopted very different personnel policies: the technical experts did not command but remained in the engine room. Secondly, it is not technology itself but *human interpretation* of machine requirements that ultimately molds personnel policy. Thus, Francis Duncan's explanation does not allow consideration of the possibility that Rickover's political action mattered. Furthermore, nuclear reactors were *not* akin to labor saving innovations that wiped out or reduced dramatically a work force, a phenomenon known as 'technological unemployment'.[25] Rather, nuclear technology was more manpower intensive than diesel technology. The nuclear attack submarines (SSNs) required officer complements 50% greater than the diesel attack boats and the missile boats (SSBNs) almost 300% more officers.[26]

[24] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 84.

[25] The phrase, 'Technological Unemployment', was first used during the Great Depression in an attempt to blame 'technology' for the phenomenon of mass unemployment. But technology seldom if ever 'fires' a person from a job. A manager makes a value judgment, and then makes a decision to hire or fire. Even in what would appear 'clear cut' cases of 'technological unemployment' in industry, the story is much more complicated, and involves value judgments about people. For a good illustration of social nature of what seem to be clear-cut cases of technological unemployment, see David F. Noble, *Forces of Production: a Social History of Industrial Automation*, 1st ed. (New York: Knopf, 1984).

[26] Norman Polmar, *The Ships and Aircraft of the U. S. fleet*, 11th ed. (Annapolis: Naval Institute Press, 1978), 17-46. Nuclear ships required from 50% to 300% more officers than diesels. For an illustration, consider the diesel class of BARBEL. The entire class of three ships commissioned in 1959 the same year as the first SSBN was commissioned. This modern diesel submarine had a crew of 8 officers. In contrast, the SSBNs of the same year had complements ranging from 24 officers (George Washington Class, combined blue and gold crews) and 34 officers (Lafayette Class, blue and gold crews). The nuclear attack

There was something in the very mindset and tradition of diesel officers that Rickover found objectionable, so objectionable that an officer's experience in command was seen *not* as a benefit but as a *detriment*. As one observer noted, "The argument that these men (submariners) had spent years in command had no appeal to him (Rickover), for these officers often represented an older tradition that had to be broken..." [27] But the observer is unclear of exactly what tradition had to be broken. Hewlett and Duncan suggested that what Rickover found objectionable was the propensity of diesel officers to recklessness and a certain "flamboyance." Hewlett writes that nuclear power, in contrast to diesel "flamboyance", demanded "…caution and self-discipline…"[28] This explanation is asserted rather than argued and appears again to be inadequate to explain Rickover's actions. The traditional submarine officers to whom Hewlett refers were in fact highly disciplined as evidenced by success in war: they had fought across the open expanse of the Pacific Ocean, developed innovative new tactics of under-sea warfare, and the survivors returned home safely in face of determined enemy attacks. This type of war-winning professionalism is not what most observers would describe as undisciplined or reckless behavior. It seems reasonable to assume that most diesel officers would not recklessly operate a nuclear reactor any more than these officers would have been reckless with torpedoes or ballast tanks.

To Rickover, the priorities of the diesel submariners were wrong. Given Rickover's ideology of technical elitism, technical expertise must displace tactical and

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submarines had complements approximately 50% larger than the diesels, for example, the STURGEON and PERMIT class had 12 officers each. While some diesel officers could serve in non-nuclear positions aboard the nuclear submarine, they could not progress to command without nuclear training.

[27] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 86.

[28] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 345.

operational knowledge as the most important priority of the 'line' officer.[29] The underlying reason for Rickover's attack on the traditional officers was that their diesel culture represented a different philosophy of command, with a different ordering of priorities: operations and tactics were valued above technical expertise. The war, as discussed in chapter three, had transformed the submarine commander to a more tactical orientation than that of the pre-war period. Several scholars and veterans of the submarine force had noted the shaping and winnowing effects of the war, and of a bias imparted by the war that prioritized the tactical over the technical.[30] The war-tested diesel submariners brought with them a tactician and operator view of command. In contrast, Rickover's technical-expert officer model was inspired not by combat experience, but by his ideology of technical elitism. From his formative years in graduate school, Rickover had come to believe that technology drove history and that man must be conformed to technology. To conform required the leader to master the minute details of technology. To be able to master the minute, the technical leaders must be scientifically and technically trained and must specialize.[31] Tactics and non-technical factors may have been supremely important in an earlier time, but the nuclear age was different. Rickover was an apostle for the idea that in the 20th century the " …hero is

[29] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001). I credit Spector with first introducing me to the idea that Rickover had engineered an inversion of the line/staff priorities which had been at issue since 1899. I read Spector's book while in command of my ship in 2002. See Spector, page 335 for a discussion of Rickover's 'inversion', which is also discussed in Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 343.
[30] W.J. Holmes, *Undersea Victory: The Influence of Submarine Operations in the War in the Pacific* (Garden City, NY: Double Day and Company, 1966); Paul R. Captain Schratz, USN, *Submarine Commander: A Story of World War II and Korea* (Lexington, KY: The University Press of Kentucky, 1988).
[31] This summary is a compilation from Rickover's own writings, his policy statements on nuclear training, the texts by Hewlett and Duncan, from interviews with numerous nuclear officers, and from my own familiarity with the naval nuclear power program over a two decade period.

the engineer or scientist who does valiant deeds that will benefit the country..."[32] The valiant deed to which Rickover aspired was to create a nuclear fleet, manned by engineering experts, not aggressive tacticians. An officer who focused more on tactics and operations was suspected to be lacking in devotion to scientific education and to the mastery of the engine. The bulk of the diesel submarine officer group in the post-WWII period was by such standards ill-suited to Rickover's purposes; their professional development and their sense of priorities represented the past, a tactical culture of combat of the Second World War.[33]

VADM James Calvert, a decorated diesel boat officer and one of the first nuclear commanders, corroborated the idea that a differing philosophy of officer models underlay the dispute between Rickover and the traditional submarine community. Calvert observed that tactics and operations, not engineering, occupied a favored place among those who rose to command in the traditional submarine community. Calvert noted that most of his submarine school classmates who rose to command in the post-WWII period were more tactically and operationally oriented than they were engineers.[34] Calvert's observation that engineering was not the path to command is further supported by the policy and career recommendations found in the Navy's Manual of Officer Qualifications of 1958, an authoritative document for career management of submarine, surface and

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[32] Rickover, as quoted in Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982), 588.
[33] Carl Lavo, *Slade Cutter: Submarine Warrior* (Annapolis: Naval Institute Press, 2003). The combat achievements of the Second World War officers were indeed impressive. See Lavo, 194, for statistics of WWII diesel effectiveness. They accounted for 55% of all Japanese vessels sunk including eight aircraft carriers. All this was accomplished by diesel officers who made up 1.6% of navy and who sustained the highest casualties in the Navy (a 22% loss rate, 3500 of 1600 submarine personnel). An officer that was considered by some to be an opponent of Rickover, Slade Cutter, had twenty three 'kills' to his credit, second only to a Medal of Honor winner, Dick O'Kane, who had twenty four.
[34] James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007.

aviator ship captains. In this manual, engineering experience was altogether absent from the list of important qualifications that defined the officer in command.[35]

Rickover's low regard for tactical acumen may have derived from the changing role of submarines. With POLARIS, an increasing share of the submarine fleet was strategic and not tactical, a change that may have convinced Rickover an inversion in the old command priorities (the tactical versus the technical) was tolerable. But among those who knew Rickover, Rickover's relatively low regard for tactical and operational training pre-dated the deployment of a large fleet of strategic missile submarines. According to one submariner who later rose to the highest rank of the service, Rickover was committed to the idea of the naval 'line' officer as engineer and would have been pleased if all the 'line' had become engineers! [36]

To Rickover, it was simply unacceptable to allow a non-engineer qualified officer to command his engineers and relegate the technical experts to the engine room. The Royal Navy had such a system wherein technical specialists were subordinate to the operators, and Rickover was highly critical of this policy.[37] To Rickover, the more

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[35] Bureau of Personnel,"Manual of Qualifications for Officers of the Line of the US Navy, 1100/1310, May 1958", NARA RG 24-470-54-26-5 Box 30. The Commanding Officer’s requisite “Knowledge and Abilities”, as described in the manual, was very clear in its tactical bias: “Knowledge of ship’s tactical doctrine and characteristics; seamanship, rules of the road; communication procedures; tactical and administrative publications such as BuPers Manual, General Signal Book, Naval Warfare Publications, type regulations, ships organization book, and various other general and type tactical publications. Skill in maneuvering ship; seamanship, navigation, and piloting; and coordinating activities of all departments for efficient functioning of the ship.”

[36] The tactical requirements of the ballistic missile submarine were decidedly less demanding than those of the attack submarine. Some submarine officers interviewed believed Rickover was indifferent to tactical training altogether and would have been quite content if all naval officers were trained as engineers. C.A.H. Trost, ADM USN, Interview with the Author, 3 November 2007, 18 December 2007.

[37] James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007. Calvert recollected that Rickover made references to the British tendency to look down upon engineering and that engineers in the Royal Navy were a lower caste when compared to the bridge officer. Rickover also expressed his concern of a slow decline in the status of engineers in the US Navy and believed there was a bias against engineers rising to command. Rickover related to Calvert his concern that if he did not take

technically specialized and expert officer should run the reactors, command the ships, and ultimately command the navy. Tactical acumen and bravery in war were to Rickover secondary, and thus by his new metric the many veteran "…bold and skillful operators…" of the old submarine officers were found wanting and were in large numbers discarded.[38] Rickover's plan to eliminate the mass of diesel officers and promote a new officer model was not, however, openly manifest for several years.

In the early years of the program, Rickover compromised. He cooperated with others holding different views of the officer corps, and he permitted his first generation of nuclear officers to conform to the integrative requirements of the King model. The first generation of nuclear officers, as discussed in chapter four, served on surface ships, commanded surface ships, and attended war colleges. But in those early years Rickover's program was a tiny segment of the Navy, and Rickover was junior in rank. As Rickover took more reactors "critical", promoted in rank and cultivated more supporters in Congress, his willingness to compromise declined. By the beginning of the 1960s, he had attained the stature of a national technological leader and gained with this heightened stature the power to challenge the Navy's conception of the officer corps. [39] Rickover

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action, the USN would trend more to a UK model of non-engineers in command. On a more personal note, Rickover apparently pointed out to Calvert that one of Calvert's major failings was his lack of an engineering tour and qualification. For similar recollections of Rickover's concern over the status of engineering, see James L. Holloway, III, ADM USN (CNO), *Aircraft Carriers at War: A Personal Retrospective of Korea, Vietnam, and the Soviet Confrontation* (Annapolis: US Naval Institute 2006).

[38] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 84.

[39] In the course of eighteen months in the late 1950s, Rickover launched the first SSBN, produced commercial power from Shippingport reactor, published a nationally acclaimed work on education, and was promoted to vice admiral. He was now empowered to extend his influence beyond naval reactors and to the larger navy. He was so well known that even *Mad Magazine* carried cartoons about him and his nuclear machines! See "Hymie Rickover and his Atomic Submarines," *Mad Magazine*, no. 7, July 1959, 6.

became more outspoken and blunt; his goals for the future became clearer and focused, broadcast through his public testimonies and his books. [40]

To expand and sustain his fleet of reactors, Rickover believed he required a technocracy to lead and manage them. Rickover's personnel policies of recruitment, training, assignment and selection supported his philosophical goals and produced a growing number of technical leaders for the Navy. Perhaps not coincidently, Rickover at one time produced 60% of all nuclear engineers in the United States, the cadre of nuclear engineers who he hoped could help solve the global energy problems he wrote about a generation before.[41] The reactors carried aboard nuclear ships became incubators for the technical experts and specialists that would, in large numbers, diffuse through the hierarchy of the Navy and Defense Department and into government and civilian industry.[42]

To create technical experts and specialists, Rickover believed he needed large numbers of men adept at scientific engineering. Rickover searched for and promoted those officers who conformed to his conception of the scientific engineer, those distinguished by "scholastic aptitude" and "intelligence" whose professional

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[40] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959). Through the publication of his nationally acclaimed books, he became a recognized expert on education.

[41]Rickover would later boast in testimony before the Joint Commission on Atomic Energy (JCAE) in 1975 that his people constituted the majority of civilian American nuclear technicians. In his JCAE testimony he explained: "These people are very valuable to industry...civilian companies are constantly advertising to get them. I would estimate that 60% of all the people who operate commercial atomic power plants today got their training in the navy. It is a fact that 2/3 of all young officers who left the (nuclear) navy in the past 2.5 years have gone to work in the commercial nuclear field." See Joint Committee on Atomic Energy, Testimony of ADM Hyman G. Rickover USN on the Value of Nuclear Trained Naval Personnel to Industry, 94th Cong., 2nd sess., 5 March 1975, 24.

[42] Rickover's program would indeed create the world's leading nuclear executives who went on to lead the Nuclear Regulatory Commission (Admirals Zech and Carr) and Department of Energy (Admiral Watkins), as well as the leadership of countless power utilities and nuclear power plants. See Nuclear Regulatory Commission website for biographies of senior civilian leaders.

advancement was "...evidenced by his work and study habits."[43] But the imposition of scientific academic criterion for officer selection cannot adequately explain why Rickover rejected such a high percentage of diesel officers. There were in reality a multitude of diesel officers who were re-trainable, and who had the academic credentials to do scientific work. The Bureau Chief, VADM Smedberg, supported Rickover's scholastic standards of selection and screened a large pool of mid-grade officers who had the academic ability to complete the technical schools. Yet, when presented the candidates, Rickover would take only a small fraction of these officers.[44] As a consequence of these many rejections, there soon emerged a pattern of persistent shortage among nuclear trained officers. Confronted with a persistent shortage condition, nuclear officers were required to remain in nuclear assignments for long periods, and when they did transfer, they went typically to another nuclear billet. There existed little time or flexibility to broaden their assignments or their education.[45] In conditions of shortage, the 'line' officers who served on nuclear submarines began to look increasingly like a group of specialists.

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[43] Joint Committee on Atomic Energy, Statement by VADM H.G. Rickover,USN, during Joint Committee Tour of USS ENTERPRISE (CVN-65), 87th Cong., 2nd sess., 31 March 1962, 46. Rickover provides a detailed description of the criteria by which he judged the diesel officers. These were described as: scholastic aptitude, experience in engineering, intelligence, and "…the willingness of the officer to undertake the difficult training program for nuclear propulsion assignment and his interest in professional advancement as evidenced by his work and study habits." When placed in the context of the testimony, his reference to 'work' appears to be associated with 'engineering', and the reference to study habits appears to be associated with grades in scientific and engineering curriculum. Hence, Rickover reveals that he was seeking a scientific engineer very much like that he had become at Columbia University a generation before.

[44] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1607. VADM Smedberg acknowledged the need for high academic standards, and explained that officers were screened carefully on the basis of their scholastic record. However, despite this careful screening of officers they were nonetheless rejected at a high rate.

[45] Dan A. Summitt, *Tales of a Cold War Submariner* (College Station: Texas A&M Press, 2004), 194. Summitt discusses the acute shortage of officers, but observes that Rickover steadfastly refused to expand the number of officers.

The shortage of men and subsequent tendency toward officer specialization was not accidental. The shortage was in fact another tool purposely created by Rickover to break the old culture[46] and force upon the new nuclear officers an identity of technical specialization. Conditions of shortage necessitated that the new officers become narrowly focused. The policy of purposeful shortage would then be followed by an infusion of surface and aviator officers into the submarine navy that would dilute the "...older tradition that had to be broken."[47] (The infusion of surface and aviator officers will be discussed later in this chapter)

The rejection of large numbers of diesel officers created a shortage condition and thereby forced officers to become technical experts in nuclear engineering. But if an officer was to be a technical expert, he could no longer be a 'generalist' or integrative officer. Such an outcome was entirely consistent with Rickover's values and beliefs about technology and leadership. Rickover's technocratic philosophy rejected the idea that a modern leader could any longer be the generally educated 'line' officer. He held a low opinion of the 'generalist' and of the King system of progressive education and assignment that produced the "…all around officer that can be shifted from post to post and do a routine job well." [48] Rickover believed attempts to spread one's time across tactics, operations, and technologies were bound to produce mediocrity.[49] Rickover

[46] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007. Wegner explained that Rickover fought a difficult bureaucratic and budget battles with the diesel leadership, and that severely limiting the number of diesel officers that could continue on to command was a means by which to undermine the diesel community.
[47] Duncan, 1990, pg. 86.
[48] Clay Blair, *The Atomic Submarine and Admiral Rickover*, [1st ed. (New York,: H. Holt, 1954) , 211.
[49] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 345; Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 86; Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 193.

acted on these convictions and used his officer selection interviews to measure the potential of an officer to embrace specialized knowledge, to focus several years of time and attention on the mastery of the technical details of an engineering field.[50]

RADM Beshany, the first deputy CNO for Submarine Warfare, was one of the senior diesel officers who pinpointed the demise of the diesel officer as rooted in a conflict of philosophies: technical expertise and specialization versus what he called the "operational philosophy", which was less technically specialized.[51] Captain Edward Beach also observed: "To be an acceptable engineer, the acme of human aspiration in Rickover's view, is to be very one-sided".[52] The diesel officers were products of the old King system that placed primacy on the operations and also encouraged a breadth of experience. Not only did the diesel officers devote themselves to anti-submarine and anti-surface tactical innovation, but also many had served on surface ships at various steps in their career. The traditional submarine officers were not only tactical and operational-minded; they were also integrative in their outlook. To advance his alternative model-- the technical expert in command-- Rickover had to eliminate rival officer models. Once Rickover's transformational strategy became clear, the diesel officers resisted and precipitated a battle that engulfed the highest levels of leadership in the Navy.

When scholars describe opponents to Rickover's personnel policies, the opposing force is sometimes represented as isolated, fighting a Luddite battle to preserve jobs made redundant by the "discipline of technology". Rickover's biographers sometimes leave the

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[50] Joint Committee on Atomic Energy, Statement by VADM H.G. Rickover,USN, during Joint Committee Tour of USS ENTERPRISE (CVN-65), 87th Cong., 2nd sess., 31 March 1962, 46.
[51] Philip A. Beshany, VADM USN, *Reminiscences of Philip A. Beshany* (Annapolis: US Naval Institute, 1983), 532-533.
[52] Edward Latimer Beach, Captain USN (retired), "Life Under Rickover: Stormy Duty in the Silent Service," *Washington Post*, 27 May 1977, D-1.

impression that most of the 'modern', non-diesel Navy stood by silently, perhaps in tacit support of Rickover's policy of mass redundancy.[53] In fact, many non-submarine officers opposed Rickover's diesel officer policy, including the highest leadership of the Navy: the Chief of the Bureau of Personnel, VADM Smedberg, a surface officer, and the CNO, Admiral Anderson, an aviator. These senior leaders recognized the diesel and nuclear officer personnel issues as among the most important facing the Navy in the early 1960s. They believed that if they could regain control of nuclear officer selection policy from Rickover, his threat to the Navy would be much reduced and might precipitate Rickover's retirement. But by joining the battle on behalf of diesel officers, the navy leaders pitted their philosophy of the officer corps against that of Rickover's. By accepting battle for the diesel officers as the test of the philosophies, they raised the stakes: if the political leadership sided with Rickover, then Rickover's model could be interpreted as the ascendant model of command, an outcome pregnant with profound and perhaps generational implications for the entire navy.

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The THRESHER Disaster and its Immediate Political Effects

By 1961 senior navy leaders had realized that Rickover might not retire the next year as planned.[54] Senior officers further concluded that Rickover's selection procedures

[53] Duncan and Hewlett concentrate most on the role of Commander Submarines Atlantic, a diesel officer. They give only passing reference to non-submarine officer interventions, in particular, VADM Smedberg, Chief of Naval Personnel. They minimize or make no mention of the CNO and Secretary of the Navy efforts to limit Rickover's authority over the officer corps development. It is clear that Duncan and Hewlett had paid too little attention to this dispute. In interviews with Jack Crawford, Deputy to Rickover until 1963, and William Wegner, deputy to Rickover from 1963-1979, and James Holloway, the disputes over personnel were in the early 1960s issues of the highest import for navy leaders.
[54] Joint Committee on Atomic Energy, Statement by VADM H.G. Rickover,USN, during Joint Committee Tour of USS ENTERPRISE (CVN-65), 87th Cong., 2nd sess., 31 March 1962, 44. See also Francis

and rigorous training schools might be purposely constructed, not to weed out poor performers, but to winnow out the bulk of the diesel force in accordance with a new model of officer.[55] If Rickover did not retire soon, his personnel policies would remain in effect long enough to eliminate the bulk of the diesel officers and along with them an important subculture of command. Furthermore, the issue had by the early 1960s grown beyond the diesel officers to include the larger fleet. With the proliferation of nuclear surface ships, there existed the real possibility that the entire fleet could go nuclear, which would then be commanded by officers selected by Rickover.[56] Rickover's public statements that "…'verbal' men are on the way out …" [57] could be interpreted to threaten not just the diesel force but perhaps the entire 'line'.

In contrast to Rickover's technocratic belief in the deterministic qualities of advanced technology, Admiral Anderson, the CNO, articulated a decidedly less technical vision of the Navy of the future. Anderson called for an officer corps with the ability to fight not only the higher technology wars with "push button" machines, but also the lower level conflicts of guerrilla warfare and small local wars. Anderson made "limited wars" his first and strongest point: "The first point is that a strong capability to wage limited war, particularly non-nuclear war, is now and I believe will continue to be mandatory …" He went on and argued for the necessity of officers with a tactical,

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Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 233.

[55] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974) , 353. Also, as recounted by William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007.

[56] USS ENTERPRISE conducted sea trials in October 1961. LONG BEACH was already operational and BAINBRIDGE not far behind. See Duncan, Hewlett, and Rockwell for details on the technical and programmatic challenges of the surface program.

[57] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 19.

operational, and less technical background.[58] But Rickover's growing power threatened this broader type of officer. The elimination of the bulk of diesel officers could be seen as the proverbial 'canary in the mineshaft', the harbinger of things to come. The Navy's top leadership met quietly and discussed ways to limit Rickover's power before Rickover became too powerful to challenge.[59]

Navy leaders faced a daunting task if they were to modify the nuclear personnel system and preserve the culture and model of command represented by the diesel officers. Rickover's policies were becoming well established. Rickover's mechanisms for transformation, as discussed in the previous chapter, were fourfold: highly selective personal interview (selection), demanding engineering schools (training), longer nuclear tours for those who became nukes (assignment), and perhaps most importantly, a changed undergraduate educational program (to be discussed in the next chapter). The selective interview blocked most diesel officers from transitioning to nuclear power and was the mechanism senior leaders found most objectionable. [60] Officers who did manage to gain selection to the program then confronted high attrition (25%) in a school system testing at

[58] George W. Jr. Anderson, ADM, USN, "The US Navy in 1973," *Shipmate*, no. 4, April 1963, 2.
[59] By the late 1950s and early 1960s, numerous senior flag officers, apparently in flag officer conferences, were openly discussing their concern about the long term effects of Rickover's influence, and were grappling with a means to limit his authority. See Ralph Kirk James, RADM USN (ret), *Reminiscences of RADM Ralph K. James, USN* (Annapolis, MD: US Naval Institute, 1972), 291. James recalled that officers expressed concern that Rickover might "...infiltrate himself into the personnel and training aspect of it to the exclusion of those people in the Navy Dept who felt that was their prerogative." Also, David Alan Rosenberg, Interview with the Author, 15 June 2007, recalled that Admiral Burke, CNO from 1955-61, confessed that one of his regrets was that he did not do more to limit Rickover's power earlier in his tenure.
[60] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1608. Smedberg voiced complete agreement with Rickover's requirement that officers must have an "adequate educational background to absorb nuclear training." But Smedberg had difficulty understanding Rickover's rationale for the rejecting so many diesel officers. He challenged this high rejection rate. Rickover replied that he sought in the interview those officers capable of an "...instant response, an officer with great mental alertness…" Smedberg agreed with the criterion, but Smedberg still complained that "…his methods by which he arrives at his conclusions are not entirely known to me."

graduate level standards of scientific-engineering.[61] Rickover developed an additional tool with which to remake the submarine force and dilute the diesel influence. In 1960-61 Rickover created a new source of officers untainted by fleet influences: he broke a 50 year peace-time tradition and began to access future submarine officers not from the fleet but directly from Annapolis. This source of officers was so important to Rickover that in little over two years the inexperienced officers who came direct from Annapolis would make up 30% of the nuclear submarine force.[62] Shortfalls remained, however, especially at the more senior levels, and thus to forestall the need to recruit additional fleet officers, those officers already nuclear qualified were required to serve extraordinarily long tours of command, some up to six years.[63]

Admiral Anderson together with Smedberg began a series of interventions to limit Rickover's officer selection authority. The key to saving the traditional submarine culture was to allow larger numbers of diesel-trained officers to transition into the nuclear program.[64] One of the more forceful interventions came in 1962 when the CNO, the

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[61] Joint Committee on Atomic Energy, Statement by VADM H.G. Rickover,USN, during Joint Committee Tour of USS ENTERPRISE (CVN-65), 87th Cong., 2nd sess., 31 March 1962, 45-47. The nuclear schools were touted to work at the graduate level in math, science, physics, chemistry, metallurgy, and reactor engineering, and resulted in a relatively high attrition, 25%.

[62] H.G. Rickover, VADM, USN,"Joint Commission Tour of USS ENTERPRISE", US Congress. Joint Commission on Atomic Energy, 87th, 2nd Session (31 March 1962), 46.

[63] Raymond Peet, VADM USN, Interview with the Author, 12 July 2007. Peet served five years on BAINBRIDGE. See also W.R. Smedberg, III, VADM USN (ret), *Reminiscences of William R. Smedberg III, VADM, USN* (Annapolis, MD: Naval Institute Press, 1979). Smedberg noted that many nuclear officers served six consecutive years as commanding officers, though such service may have been on different crews of boats. See Smedberg, 717-718.

[64] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 326, note 91. Duncan devotes little more than a paragraph to this policy dispute, and leaves the impression it was little more than a series of memo exchanges between BUPERS and Rickover from December 1961 through 1962. (The memos are held at Naval Reactors and were inexplicably classified and were not made available for any outside review). The several memos did not persuade Rickover to change and the dispute continued. SECNAV eventually called a 'summit' between Rickover, CNO, and Smedberg in 1962, referenced by Smedberg in THRESHER hearings. See Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1608.

Submarine Force Commander, and the Chief of Personnel examined Rickover's manning requirements and ordered him to accept "… 117 senior officers in the LCDR-CDR bracket from the conventional submarines to be trained in the nuclear program." In the end, Rickover resisted and took only fifteen.[65] Rickover was nevertheless pressed hard by their efforts and complained to Congress that he was "…being constantly harassed with attempts to reduce training, to use people we don't think are qualified, or put people into the program for short periods of time …to help their chances of promotion."[66] Rickover's passing reference to promotion was disingenuous. More was at stake than just improving chances for promotion of a handful of officers. In the military culture of 'up or out', promotion equated to professional survival. And more importantly to the discussion here, promotion was the critical step leading to the formation of the group that would rise to senior command, to flag rank. What was at stake was no less than the future of the Navy's commanding elites. The number of nuclear crews would soon overtake diesel boat crews. Without the opportunity to transition to the nuclear boats, the diesel officers would be without commands, and their profession would have been wrestled from them. (See Figure 5-2)

Rickover was not one to stay on the defensive and realized that to preserve his emerging model of technically expert commander, he had to discredit the alternative, the versatile, well-rounded officer of the King model. Rickover became increasingly vocal in his criticisms of the old model of versatility, a model he disparaged as designed "…to

[65] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., Smedberg testimony, 1607.
[66] Joint Committee on Atomic Energy, Statement by VADM H.G. Rickover,USN, during Joint Committee Tour of USS ENTERPRISE (CVN-65), 87th Cong., 2nd sess., 31 March 1962, 40.

train every officer to be the Chief of Naval Operations.” [67] In addition, after CNO Anderson’s attacks on the nuclear system of command selection, Rickover called upon his technical and political allies to sustain his methods of officer selection.

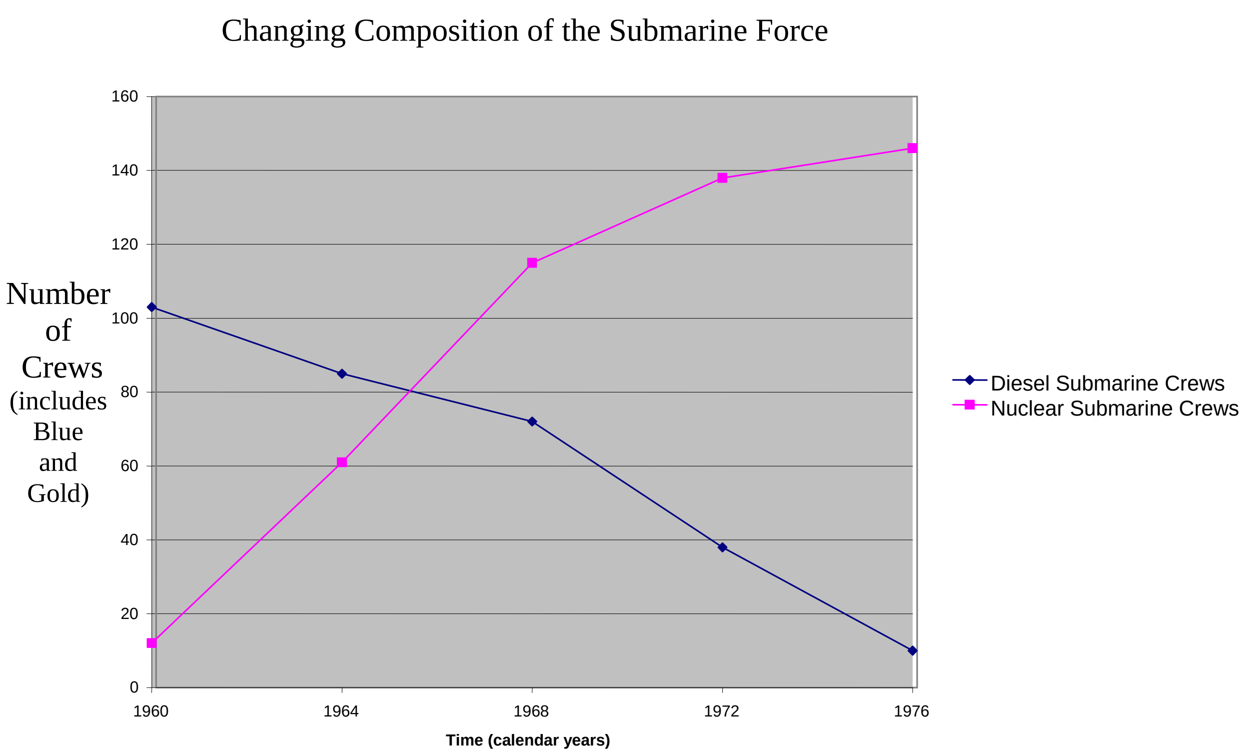

Figure 5-2: Data Drawn from Polmar, 1978

On at least one occasion, Glen Seaborg at the Atomic Energy Commission used his technical expertise and political credentials to publicly support Rickover’s method of officer development when it came under criticism by the 'line'. [68] Congressional leaders

[67] Ibid., 40.
[68] George Anderson, ADM, USN,"Personal Papers", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Boxes 40, 43, 51-53 X File, Aug 1961-Dec 1962. A summary of a staff officer reported to the CNO that Rep Chet Holifield, JCAE, exchanged letters with Dr. Seaborg of AEC. Both strongly endorsed a policy whereby AEC (Naval Reactors) assisted in the selection and training of nuclear officers, and expressed the opinion that there could be no relaxation of this practice. Interestingly, a staff

went on record and called for the continuation of the unique system of officer selection and assignment, especially the long tours that reduced the number of billets open to aspiring diesel officers. [69] In the face of congressional pressure, the new Secretary of the Navy Korth sided with Rickover.[70] To dislodge Rickover's policies, the 'line' needed some event that could trump Rickover's political allies or persuade them to switch sides in the debate. Such an event presented itself when 129 men were lost at sea aboard a nuclear powered submarine.

The nuclear power program experienced its first tragedy when the USS THRESHER on 10 April 1963 sank off the coast of New England. The submarine had just completed a shipyard repair period and was conducting routine testing when it failed to surface. Following an extensive search by submarine, surface, and aviation units of the Atlantic Fleet, it was determined that the submarine had sunk, taking with her all hands. The incident captured the attention of the world. Congress prepared to hold hearings after the Navy had completed its formal inquiry of the sinking. The Navy convened a Court of Inquiry under Vice Admiral Bernard L. Austin, a submarine officer. Rickover's personnel policies came under close scrutiny. This event provided an

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note attached to this memo indicates that McNamera had sent his own memo to the Secretary of the Navy, Fred Korth, stating that the SECDEF supported the Navy 'line' in its dispute with Rickover. It appears that Korth had intercepted the memo and thereby deprived CNO Anderson knowledge of high level support that might have tipped the balance against Rickover.

[69] Chet Holifield,"Tour of the USS ENTERPRISE and Report on the Joint AEC-Naval Reactor Program", JCAE, 87th Congress, 31 March 1962, Washington, D.C.: Government Printing Office. Holified writes of the assignment of nuclear officers: "Continued cooperation between the Atomic Energy Commission and the Navy is required to insure these individuals remain in their assignments for long periods to utilize their knowledge and experience to the fullest extent."

[70] George W. Jr. Anderson, ADM, USN,"Office Notes on Nuclear Officer Selection/Training Policies dtd March 16, 1962", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Box 52, X File, Aug 1961-Dec 1962

opportunity for Rickover's opponents to undermine his authority, or to effect his removal altogether.

By 1963 the nuclear submarine yards were producing a steady stream of new ships, a pace of construction that placed enormous strain on an already short-handed group of nuclear officers. Such was the pace of production that, for the first time since the Second World War, shipyards commissioned two submarines on a single day. At the same time more ships were joining the fleet, none would retire for several years, and thus the inventory of nuclear ships in the fleet grew rapidly. The number of SSBNs increased from one hull in early 1960 to forty-one a few years later.[71] To maintain the production schedules under conditions of severe officer shortages, experienced officers were moved quickly and sometimes en masse to new ships still under construction. This was the case with THRESHER: both the CO and XO transferred from THRESHER to new submarines under construction just prior to the sinking. Their transfer left THRESHER with only three officers qualified on the reactor.[72] Thus, the sinking offered an opportunity for Rickover's opponents to criticize his policies that had created the officer shortfalls.

Sensing opportunity in THRESHER's loss, the CNO attacked Rickover's officer policies in a meeting with the Secretary of the Navy on 27 April 1963. Anderson, Smedberg, Rickover and his deputy, Captain John Crawford, were present for the battle of philosophies.[73] In a heated exchange, Admiral Anderson, an aviator, argued that

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[71] See early editions of *Jane's Fighting Ships* as perhaps the best reflection of the rapidly changing composition of the fleet, one that began to filter over to foreign navies as well.
[72] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990) , 75.
[73] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007. Crawford explained that the personnel dispute was essentially a clash over visions of the

Rickover's selection and assignment policies were unfair to the mass of traditional submarine officers and detrimental to the future of the officer corps and the fleet. Anderson wanted the Secretary to order Rickover to accept substantially more diesel-trained officers to be re-trained on the new, nuclear technology. As many times before, Rickover used the unique status of nuclear reactors (they belonged to two organizations, the AEC and the Navy) to deflect challenges to his authority. Rickover played the technical "safety" card (the AEC card) which swayed the Secretary of the Navy to take no immediate action. Korth would await the outcome of the board of inquiry and the Congressional hearings.[74] By raising the possibility that he might lose control of a dangerous technology, Rickover had won the first round in a battle over competing models of command.[75]

As long as the Austin court remained in session, the Navy 'line' still hoped to compel Rickover to change his officer policies and to accept more diesel officers into his program. The Court provided the 'line' an opportunity to attack Rickover's personnel policies. It was thus not accidental that the court called VADM William Smedberg, the Chief of Personnel, and questioned him about nuclear personnel policies. The questioners offered Smedberg the stage he wanted: they asked Smedberg why

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officer corps: who would shape the most important new contingent of the officer corps, submarine, surface, and aviation.

[74] George Anderson, ADM, USN,"Personal Papers", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Boxes 40, 43, 51-53, "Summit on Nuclear Personnel: 27 April 1963". The meeting on 27 April 1963, just days after the loss of THRESHER, was described as a heated discussion concerning the future of the diesel officers.

[75]To be sure, safety was a core issue for Rickover. He saw reactor safety as perhaps his greatest duty, one he likened to a fatherly responsibility. See Thomas R. Weschler, VADM USN, *The Reminiscences of VADM Thomas R. Weschler, US Navy (Ret)*, 2 vols. (Annapolis, MD: US Naval Institute, 1995), 315. Weschler recounts Rickover used fatherly analogies when he talked about his responsibilities for reactor safety. In the late 1955, Rickover drove the then LCDR Weschler to the Pittsburgh airport from Shippingport, and in the course of conversation Rickover described his responsibility and philosophy: "Really, I have a very simple rule. I say to myself: 'I have a son. I love my son. I want everything that I do to be so safe that I would be happy to have my son operating it.' That's my fundamental rule."

THRESHER's captain and executive officer had transferred almost simultaneously in the months immediately preceding the sinking.[76] Smedberg responded that the transfers were necessary because nuclear officers were in critically short supply. But despite the severe shortages, Smedberg volunteered, Rickover had been unwilling to make up the shortfalls with more diesel officers. Smedberg explained that *seven hundred* additional diesel officers at the rank of lieutenant desired to transition to the nuclear program and that the Bureau had recommended *three hundred* as academically suitable for the program. *Rickover, however, took few if any of these officers.* The result was, in Smedberg's opinion, Rickover's shortages in personnel, which contributed to the untimely transfers from THRESHER.[77]

VADM Smedberg went further and implied that Rickover's personnel policies may be hazarding ships. He argued that Rickover's excessive selectivity created officer shortages that resulted in longer tours. The cost of longer tours was the physical and mental exhaustion of SSBN senior officers. He told the board about one exhausted, long-serving Polaris submarine captain who came into Smedberg's office and pleaded *not* to be sent to another submarine.[78] Smedberg was challenged, however, by a Captain Osborn, a nuclear trained member of the board. Osborn asked Smedberg to provide more details to support his assertion that the quality of diesel officers was sufficient for nuclear power. Upon hearing Smedberg's answers, Osborn suggested that the shortfall in officers could not be solved by taking more diesel officers. Osborn then offered a fatalistic summary of

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[76] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1605-1606.
[77] Ibid., 1607, 1613.
[78] Ibid., 1613, 1615. W.R. Smedberg, III, VADM USN (ret), *Reminiscences of William R. Smedberg III, VADM, USN* (Annapolis, MD: Naval Institute Press, 1979), 717-718.

the nuclear officer shortage problem: “It looks like we are in a position that we can never get this problem solved until time settles it.” Smedberg challenged Osborn’s fatalistic assessment and argued that if the Navy waited to take action the command tours would increase to intolerable lengths, at a cost in personnel and morale.[79]

Rickover had heard Smedberg's complaints before and would not concede that his policies were producing shortages or eroding morale and retention. He refused to admit in public that his policy of shortage may have contributed to the loss of THRESHER. But Rickover's position on this issue was precarious. Just two days before THRESHER sank, Rickover had refused to attend a CNO-level meeting concerning a severe, fleet-wide shortage of nuclear officers. His refusal to attend was significant enough that Rickover's absence from the briefing was recorded in the CNO records of the day.[80] But chance events apparently saved Rickover and his policy. Due to shipyard delays in completing the maintenance work on the THRESHER, the transfer of several officers to shore had been delayed. Thus, when the submarine sank, numerous ‘extra’ officers were still on board. The unplanned presence of extra officers on the ship that April morning of 1963 ensured THRESHER sank as one of the *most overmanned ships in*

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[79] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1613. The proceedings were not without some humor. In reference to Rickover's practice of long nuclear assignments, Smedberg conceded that there were some officers who wouldn’t object to the continuous nuclear duty: “Now, there are people, perhaps like yourself, Captain Osborn, who could go on to command a submarine for ten, fifteen or twenty years without a break and without it affecting them, but there are others that this sole responsibility without a break for extended periods does affect." Osborn replied to Smedberg: “There’s lots of people, Admiral, that think I’ve been pretty well affected already (by the long nuclear tours).”

[80] George Anderson, ADM, USN,"Personal Papers", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Boxes 40, 43, 51-53. Isaac Kidd, EA to the CNO, noted in the records of 8 April 1963 that Rickover refused to receive the OPNAV brief on the situation of manpower shortfalls in the nuclear navy.

the submarine fleet![81] Though Smedberg could show the submarine fleet was critically under-manned, the THRESHER was not! This unfortunate circumstance of work delays and officer transfers may have cost lives, but saved Rickover's personnel policy and possibly Rickover himself.

When Rickover was called to testify, the court of naval officers asked Rickover few if any questions about personnel policy. Rickover had emerged from the navy inquiry with his program and policies intact.[82] Shortly thereafter, Congress convened its own hearings on THRESHER, which included a review of personnel practices. In June 1963, Rickover's allies on the Hill reaffirmed their support for his personnel policies: "The committee reaffirms there should be no relaxation of existing procedures used in the selection, training, and assignment of nuclear propulsion personnel" [83]

Rickover had survived the 'line' officer attack and now shifted from defense to offense. He argued to his congressional allies that a contributing cause of THRESHER's loss was *not* nuclear manning policies but the Navy's old policy (the King system) of varied assignment and shorter tours, key tenets of the generalist model. Sympathetic congressmen would, after a delay of some months, eventually join with Rickover and attack the Navy's forty year-old model of officer development. Influential congressmen would urge the non-nuclear Navy to adopt a personnel system of assignment more

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[81] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007. Crawford, then deputy to Rickover, explained that when Thresher went down, one of the first concerns was the ship's manning levels, which Crawford checked immediately. As tragic as was the loss of life, it came as a bureaucratic benefit to Rickover that the ship went down with more than a full complement of officers.

[82] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 84-85.

[83] Joint Committee on Atomic Energy, Hearings on Loss of USS THRESHER, 88th Cong., 2nd Sess., 26,27 June, 23 July 1963, and 1 July 64, ix.

closely aligned with Rickover's model of greater specialization. This intervention, though conducted quietly between the Secretary of the Navy and Capital Hill, would carry with it profound implications for the larger officer corps, which will be discussed in chapter seven.[84]

Following the loss of THRESHER, another contingent event in history intervened to shape personnel policy. The CNO was fired by the Secretary of the Navy a few days after the April 27th meeting. As it became clear that Rickover would survive the THRESHER dispute and Anderson would not, the outgoing CNO made a last attempt to persuade Rickover to change his policies and accept more of the traditional submarine officers. As one of his last acts as CNO, Anderson penned a personal, handwritten letter to Rickover, imploring him for the good of the Navy that he change his officer personnel policies. By all indications, Rickover ignored Anderson's plea and did not answer the letter.[85] Anderson, like many of Rickover's adversaries, did not understand that, once Rickover gained power, there was little room for negotiation when it came to issues involving Rickover's technocratic philosophy and his model of command. Rickover's

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[84] In March of 1965, Representative Chet Holifield, the Chairman of the Joint Committee on Atomic Energy, would challenge CNO McDonald and the Secretary of the Navy to defend the Navy's officer policy of broadening and frequent assignment changes. As will be discussed in chapter seven, Secretary Nitze would yield to Holifield's demands. There followed Nitze's concession a series of events, meetings, policy papers that presaged the demise the King's model of integrative officer development. The influence of this congressional intervention is hard to measure, but what is certain is that THRESHER and Rickover's agitation were the catalyst for congressional intervention.

[85] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007.   George Whelan Anderson and United States Naval Institute., *The Reminiscences of Admiral George W. Anderson, Jr., U.S. Navy (Retired)*, 2 vols. (Annapolis: U.S. Naval Institute, 1983). Three sources confirm the existence of such a letter. First, Crawford recollected that he received the letter from Rickover and kept it in his desk, apparently not knowing if or when the admiral would respond. Crawford read the letter and interpreted from the text and tone of the letter that ADM Anderson knew Rickover was in an unassailable position with congressional support, and thus the CNO made the personal appeal in a handwritten note to Rickover. Anderson implored him, for the good of the navy, to relax his powerful role over the shaping of the future officer corps. The existence of such a letter is corroborated in both Admiral Anderson's oral history(pg. 598) and in Anderson's CNO records in an a daily staff notation by Captain Isaac Kidd, Chief of Staff to Anderson, see NHC, OO files, Anderson Miscellaneous Files, box 43.

policies were not just those of another bureaucrat maneuvering for power. Rickover was a technocratic visionary and revolutionary destroying the old and bringing in the new. As a revolutionary empowered with high rank and unmatched political support, he would no longer negotiate or compromise. Rickover was building both a nuclear fleet and providing the nuclear technicians and specialized officers to command this fleet. Informed by his philosophy of technocracy, Rickover believed the old model that valued general education and assignments outside an officer's specialty must give way.

Rickover had won this most important of bureaucratic battles: he had faced down the CNO and the Bureau Chief. It was Admiral Anderson, the senior officer in the Navy, not Vice Admiral Rickover, who was fired. Perhaps most importantly, Anderson believed Rickover was the cause of his early departure.[86] Faced with what appeared to be Rickover's complete victory, Anderson's successors hesitated to again confront Rickover on nuclear or diesel submarine matters. Rickover could exclude from submarine command any officer he so chose. Rickover chose to exclude even more diesel officers. But in order to exclude so many, he needed a new source of officers to take their place. He settled for a massive, fleet-wide draft of surface ship and aviator

[86] George W. Jr. Anderson, ADM, USN,"Tasking Notes to Executive Assistant, Captain Isaac Kidd, dtd 8 May 1963", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Box 52, "X" Folder (sensitive, private). Anderson believed that his battles with Rickover, including the meeting on 27 April 1963 on officer policy, precipitated more than any issue or event his early termination. On 8 May 1963, Anderson discretely tasked his staff to determine the most likely cause of his termination, to include a timeline of recent events. In notes dictated to Kidd, Anderson lists Rickover as the most significant of eighteen policy disputes with his civilian superiors, and lists the meeting on 27 April 1963 at 1000am, followed by a visit by Korth at 1445, as the possible causal moments of his termination. Anderson's elevated perception of Rickover's power was significant, for in the subsequent turnover process with the incoming CNO, Admiral McDonald, it is reasonable to assume that Anderson counseled McDonald to accept Rickover's authority on personnel, which may explain McDonald's later passivity and the subsequent unimpeded diffusion of the Rickover-like model of line officer through the fleet.

officers.[87] Chastened by their defeat in the battle over THRESHER and still puzzled by Anderson's departure, the Navy's senior leaders acquiesced to Rickover's unprecedented demand for a fleet-wide draft of scientifically adept aviator and surface officers. On 10 August 1963, just a few weeks after the conclusion of the THRESHER inquiry, hundreds of surface and aviation officers were told to report to Rickover for interviews.[88] The draft of these non-submarine officers relieved the pressure on Rickover to accept more traditional submarine officers and thereby assured the dilution of the tactical-operational culture that had defined the diesel boat fleet. But even with the draft, Rickover took just enough surface and aviator officers to fill the anticipated billets; no excess was allowed. As before, he sought to sustain a condition of persistent shortage, which in turn necessitated the new surface and aviator officers to conform to a career of a technical expert and nuclear specialist.[89]

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[87] J.O. Cobb,"Memorandum from Pers B to Pers 161, dtd 5 August 1963, Subject Nuclear Power Program: Query 46-63", Author has copy.

[88] William Smedberg, III, VADM, USN,"Letter from Smedberg to Rickover regarding Nuclear Draft, dtd 10 August 1963", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Box 52, "X" files A first hand account of the draft of aviator and surface officers was provided by one of the first senior surface officer draftees, J.A. Sagerholm, VADM USN, Interview with the Author, 11 July 2007. VADM Sagerholm explained that most senior surface ship officers had no tactical experience on submarines. He himself was very senior, having just served as an XO of a surface ship and was soon to promote to commander. He explained that the draft was quick and unavoidable. Sagerholm recalled that he, along with several hundred surface officers, were called into the auditorium at the Bureau of Personnel headquarters in August of 1963. VADM Smedberg informed the officers that they would all interview with Admiral Rickover and had no choice but to accept if selected for nuclear power training. From Sagerholm's recollection, several hundred surface officers were drafted over the next couple years and provided the crucial manpower source to allow the Fleet Ballistic Missile program to continue. What is remarkable is that officers as senior as Sagerholm would be transitioned to senior positions in a nuclear submarine—Sagerholm went directly to XO of a submarine following a brief tour as a division officer (he was a LCDR at the time, while most division officers were ensigns or LTJGs). This practice further confirms the notion that technical expertise had eclipsed tactical or operational expertise as the primary focus of the commander. The implication of this massive draft of surface officers may not yet be fully appreciated.

[89] Harry Depue Train, ADM USN, Interview with the Author, 2 November 2007. Admiral Train recounted the shortages were so extreme that when a single department officer was relieved of his duty on one ship, his loss disrupted several other officer assignments on other ships. According to Train, who served as the assistant submarine detailer in the early 1960s, the policy of shortage was 'by design'. Admiral Trost observed that additional causes combined to perpetuate the shortage, not all of which were intentional. Trost explained Rickover had a policy of high selectivity (taking no more than ½ of any group of officers,

With Rickover's victory over the CNO, the bulk of the diesel officers were consigned to professional oblivion: most would be forced out of the ‘line’ when command opportunities evaporated along with the diesel submarines.[90] The nuclear model of 'line' officer had become the reigning model in the submarine fleet, a transformation guided by Rickover. Admiral Charles K. Duncan noted that Rickover’s legacy, which had been the transformation of ships and engines in the 1950s, became in the new decade the transformation of personnel: "… he really selected who the nuclear submarine commanders should be. Eventually, he would select every submarine commander in the navy.”[91] Having won his battle with the CNO and cemented his absolute control of the selection and assignment of nuclear personnel, Rickover turned his attention to his nuclear training and qualification system. THRESHER was his first disaster, and he set out to determine what lessons he could draw from the tragedy.

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The THRESHER Disaster and its Longer term Consequences: Technological Over-shoot and a New Generation of Nuclear Officer

The investigation of THRESHER produced thousands of pages of documents and multiple theories of causation. The tragic sequence of events most likely originated with a failure of a material system, but Rickover’s officers and his reactor plant procedures

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no matter how talented they might be as a group). But retention of officers in the program was also low, in part due to the rapidly expanding civilian nuclear power program. C.A.H Trost, ADM USN, Interview with the Author, 3 November 2007, 18 December 2007.

[90]Bureau of Personnel Navy Department,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197, 50. Command opportunities for diesel and missile officers existed in limited numbers through the 1960s, but non-nuclear officer command opportunity evaporated for officer year groups younger than 1970.

[91] Charles Kenney Duncan, *The Reminiscences of Admiral Charles K. Duncan, USN (Ret.),* 4 vols. (Annapolis: U. S. Naval Institute, 1978), 479.

were not beyond reproach. RADM John H. Maurer, Director of Submarine Warfare in 1963, hypothesized that Rickover's officers and their procedures were at fault: "…there were specified operating procedures in connection with the nuclear plant….the plant remained shut down until they (operators) had gone through these definitive steps to bring the plant back…"[92] But the delay in bringing the plant up, Maurer argued, had doomed the submarine. Rickover and his staff publicly rejected Mauer's analysis. Rickover claimed the evidence inconclusive and protested that, even should the procedures be found wanting, his nuclear officers knew when to depart from written guidance. But apparently, behind closed doors, Rickover concluded that the failure of the crew to restart the reactor fast enough may have in fact contributed to the ultimate loss of the submarine.[93] As hard as it was to accept, the facts appeared to show that the first generation nuclear officers had made a profound, tragic, and perhaps, avoidable mistake. The loss of the THRESHER compelled Rickover and his staff to abbreviate the procedure by which operators could restart the reactor.[94] If measured by words on a page, the new

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[92] Maurer, John H., RADM USN as quoted in Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 90. This same opinion was also voiced by Ralph Kirk James, RADM USN (ret), *Reminiscences of RADM Ralph K. James, USN* (Annapolis, MD: US Naval Institute, 1972), 392.

[93] James L. Holloway, III, ADM USN (CNO), *Aircraft Carriers at War: A Personal Retrospective of Korea, Vietnam, and the Soviet Confrontation* (Annapolis: US Naval Institute 2006), 169. Holloway confirms Mauer's and James' suspicion that a contributing cause of the loss of Thresher was the failure of personnel to more rapidly recover the reactor following the inadvertent shutdown. Holloway, who was a student at NR headquarters in early 1964 would seem in a position to know this information. Holloway states clearly in his book: "Still, the nuclear submarine Thresher was lost at sea with all hands when the crew failed to recover the reactor plant properly following an inadvertent emergency shutdown, or SCRAM, of the reactors while underway submerged." This same argument was raised in testimony before the JCAE in June 1963 by RADM John H. Maurer, the non-nuclear director of submarine warfare. However, Rickover and his staff publicly discredited Maurer's criticism of the reactor plant as not fully substantiated by the limited acoustic evidence. See Duncan, 1990, 89-93.

[94] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 92. Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982), 434. They refer to the recollections of one submarine flag officer who speculated that because of THRESHER, the time to start up a reactor reduced by half. Though the numbers involved seem suspect, the testimony of the officer appears to further confirm that THRESHER was the catalyst to significant change in procedures and officer training and qualifications.

procedural change constituted a relatively minor addition to voluminous reactor documents. But the sequence of actions and policies associated with the implementation of the revised procedure, in fact, held profound implications for the nuclear officer training, qualification process, and ultimately the entire officer corps.

To adapt the accelerated procedure to fleet use, Rickover ordered officers to attend training on reactor start up procedures.[95] Most importantly, the admiral ordered most, if not all, of his ship engineers back to the Washington D.C. headquarters to be trained by his personal staff on the new procedures. The return of dozens of officers to headquarters brought about an unpredictable turn of events that was to significantly re-shape the career path of all future nuclear officers. When the sea-going engineer officers reported to Naval Reactors in Washington, they were subject to evaluation, testing, and questioning concerning their understanding and knowledge of reactor operations. Rickover found some officers to be deficient in their technical knowledge.[96] He was, to put it mildly, displeased with their level of technical knowledge. With his discovery it became apparent to Rickover that not only had the officers on THRESHER failed to fully understand their technology, a deficiency that contributed to the sinking, but now Rickover had further evidence these same knowledge deficiencies existed fleet-wide. Unseen to the outside world, Rickover and his personnel program fell into a quiet crisis.

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[95] James D Watkins,"Memorandum: Report of Conference on Nuclear Power School Training Matters, dtd 19 May 1963", signed by future CNO James Watkins, who was then serving in the immediate office of Admiral Rickover. The document listed areas of deficient training and tasked the staff to produce new case studies and procedures. Included on the short list was the need to revise “start up” training. In addition, most recent scholarship dates the revision of the procedures to the day after the THRESHER sinking, approximately 11 April. See Thomas B. Allen and Norman Polmar, *Rickover: Father of the Nuclear Navy* (Washington, D.C.: Potomac Books Inc., 2007), 61.

[96] William Wegner, Deputy Naval Reactors, 1963-1979, Interview with the Author, 17 July 1007. Wegner was the deputy manager of nuclear reactors at this time and was especially privileged as to the origin and nature of the policy changes that followed THRESHER.

Rickover's state of mind at this period is unclear, but it is reasonable to conclude that he may have been, in these conditions, under severe stress and perhaps prone to over-reaction. Rickover felt a heavy personal responsibility for the death of over a hundred men. In the wake of the tragedy, Rickover expressed his condolences in handwritten letters sent to *every* sailor's widow or mother. In a letter to the CNO, Rickover sounded depressed and in crisis. In this brief letter of only ten sentences, Rickover wrote about "man's dependence on God", mentioned 'God' or 'prayer' four times, and quoted an ancient Breton fisherman's prayer. He went on to recommit himself and his staff to better design, build, and operate the nuclear machines.[97] It was in this state of mind that Rickover made some of the most profound changes to both the material and personnel policies of his program since its inception almost fifteen years before.

It is well known that in response to the loss of THRESHER Rickover made major changes to material management procedures of his program whereby he attained unprecedented levels of quality control.[98] Less well known is the fact that he also redoubled his efforts to gain more complete control of the 'human element'. In public Rickover rejected Maurer's accusations that his men may have acted like robots and strictly adhered to his startup procedures all the way to the bottom, even though "...common sense tells you this is not so…"[99] But in private, in this emotional and stressful period, Rickover knew otherwise. Rickover was now confronted with the

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[97] George Anderson, ADM, USN,"Personal Papers", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Boxes 40, 43, 51-53 ltr from Rickover to Anderson, dtd 6 May 1963. Rickover closed the letter: "I pray that those of responsible for submarines will learn to design, build, and operate these submarines in a manner worthy of those men who gave their lives on THRESHER."
[98] Theodore Rockwell, Interview with the Author, 25 September 2007. See also John Pina Craven, *The Cold War Beneath the Sea: The Silent War* (New York: Simon and Schuster, 2001), 103-108.
[99] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 92. Though study of accelerated start up procedures had commenced before the loss of THRESHER, the efforts were accelerated after the sinking.

knowledge that nuclear officers, especially the ship captains, did not adequately understand their technology. The perceived knowledge deficiency of the first generation of nuclear officer compelled him to take action.

The personnel deficiencies revealed by THRESHER validated Rickover's core beliefs: that technology drove history and people; that men must be conformed to the machine requirements; that men must be trained to the standards necessary to exercise *absolute* control over their nuclear machines.[100] He had lost a submarine in part due to the failure of his officers to fully understand and then fully control their machines. The professional development process that produced the first generation of nuclear officer was thus, by implication, inadequate.[101] Scientifically engineered nuclear technology required more of an officer's time, attention, and education than even Rickover had anticipated. But the question remained as to how to balance these new demands with the other professional requirements naval 'line' officers had to complete in order to promote and to command in battle. If Rickover discarded the first generation model of nuclear officers, two options remained. First, he could return to a pre-1899 model of the 'line' and man his reactors with dedicated nuclear specialist engineers who did not command; this was the Royal Navy model, which had been considered but not adopted by the Bruton Board of 1954. Alternatively, he could levy on his 'line' officers substantial new training and qualification requirements and make them in spirit, if not in fact, 'engineers

[100] Ibid., 87.
[101] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007. According to Crawford, the system that produced the first generation of nuclear officers was less technically robust than Rickover had preferred. Early in the program Rickover had voiced the opinion that perhaps only those officers who had served as engineer should be eligible for command. However VADM Smedberg was opposed to this engineering pre-requisite for command, and Smedberg was until THRESHER powerful enough to reject this requirement. The loss of THRESHER convinced Rickover to act on his technocratic philosophy, and the bureaucratic victory gave him the power to ignore Smedberg.

in command', the ultimate expression of the type of leader idealized by the Technocracy Movement of Columbia University earlier in the century.

The first option, to develop a corps of nuclear specialists EDOs to run the reactors but not command, was an untried concept when first suggested in 1954 by the Bruton Board. However, when THRESHER sank and a search for lessons began, there existed a successful example of nuclear specialists who operated the reactor but who remained subordinate to a more broadly educated, tactically minded 'line' officer. This alternative model in 1963 was the nuclear engineer of the Royal Navy.[102]

The British system of manning and commanding nuclear submarines presented an alternative model of nuclear-age officer development. In the British system, the captain's knowledge focused primarily on tactics and ship operations, leavened with modest training in nuclear technology. The officer in charge of the reactor was a technical expert, a pure specialist, and devoted himself exclusively to engineering knowledge, but did NOT rise to command at sea. RN leaders believed that nuclear technology had *not invalidated* their model of command and fought to preserve their cultural forms. When the S5W reactor system (Rickover's system) was transferred to the Royal Navy, a major point of contention that threatened to sour relations between the two navies was Rickover's insistence that the British submit to his method of personnel

[102] The Royal Navy had, since the advent of steam, taken a different approach to command and engineering specialization. The 'line' commander was in overall command, but possessed limited engineering knowledge. The engineer in turn enjoyed a great degree of autonomy, but could NOT rise to command. For a brief comparison of these differences in American and British approaches to engineering specialization and command, see John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 213.

selection and assignment.[103] The British refused to adopt Rickover's personnel system of command and continued with their own unique and apparently effective system of officer manning and development. That the British model was indeed a viable alternative to the American approach was evidenced by the fact that the Royal Navy operated a reactor and propulsion system *identical* to the American S5W reactor without serious accident: the Royal Navy would operate multiple S5W-type reactors for almost a half century without losing a ship.[104] Thus, for the US Navy, it was not the 'discipline of technology', but it was Rickover who chose the model of command.

In devising his post-THRESHER reforms, Rickover chose to ignore altogether the British model. He also rejected further accommodations with the 'generalist' model that had produced the first generation nuclear officer. To ensure he never lost another submarine due to officer error, he placed even more priority on technical expertise and created an even more technically demanding qualification process. Rickover would make the next generation of nuclear ship captains quite literally into 'engineers in command'.[105]

In comparison to the early nuclear commanders, the second generation of officers faced substantially more rigorous standards of testing and evaluation. To succeed in the more rigorous technical tests and schools, the second generation of nuclear officers would all but abandon graduate school, war college, and other assignments that

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[103] John Coote, Captain, Royal Navy (retired), "Commentary on 'Lord Louis'," *US Naval Institute Proceedings,* 107, no. 3, March 1981, 16.

[104] VADM Sir Robert Hill, RN, "Admiral Hyman G. Rickover USN and the UK Nuclear Submarine Propulsion Programme," in *The Seventy Seventh Thomas Lowe Gray Memorial Lecture* (Institution of Mechanical Engineers: Power Industries Division, 2005).

[105] This is in fact what Rickover did. Evidence of this change is found in officer records. Following THRESHER, the Navy Officers' Register was changed to reflect the new requirement that submarine officers on nuclear ships were qualified as "engineers". The notation in the record went further to explain that the nuclear engineering qualification superseded any and all other qualifications. See volumes 1963-1966 United States. Bureau of Naval Personnel., *Register of Commissioned and Warrant officers of the United States Navy and Marine Corps* (Washington: Govt. Print. Off. etc., 1814-2002).

distracted from the specialty of nuclear engineering. If the first generation of nuclear officers were ‘versatile' officers who integrated the latest technology (e.g., nuclear) with the education of war (e.g., the war college), this second generation was the more technocratic and, by training and education, reflected a model wherein technical expertise became the supreme qualification for command.[106] After these changes, Rickover’s model of the ‘line’ began to more closely approximate what heretofore had been the Navy’s definition of an Engineering Duty specialist, an officer to “…fill those positions requiring technical proficiency that can only be acquired and maintained by extensive education and *continuous* duties in their specialties.”[107] (italics my emphasis)

In contrast to the first generation of officers, now *all* nuclear officers had to qualify as senior engineer of a reactor to be allowed to progress to command. This was a significant change from the earlier model. In the earlier model of nuclear command, an officer could avoid duty as engineer, merely qualify as a junior supervisor, and still promote to command.[108] The path to engineer would be even more technically specialized and would require additional training and a return to headquarters to take and

[106] The first generation of nuclear officers was indeed the ‘renaissance’ men of their day. They were the ultimate product of the King system, educated widely and progressively, with varied assignments in their careers, including service on two of three platforms and command of both surface ships and submarines. The first generation had studied and some would say had mastered nuclear technology. Technically, however, they were less rigorously trained than the officers who were to follow for few, if any, of the first generation had actually served as chief engineers of a nuclear reactor plant.

[107] Arleigh Burke, Admiral, USN,"Precept Convening Board to Study Billet and Post-Graduate Educational Requirements in the Specialty Areas in the Line of the Navy, dtd 15 June 1959", NARA RG 24-470-54-25-6 box 5 Official definition of 'specialist' adopted by the navy in 1959.

[108] Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990), 248. Duncan discusses the increased engineering demands on nuclear officers, and the evolution toward the requirement levied on all aspiring nuclear captains to serve as chief engineer, not merely to have stood watch in the reactor spaces. William Wegner, Rickover’s Deputy for almost 20 years, concurred that THRESHER gave rise to the new, more stringent qualification process. In addition, Wegner explained that prior to THRESHER, the commanding officer had the authority to certify subordinate officers as ‘engineer’. After 1964, only NR HQ could certify officers as a nuclear 'engineer'.

pass an engineer's exam.[109] Furthermore, it now became mandatory that to command a nuclear ship an officer had to have served in the billet of senior engineer of the submarine or surface ship (the only exception remained the nuclear aviators in command of aircraft carriers).[110] With the added technical requirements, nuclear officers were forced to abandon the King model of versatility in favor of technical specialization. Thus it was, in response to the loss of THRESHER and the need for a new reactor 'start-up' procedure, that Rickover changed the type of officer who would become the senior nuclear officers of the Navy.[111]

The CNO's staff caught wind of the new technical pre-requisite for command and recognized the implications that such changes, if adopted, might hold for the officer corps. But attempts by the CNO's staff to view the new policy documents were rebuffed

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[109] The exam, which remains in effect today almost a half century later, is arguably the most demanding technical examination to which any combat officer in any military service is subjected. As a consequence of the additional testing, yet more officers would attrite from the program. For a description of Rickover's post-THRESHER exam process, see U.S. Congress,"Trip to the Knolls Atomic Power Laboratory, September 28, 1970", House Subcommittee on AntiSubmarine Warfare of the Committee on Armed Services,91st Cong., 2nd sess., 23 October 1970, 12258.

[110] For the best first hand summary of Rickover's views on nuclear training, and the requirements leading to command, see H.G. Rickover, Admiral USN, *Statement before the Subcommittee on Energy Research and Production of the Committee on Science and Technology, U.S. House of Representatives, Ninety-sixth Congress, first session, May 22, 23, 24, 1979* (Washington, D.C.: U.S. GPO, 1979).

[111] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007; Francis Duncan, *Rickover and the Nuclear Navy: The Discipline of Technology* (Annapolis: Naval Institute Press, 1990); C.A.H Trost, ADM USN, Interview with the Author, 3 November 2007, 18 December 2007. Wegner, Rickover's deputy in this period, explained that the requirement for the accelerated startup procedure was the catalyst and justification that led to the requirement for all officers to complete successfully the engineer's exam, which led, inevitably, to the loss of yet more officers who were less mathematical and technical. Duncan in 1990 explained that to be the captain of a nuclear ship an officer must qualify and serve as a nuclear engineer (pg. 248). The requirement that commanding officers serve first as chief engineer became a barrier for those officers weaker in engineering, but perhaps more adept in operations or tactics. Admiral Trost corroborated William Wegner's recollection that the loss of THRESHER exerted a significant effect on officer qualification requirements. Trost noted that the engineer's qualification and exam emerged in its final form in the aftermath of the loss of THRESHER, and this exam exerted a winnowing effect on the officer corps. Trost recollected that the new engineer's exam eliminated from the program at least two officers he knew personally. The net result of the exam was to raise engineering standards, but possibly led to a loss of other skills or talents to the larger navy. (Note: Trost, a future CNO, joined the nuclear navy early enough that he was less affected by post-THRESHER policy. Interestingly, Trost never served as engineer on a nuclear submarine).

by Naval Reactors.[112] After Rickover's victory in the THRESHER power struggle, Naval Reactor personnel policy was practically autonomous in the Navy. Senior non-nuclear leaders remained convinced, however, of the validity of some elements of the old King model and implored Rickover to act in the best interests of the officers and allow his men to broaden their careers beyond the reactor and nuclear ship assignments.

VADM Smedberg conceded that all nuclear officers would be recruited according to Rickover's preferences, trained in his schools by his standards, and selected for and assigned to command in accordance with NR's desires. But Smedberg believed the nuclear officer recruits were the Navy's best officers and should be broadened.[113] Smedberg was concerned that these elite would rise to high command with an overly narrow and parochial experience. As early as the first half of the 1960s, nuclear officer attendance at graduate school, for example, was already falling and was linked to a declining morale.[114] Smedberg sought to sustain for the nuclear officers as many elements of the integrative education and assignment system as he could and openly expressed his desire "…to give a greater broadening to these officers…"[115]

The broadening of nuclear officers was by the middle of the 1960s becoming increasingly problematic. Rickover's deliberate policy of shortage, useful as a tool to break the old culture of the diesel officers, was becoming a structural feature of the

[112] Eugene P. Wilkinson, VADM USN, Interview with the Author, 26 March 2007. Wilkinson explained that Rickover sent him to tell the CNO staff that the policy was approved by Rickover, and the CNO's staff had no need to be involved, or to view the documents.
[113] W.R. Smedberg, III, VADM USN (ret), *Reminiscences of William R. Smedberg III, VADM, USN* (Annapolis, MD: Naval Institute Press, 1979) 625-626.
[114] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C. , 1607-1609.
[115] Ibid., 1609-1610.

nuclear officer corps. A slight decline in submarine officer retention, combined with the manning pressures of an expanding nuclear force and the lack of an officer surplus on which to call in emergency, produced a self-reinforcing spiral in retention that produced ever longer and repeat sea tours.[116] By design, Rickover's draft of surface and aviation officers in 1963 filled only the required number of nuclear billets and appears to have done little to improve nuclear officer opportunities for shore duty, graduate school, or other various assignments.[117] The inability of his nuclear officers to attend graduate school or other non-nuclear shore duty did not, however, concern Rickover, for he was philosophically disposed toward the 'line' officer as technical expert and specialist.

Nuclear submarine officers were slowly coming to share some of Smedberg's concern about the trajectory on which Rickover had placed the nuclear officer corps. Relatively junior nuclear 'line' officers occasionally questioned Rickover and argued for a change in policy, for a return to some elements of the 'versatile' officer career. Some younger officers published in *Proceedings* complaints about the narrow nature of nuclear training.[118] A few outspoken submarine captains brought their concerns to Rickover but

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[116] Lando Zech, VADM USN, Interview with the Author, 3 August 2007.

[117] After the draft of 1963, officers were seldom involuntarily drafted. However, the Navy did encourage some surface and aviation officers to 'lateral transfer' into the submarine navy. As before, tactical experience was of secondary importance compared to technical aptitude. The main requirement was that the officers be able to master the engineering and technical requirements of Rickover's schools. Nav OP 38 of 1977 See "Navy Requests URLs to Enter Nuclear Field," *Navy Times*, 18 April 1977.

[118] Thomas H. Taylor, LCDR USN, "Nuclear Power Training," *US Naval Institute Proceedings,* 89, no. 7, July 1963; Albert H. Konetzni, Jr., CDR USN, "Comment," *US Naval Institute Proceedings,* 107, no. 2, February 1981. Konetzni would rise to the rank of vice admiral. In his article of the early 1980s he reflects on the earlier period, and noted that the narrow career path was a deterrent to officers, that various measures were adopted to entice officers to remain, including the start of the bonus program in 1969. Regardless of these efforts, attrition of officers after their initial obligation reached 66% in the later 1960s.

to no avail.[119] Others complained years later, after they had retired as senior flag officers, that the nuclear training program had been unnecessarily lengthy.[120]

But the key issue was not the length of nuclear training, but was instead the career path that was highly specialized and the implications a specialist career held for the retention of officers of the 'line'. The policy of shortage ensured officers remained close to the reactor, but such narrowness did not persuade officers to remain in the service, and as a consequence attrition climbed higher. Long after Rickover had diluted and marginalized the diesel culture, the condition of shortage persisted and even deepened. There were signs that Rickover was losing control of officer retention, and it began to spiral downward. The higher attrition required officers who remained in the service to spend yet more time on the reactor plants, which further narrowed the officer's career. More time at sea and with the reactor reinforced the tendency of officers to leave the nuclear service for high paying civilian jobs. A major factor in the demoralization and declining retention among nuclear officers appears to have been the shift in identity to that of technical specialist notion of the 'line'.[121]

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[119] Theodore Rockwell, Interview with the Author, 25 September 2007. Rockwell explains that indeed some submarine captains of the time recognized the cost to tactical proficiency and confronted ADM Rickover, via Rockwell. Two of the officers cited by Rockwell were James Osborne and Tappey Simms, neither of whom have been by the time of this publication interviewed, and hence, have not yet been able to corroborate Rockwell's recollection.

[120] Kent L. Lee, Vice Admiral, USN (Ret), "The Enterprise in WestPac," in *Into the Jet Age: Conflict and Change in Naval Aviation, 1945-1975*, ed. E.T. Wooldridge, Captain, USN (ret) (Annapolis, MD: Naval Institute Press, 1995), 237. VADM Kent L. Lee, the aviator who followed Holloway in command of USS Enterprise, observed that nuclear power training was too long, almost by a factor of 3. Lee recalled he had 14 months in Rickover's office, followed by 2 months on Enterprise, and then relieved Holloway. Lee observed: "I don't think I needed that extensive kind of training. I think five or six months total would have been adequate, but Rickover had a policy that the original training would be one year to the minute."

[121] Thomas B. Thamm, Capt, USN, "Quiet Crisis in the Silent Service", *US Naval Institute Proceedings*, no. 8 August 1971. Though most nuclear officers did not write about their community, a few pieces did emerge in the professional press. Captain Thomas Thamm, a nuclear officer, provided a detailed description of the personnel shortages that wracked the nuclear force. He went further than most to speculate as to the root causes of the personnel problems: the way nuclear technology defined personnel

As junior officer retention continued to decline, approaching historically unprecedented low levels,[122] the first generation nuclear officers approached Rickover and offered suggestions to reverse the trend. Captains (later VADMs) Lando Zech, the first nuclear submarine detailer, and Raymond Peet, the first nuclear surface officer, were representative of this quiet debate within the program. Captain Ray Peet, himself one of the most broadly educated and experienced of the nuclear pioneers, pushed for expanded educational opportunities for his nuclear officers and in those early days won a few confrontations with Rickover.[123] Captain Zech in his capacity as head submarine detailer, the officer responsible for the assignment of submarine officers, met with Admiral Rickover in the summer of 1966 at which time Zech recommended more officers be allowed into the program. Zech hoped the addition of more officers might mitigate some of the worst quality-of-life aspects of the submarine program and allow some officers to achieve a more balanced and broad professional experience, which then

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policy. He observed that resignations in the new nuclear submarine force climbed to 3 times the resignations than in the "old" submarine force, and all this BEFORE the worst of the Vietnam retention crises that came to afflict the rest of the Navy (pg. 55). Thamm explained: "In less than 20 years the submarine service has been transformed from a military service with a waiting line to get in, to one with a waiting line to get out." (pg 52) "Innovations such as radar, sonar and other electronic devices were introduced and , while complex, they were absorbed into the body of required knowledge with no particular difficulty." "The science of nuclear energy and ballistic missiles could not be absorbed into the old order. To understand and apply these new technologies, officers required highly specialized training. Officers became identified as nuclear-trained, weapons-trained, or neither. ...In accepting these advantages (of nuclear technology) the submarine force has had to pay a human cost." "The technological change brought about a radical shift in officer qualification emphasis. The officer's first duty was to prove and reprove his command of a technical specialty such as nuclear power..." (pg. 53) "The perceived consequences of failure brought about an intense pressure to concentrate on one end of the boat." "But the human animal can cope with only so many priorities at a time and most officers--perhaps unconsciously--decided that qualification as a submarine officer simply would have to take second place in the event of a conflict with technical qualification requirements."

[122] Albert H. Konetzni, Jr., CDR USN, "Comment," *US Naval Institute Proceedings*, 107, no. 2, February 1981, 89. Commander, later VADM Konetzni, noted that by the late 1960s, attrition of young officers after their first tour had risen as high as 66%.

[123] Raymond Peet, VADM USN, Interview with the Author, 12 July 2007. Peet recounted how he fought for graduate school for officers, in particular for a supply officer who would later, in part based on his advanced education, rise to be the head of the navy supply system. Rickover preferred instead, Peet explained, that the supply officer remain in nuclear related billets.

in turn might improve retention. Zech's recommendations were, however, rejected. Captain Zech challenged Rickover a second time a year later.[124] A second time Rickover refused to take more officers or allow departures from a career path of nuclear specialization, even if such intransigence came at a cost of yet higher attrition. Later events showed Zech and Peet were correct in their early reform attempts. In testimony when he was CNO, Admiral James Watkins would make essentially the same arguments Zech had made. But Watkins' calls for reform came too late, well after the pattern and mindset of narrow specialization and low retention had deeply established itself in the submarine community.[125]

The reality was that Rickover remained in favor of specialization over breadth, in spite of falling retention, and continued to work to minimize any and all distractions to his officers. According to his biographer, Rickover discouraged even the most minor of what he considered distracting activities and "... refused, for example, to allow them to attend extraneous courses, conferences, and meetings." [126] Those who challenged the policy did so at great risk to their career. An occasional nuclear officer was allowed to go to War College or graduate school, but these exceptions were apparently designed to give

[124] Lando Zech, VADM USN, Interview with the Author, 3 August 2007. Zech explained that relatively soon Rickover lost his capacity to provide broadening opportunities to more than a token number of submarine officers. The exigencies of the Cold War and the growth in the nuclear fleet combined to keep the shrinking pool of officers in nuclear assignments. In short, the nuclear career path was in large part a compromise position reached under very unique circumstances of the middle 1960s. The problem, according to Zech, was that the Cold War pattern or low retention and low morale persisted even after ship construction rates slowed.

[125] Senate Armed Services Committee, Subcommittee on Manpower and Personnel, Statement of VADM James D. Watkins, USN, Chief of Naval Personnel H.R. 10451, a Bill to Amend Title 37, United States Code, Relating to Special Pay for Nuclear Qualified Officers., 94th Cong., 2nd sess., 3 June 1976. Watkins in his testimony would raise the concern that nuclear officers were remaining at sea for 16 years with but a single, 2 year shore tour; that the nuclear officers were not receiving broadening educational opportunities. These conditions Peet and Zech had anticipated a decade before they reached such crisis proportions.

[126] Francis Duncan, *Rickover: the Struggle for Excellence* (Annapolis, Md.: Naval Institute Press, 2001), 307. In interviews with Admirals Calvert, Zech, and Mckee, as well as with scholars Hattendorf, Rickover held a strongly negative attitude toward senior service school programs.

the appearance of breadth so as to draw more recruits to the program; they did not signify any change in the pattern of specialization.[127] Even some of the high profile departures from narrow specialization-- CDR Trost's participation in the Olmsted Program—were bitterly contested behind closed doors. When CDR Carlisle Trost, a future CNO, returned to the submarine navy after studying in Europe, Rickover sought to bar him from further nuclear duty, a prohibition that was tantamount to ending Trost's career. Only the intervention of the traditional diesel officers saved Trost's career.[128]

Rickover's model for officer development, forged in the after-math of THRESHER, produced the most technically skilled officers in the Navy, surpassing in technical knowledge those of the first generation. But to gain the additional expertise required even more narrow focus on the part of the officers. The widely distributed career guidance documents for this new generation of nuclear officers captured this shift in emphasis from integrative education to narrow technical training. In contrast to earlier career guides (e.g. the 1963 Pride Report to be discussed in chapter 7) that emphasized the importance of war college programs, the career guide for nuclear officers did not encourage education or broadening experience. The guidance given to officers was to focus on the reactor and the platform: "The fundamental goal of the nuclear trained submarine officer is to develop the professional SKILL and operational background to

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[127] Albert H. Konetzni, Jr., CDR USN, "Comment," *US Naval Institute Proceedings*, 107, no. 2, February 1981. Konetzni writes: " In addition, several officers were detailed to postgraduate schools and non-submarine related shore assignments to help create the *perception* that submariners would, during their early careers, experience a wider variety of assignments." Konetzni's observation was also confirmed by senior submarine officers. Charles R. Larson, ADM, USN (ret), Discussion with the Author, 2 January 2008.

[128] Captain Harry Train was the assistant submarine detailer, and was in the office that wrote the orders for Trost to report as XO of a nuclear submarine over Rickover's objections. Harry Depue Train, ADM USN, Interview with the Author, 2 November 2007. In follow-up discussions with Admiral Trost, Trost did not dispute Train's account.

command a nuclear submarine…accomplished through a definite series of professional qualifications, advanced training and operational sea experience." [129]

Nuclear officers are known for discipline and compliance with procedures. It came as no surprise that nuclear officers quickly conformed to the career guidance emanating from the submarine detailer's office. Whereas many of the first generation of officers were graduates of Naval Post Graduate School (NPGS) or the war college, in the 1960s nuclear officer graduate school participation dropped off markedly. [130] For most of the succeeding two decades, the vast majority of nuclear submarine officers, though they were the navy's most academically talented officers, were denied the opportunity to attend NPGS.[131] Declining nuclear officer attendance at the Naval War College and joint service schools paralleled that of graduate school. Rickover pursued a policy of 'crowding out': he refused to send his officers to the institution.[132] Whereas almost all of the first generation nuclear officers who rose to flag rank had attended the war colleges, this pattern was broken with the second generation nuclear officers. By the mid-1960s, the decline in submarine officer attendance at the Naval War College was noticeable.[133] Rickover's personnel policy of purposeful shortage led to a narrowing of assignment and

[129] N.R. Thunman,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197, 47.
[130] Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1610.
[131] N.R. Thunman,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197, 51. Guidebook explains that nuclear officers had almost no opportunity for graduate school, in part due to shortages of personnel. In contrast, the diesel officers could attend in large numbers.
[132] All those interviewed who worked close to Rickover recalled that Rickover held the war colleges in low regard, and prevented most officers from attending.
[133] Naval War College Staff,"Staff Study ", NWC Archives RG 17 Box 3 Staff Study 1 April 1969. Matriculation of submariners at NWC command and staff school from 1965-1969 declined to approximately 3%. The 3% figure included diesel officers. Therefore it can be assumed that the number of nuclear officers attending NWC most was most probably lower, though no definitive documents attest to the exact percentage.

education and established a pattern of technical specialization in the submarine officer corps that would persist for a generation. The pattern became so engrained that it can be seen in the educational and joint qualifications of nuclear trained flag officers on active duty in the first years of the 21st century.[134] The nuclear officers were the first to be denied the benefits of King's integrative and well-rounded career pattern. The consequences of such a policy would shape a generation who would rise to command.

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Where to Get the Technical Elite: Plans for Annapolis

The 'generalist' model of command that had successfully *accommodated* a half century of technological change and molded a generation of leaders would not survive the 1960s. The challenger was a potent combination of a truly unique technology, an aggressive philosophy of technical elitism, and a bureaucratic genius. Rickover directed his first transformative efforts at the men who commanded the submarines. Rickover's selection interviews, high technical standards, demanding schools, and the draft of aviators and surface officers achieved its purpose: to prevent the wholesale transition of diesel officers into nuclear power and thereby break their culture and traditions. The primacy once placed on tactics, operations, and integration was replaced by an emphasis on technical expertise and specialization. Nuclear submariners would become a group

[134] A comparison of 'line' officers in 2006 showed the persistence of the pattern of narrow technical specialization first established in the 1960s. Using a common metric of joint qualification (JS1) to represent a broadened and integrative career, submarine officers had the lowest percentage among the three warfare communities when measured at the top three ranks of 0-10, 0-9, 0-8 (admiral, vice admiral, and rear admiral). Among line captains with joint qualification (JS1), the submariners lagged the surface navy by approximately 50% and lagged aviators by 30%. Data from Bureau of Personnel officer inventory and qualification records, data run 5 December 2006.

that valued technical expertise over tactical and non-technical abilities. As such, it was the more technical officers, the engineers, who quickly rose to command.[135]

But solving questions of who would command did not necessarily solve the problem of securing adequate junior officers for the rapidly expanding fleet of reactors. To sustain the ambitious ship construction program, Rickover had to man new ships. But in addition to manning the new ships, he faced the challenge of filling the shortfalls spawned by spiraling attrition. Rickover had already begun tapping a new source of young officers, direct accessions from Annapolis. But Rickover found many of the freshly minted ensigns to be weak engineers when compared to those who graduated from civilian polytechnics. The education provided by the military school on the banks of the Severn was to Rickover academically backward, overly military in orientation, and insufficiently technical. Rickover set his sights on his next transformation challenge: the Naval Academy and the minds of the midshipmen.

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[135] Norman Polmar and Thomas B. Allen, *Rickover* (New York: Simon and Schuster, 1982), 336- 350. Polmar provides a persuasive summary of the nuclear officer's rapid rise to leadership in the navy by the early 1970s: By 1972, Rickover had trained 4000 officers and 22,000 enlisted men. The first generation of nuclear officers—Wilkinson, Peet, Depoix, Zech, and Calvert—were all 3 stars; two of the first Enterprise captains, Michelis and Holloway were 4 stars. Control of submarine warfare, the DCNO (OP-02) had shifted to the nuclear officer control in approximately 1973. By 1978, 35% of fleet was nuclear (pg. 350); and the only air craft carriers and submarines under construction were nuclear.

Chapter Six

The Battle for the Minds of the Midshipman: The Eclipse of Non-technical and General Education at Annapolis, 1959-1972

"I think the Naval Academy is the most important institution in the Navy because it is the fountainhead of future naval officers and leaders and therefore our formative place…"
Admiral Horacio Rivero, Jr. USN (retired), Ambassador to Spain, 1978 [1]

"Surely the Naval Academy's reason for being is to educate its graduates so that they can accept the broad responsibilities of the Line-of-the-Navy leadership and command…the only vital curriculum recommendation is: Never allow the Academy to become, by default, a polytechnic institute; keep the Line-of-the-Navy aspect always paramount in any consideration of curriculum…"
Captain Allen M. Shinn, USN (later VADM Shinn)
Commandant of Midshipmen 1956-58[2]

"With the increased dependency on nuclear power plant systems, every (Naval Academy) major must include enough math, science, and engineering that any midshipman, regardless of his academic major, qualifies for selection to the nuclear power program."
Bruce M. Davidson
PhD, Engineering
Dean of Midshipmen, 1973[3]

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Summary

Rickover had held a technocratic view of education since the 1920s but as late as 1958 had not intervened to reform the Navy's most formative educational institution, the U.S. Naval Academy. His policy of non-intervention changed dramatically between 1959 and 1963, and Rickover would become, more than any other single figure, the

[1] Horacio Rivero, Jr., Admiral USN (Retired), *Reminiscences of Admiral Horacio Rivero USN (retired)* (Annapolis, MD: US Naval Institute Press, 1978), 467.
[2] Allen M. Shinn, CAPT USN (Former USNA Commandant 1956-58)," From Captain Allen M. Shinn to RADM Charles Melson, dtd 14 August 1959", RG 405, USNA Spec collections, Curriculum Studies 1915-1957, box 3, folder 4, 1959.
[3] Bruce M. Davidson, Academic Dean, USNA, "The Academic Dean Looks at the Academy," *Shipmate*, no. 3, March 1973, 26.

driving force behind the most profound reforms at Annapolis since 1845.[4] In ten short years, Rickover transformed the midshipmen college into a polytechnic.

Motivated by the need for young officers, Rickover imposed the rigorous technical requirements of his program on the Naval Academy curriculum. The ‘line’ veterans of the Second World War initially resisted Rickover’s attempts to make Annapolis into a polytechnic, thus compelling Rickover to call on his congressional allies to push forward the reforms. With the aide of his political allies, Rickover orchestrated the unprecedented displacement of the military dean by a civilian engineer. THRESHER confirmed Rickover's belief that officers must become technical experts, and the admiral encouraged the new civilian dean to play an increasingly influential role in remaking the academy curriculum. The midshipmen, however, did not embrace the engineering and sciences in sufficient numbers. When one of Rickover's officers became superintendent, the academy adopted a specialized majors program, and midshipmen were strongly encouraged to specialize in one of several technical fields. However, the future ensigns again failed to follow prompting to meet Rickover's needs, and for the first time, quotas on engineering and science majors were instituted. When quotas also proved ineffective, academy leaders worked with Naval Reactors staff to shape high school admissions metrics in order to increase the number of midshipman appointments offered to technically inclined individuals. The manipulation of admissions metrics proved remarkably effective in satisfying engineering and science quotas, but in so doing,

[4] Most if not all scholars of Annapolis recognize this period, from 1959 to the end of the 1960s, as the Naval Academy's ‘academic revolution’. For a detailed discussion of the reforms, see Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004); John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979). These histories acknowledge Rickover played an important role, but they do not provide a deeper explanation of how Rickover intervened, and the significance of the technological system, the nuclear reactor.

reduced the number of midshipmen who were verbally and linguistically gifted. The re-engineered admissions metrics and the elimination of the universal language requirement produced after 1968 a far lower share of linguistically educated officers than the academy had typically produced in the first century of its existence.[5]

In a decade Rickover's interventions transformed the Naval Academy into an elite polytechnic and funneled a generation of the most talented officers into the fields of engineering. Whereas in 1959 the commandant asserted that the academy mission was to produce the generalist-integrative officer, by 1973 the civilian dean would assert that the academy's objective was to ensure *every* midshipman was qualified academically to be a nuclear engineer.

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Competing Models for Annapolis:
General Education or an Engineering Polytechnic, 1959-60

Rickover recognized the unique power of undergraduate institutions to shape the values and thinking of the officer corps. He thus made it a top priority to inculcate into young officers his values and ideas. One of Rickover's closest and most trusted advisors, John W. Crawford, Jr., captured the essence of Rickover's ideas about youth and published his thoughts in the Naval Institute *Proceedings* in an article titled, "Get 'em Young and Train 'em Right".[6] Admiral Mckee, Rickover's successor as head of Naval Reactors, corroborated Crawford's recollection: Rickover sought to recruit young officers

[5] Because of these reforms, officer language education would fall from 100% of academy graduates to less than 30% on average.
[6] John W. Jr. Crawford, "Get 'em Young and Train 'em Right," *US Naval Institute Proceedings*, April 1987, 103.

and midshipmen so that he could more readily shape their thinking and values to his own.[7] This idea of 'getting them young' was not, however, a new one. The Royal Navy was built upon a foundation of youthful recruitment. As early as 1859, the Royal Navy reported to the Queen: "Men, who had been received into the Navy as boys, become from early habits and associations more attached, and adhere more closely to the service, than those entered at a more advanced age." [8]

Faced with looming shortages of 'suitable' fleet officers, the EDO admiral not surprisingly called on the Annapolis midshipmen to man his reactors. In contrast to re-educating fleet transfer officers, the 'mids' were more impressionable. Furthermore, the Annapolis students offered a potentially good 'return on investment' when compared to other sources of officer accessions: Naval Academy graduates retained at much higher rates than NROTC or OCS officers did.[9] But the investment was only meaningful insofar as Rickover was concerned if the vast majority of midshipmen could pass his rigorous scientific engineering schools, a feat that they were finding especially difficult to achieve. In an effort to raise midshipmen education up to his standards of technical rigor, Rickover began quietly in the late 1950s to take the initial steps to remake the Naval Academy into an elite polytechnic. The transformed college was to become the intellectual incubator of the technical elite needed to control his nuclear reactors.

[7] Kinnaird R. Mckee, Admiral, USN, Interview with the Author, 18 September 2006.
[8] Royal Navy Commissioners, *Report of the Commissioners Appointed to Inquire into the Best Means of Manning the Navy* (London, England: Her Majesty's Stationary Office, 1859), vi.
[9] B.J. Semmes Jr., VADM USN,"Memorandum Chief of Naval Personnel to Secretary of the Navy, Subject: Retention, dtd 30 March 1965", Naval Historical Center, Operational Archives, 00 Files, 1965, box 29. USNA graduates were retained at almost three or four times that of OCS graduates and two to three times that of NROTC at the end of obligated service. And by four years later, the disparity was even greater, USNA retaining up to 43% as compared to approximately 5 % for NROTC and OCS.

The first step in Rickover's reform efforts was to suggest an alternative to the traditional Annapolis 'general' education model. The King plan called for 'line' commanders to be generalists, and Annapolis produced generalists. In the early 1960s, King's ideas still influenced the academy curriculum and were referenced in several education policy documents.[10] Rickover sought to break the King model and instead suggested the academy emulate institutions that produced technical experts and specialists.

To be sure, the Naval Academy under the King plan had included a substantial engineering education program. From 1899 to 1959, the academy had produced a line officer with solid, practical engineering knowledge.[11] However, it was an altogether different task to produce a midshipman who could be both scientific engineer and, as Halsey advocated, a future tactician and commander of a joint integrated military force. As technological complexity increased, some questioned whether a future ‘line’ officer had the time to study scientific engineering and still develop the foundation that would enable him to command the integrated and joint forces of the modern military.[12] Rickover may have agreed that the 'line' could not do both, but Rickover was clear about which endeavor must take priority. Rickover asserted that the priority had been clear for a half century: engineering. Rather than reconsider the premise that ‘all line officers were

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[10] The King plan was noted in the Keith Board of 1959, and in Chief of Bureau of Personnel study of education in 1966. The Holloway Board Report of 1945, a particularly important document that remained a key reference well into the 1960s, also followed the King recommendations.
[11] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (New York: The Free Press, 1972), 356.
[12] R.T.S. Keith, RADM, USNR,"Billet and post-graduate educational requirements in the specialty areas in the line of the Navy, Report of Board 1 October 1959", NARA RG 24-470-54-25-6 box 5.

to be engineers', Rickover invoked the Act of 1899 as an inviolable principle.[13] If ships were now propelled by the most advanced scientifically engineered machines, then logically naval 'line' officers must be scientific engineers in command. To interpret the Act in this way required the academy and the 'line' to conform to the requirements of the modern engineering profession as defined, not by naval officers, but by polytechnic faculty in schools that produced highly specialized engineers. The possibility that the increased complexity of joint operations and the greater demands of scientific engineering might justify a reevaluation of decisions made in 1899—to split out engineers and the 'line'-- did not appear to have been considered as a serious alternative in 1959. Rather, guided by a technocratic philosophy, Rickover asserted that the Naval Academy must follow the example of the polytechnics and place priority on the study of scientific engineering.

The leading polytechnics of the later 1950s were quite different from the Naval Academy. In the mid 20th century, scientific engineering had begun to gradually displace the study of practical engineering in most engineering colleges. MIT served as a leading barometer of the direction of engineering pedagogy. MIT had started the shift to a science-based engineering curriculum in the 1930s, in part prompted by the arrival of Karl Compton who was later made famous for his role in the Manhattan Project.[14] By the late 1950s, the new scientific ideology of engineering had spread to the majority of polytechnic campuses. As one observer noted, the scientific content of the engineering

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[13] Richard G. Hewlett and Francis Duncan, *Nuclear Navy, 1946-1962* (Chicago: University of Chicago Press, 1974), 348.

[14] Bruce Seely, "Research, Engineering, and Science in American Engineering Colleges, 1900-1969," in *Technology & American History: an Historical Anthology from Technology & Culture*, ed. Stephen H. Cutcliffe and Terry S. Reynolds (Chicago: University of Chicago Press, 1997), 359-361. Seely describes how "engineering science" in the post-war period displaced practical engineering which had dominated prior to 1940. See also Don K. Price, *The Scientific Estate.*

curriculum had been characterized by a rapid increase, and "...in the 20 years or so after 1945, of a quantum jump in engineering knowledge."[15] To Rickover the new polytechnic like MIT was the way of the future, steeped as it was in scientific engineering and advanced mathematics. Rickover's technocratic philosophy held as one of its tenets the conviction that scientific education was the way of the future, that "…technological revolution arises from the power of the new science…", and those who would lead required "…an impersonal scientific attitude toward work that must be done." [16] However, such a shift was at odds with how the academy had evolved over the past two generations and was at odds with the latest, and most detailed, academy curriculum review completed just months before Rickover intervened.

Naval "line" officers at mid-century were not convinced that the Naval Academy should be a scientific-based engineering college patterned after the polytechnic model. For half of a century, naval officers had been wary of placing too great an emphasis on engineering, and this hesitancy persisted into the 1960s. In 1899 when 'line' and engineering education merged at Annapolis, the 'line' and operational components of the curriculum had been pre-dominant, not engineering. The academy leaders in the 1920s and 1930s pursued reforms to maintain a non-technical and technical balance. Under the command of Admiral Thomas Hart, the academy had expanded substantially the non-technical portions of the curriculum to include the study of politics, economics, and foreign language. Following the disruption of the Second World War, a series of

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[15] Edwin T. Layton, *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession* (Cleveland,: Press of Case Western Reserve University, 1971), 251.
[16] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 102. The deterministic underpinnings of Rickover's technological philosophy is again evident, the idea that persons must become 'impersonal' and conform themselves to the discipline of a god-like technological force.

successive superintendent admirals returned the academy to Hart's pre-war balance, with the exception of the modest addition of aviation-related course work.

On the eve of Rickover's intervention, the academy curriculum remained balanced between the non-technical and technical, professional and academic, and set as its goal to produce the generalist officer, otherwise known as the 'well rounded line officer'. The trend at Annapolis up to the late 1950s, despite what was happening in civilian engineering schools, was to maintain a balance between the non-technical and technical, perhaps even tilt toward the non-technical parts of the curriculum.[17] Masland and Radway in their 1957 landmark study of military education rebutted those who described the Naval Academy as one of the "… engineering schools. This is untrue."[18] A former senior engineering professor of the Naval Academy who taught in the 1960s would explain that not until the Rickover reforms of the 1960s did Annapolis begin to produce engineers in the modern sense of the word.[19] Even in the midst of Rickover's intervention, a Naval Academy Superintendent, RADM Kirkpatrick, would prefer to compare the Naval Academy to an Ivy League liberal arts college rather than to a polytechnic.[20]

Two generations of naval leaders, from King to Kirkpatrick, declined to endorse a curriculum centered on specialized scientific engineering. These leaders were not Luddite admirals who possessed an anti-technical mindset. Rather, they recognized that

[17] For a detailed examination of USNA curriculum changes, see Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974).
[18] John Wesley Masland and Laurence Ingram Radway, *Soldiers and Scholars: Military Education and National Policy* (Princeton,: Princeton University Press, 1957), 211.
[19] Peter Wiggins, PhD (academy professor from 1960s-1990s), Interview with the Author, 24 Sept 2007.
[20] C. C. Kirkpatrick, RADM USN, "Rhode Scholars? Yes! But Naval Officers First: A Century of Academic Achievements," *Shipmate*, no. 9-10, Sept-October 1963, 9.

the Naval Academy, as a service academy, was one of only a handful of institutions dedicated to the creation of the nation's warrior class. They believed that what must be preserved at Annapolis was its general military emphasis, even at the expense of falling behind the latest advances in engineering. They pointed out that by mid-century in the United States there existed hundreds of engineering colleges and over a million engineers in the country. Sheppard, author of perhaps the most detailed analysis of academy curricular change, wrote of the uniqueness of the service academy and the difficulty in striking a balance between the academic and the military requirements:

> "It is this feature which distinguished these highly specialized professional institutions from the typical college, which does not have a responsibility to any one particular profession. It is also this feature which makes the professional educational institution's job increasingly difficult as the profession becomes more complex; for in the face of a growing number of things which one "should know" in particular profession, it becomes increasingly important that these essential areas of fundamental knowledge are given adequate attention….unlike other educational institutions, which prepare men for specific professions, service academies are designed primarily to provide a general foundation upon which more advanced professional education, along with actual service can build." [21]

Naval officers were fully aware of the technological change engulfing mid-twentieth century American colleges.[22] However, they reached different conclusions than did Rickover. The combat veterans concluded that Annapolis was different and should not become a polytechnic-- that is, an engineering school with specialized engineering degrees. The academy's 1957 curriculum review articulated that Annapolis must keep pace with the changing world, but that it was primarily a college to prepare midshipmen to be general 'line' officers.

[21] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 182-183.
[22] Board of Visitors and miscellaneous reports of 1953-1959, NARA RG 405, US Naval Academy, Special Collections. Several staff papers and clippings of education articles from leading publications were collected by the Superintendent's staff. The Superintendent and his staff, unprompted from the outside, initiated a curricular review in 1957 in order to identify recommendations for changes in the curriculum.

To better prepare midshipmen for the changing world of the later 1950s, the Naval Academy studied its curriculum and, in the 1957 review, called for strengthened humanities and linguistics. These changes were justified by the global nature of the Cold War. As for pedagogical approaches, the review acknowledged the leadership of national educational reformers and proposed the academy begin to move from ‘how to’ technical courses to a more rigorous study of the fundamentals.[23] The internal academy assessment of 1957 very clearly engaged the idea of a broad education, one strong in liberal arts and language. J.E. Dougherty, the chair of the language department, wrote to the 'line' officer Dean (then known as the Secretary of the Academic Board) on 1 Nov 1957 and argued for expanded foreign language education. He offered as evidence for an expanded program the pronouncements of the most respected leaders of the military and the scientific world-- Omar Bradley, John F. Dulles, Karl Compton, General Mathew Ridgeway, and Admiral Arleigh A. Burke-- all of whom advocated language training for the young officer. Prophetically, Dougherty noted that changes to foreign language curriculum policy could hold consequences not “...only for the years just ahead but for a generation to come.” He explained that the department saw the “…need for the Navy and of the nation for capable junior officers, broadly trained for eventual leadership in a variety of positions of the highest importance in military and in government affairs.” He went on to conclude: “In any future combat circumstances, just as now in the Cold War, the better we understand both our allies and our enemies, and the better we know their languages, the more effective and the less costly will be our operations. We may never again possess the overwhelming material and technical superiority which was brought to

[23] W.D. Brinckloe, CAPT USN, "Head Department of Marine Engineering to Secretary of Academic Board, 5 Dec 1957, Subj: Final Curriculum Study", RG 405, USNA Special Collections, Curriculum Studies and General Correspondence 1915-1957, Box 3.

bear against the Japanese and against Hitler's forces in WWII."[24] And Dougherty was not alone in his advocacy for more language training for naval officers. The CNO at the time advised all line officers to make one of their top three career priorities the mastery of a foreign language. [25]

The senior admirals and language professors had other allies who also advocated for language education for midshipmen. Some military engineers went so far as to recommend an expansion of non-technical education at the expense of the study of engineering. W.D. Brinckloe, the Head of the Department of Marine Engineering, and his fellow engineers, in a remarkable analysis submitted to the Secretary of the Academic Board in 5 December 1957, called for the abolition of several engineering courses in order to allow an expansion in the humanities and social sciences. This engineer department head, in a moment of commendable non-partisanship, favored an additional 252 hours in the humanities and linguistic fields, as compared to an increase of 117 hours for math-chemistry-physics. The expansion in these two non-engineering fields was to be facilitated in part by a *reduction* in his engineering department share by 156 hours.[26] The approved plan was scheduled for implementation in June 1959, which if implemented, would have reduced courses in 'applied technology' and favored courses in fundamentals. The approved plan preserved foreign language education for *all*

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[24] J.E.Dougherty, "Head of Dept of Foreign Languages to Sec of Academic Board, 1 Nov 1957", RG 405, USNA Special Collections, Curriculum Studies and General Correspondence 1915-1957, Box 3, Folder 1.
[25] Arleigh A. Burke, ADM, USN, "Letter From the Chief of Naval Operations to All Line Officers," *Line Officer Personnel Newsletter*, September 1956; Arleigh Burke,"Language Training for Navy Personnel, memo to Chief of Naval Personnel, dtd 29 Dec 1958", NHC 00 Files, 1958, Box 11, Folder 11, 16.
[26] W.D. Brinckloe, Capt USN, "Head Department of Marine Engineering to Secretary of Academic Board, 5 Dec 1957, Subj: Final Curriculum Study", RG 405, USNA Special Collections, Curriculum Studies and General Correspondence 1915-1957, Box 3.

midshipmen.[27] RADM Melson, the Superintendent at the time, described his goal as to move beyond the "…narrowed and very fixed…"and instead to "…broaden the curriculum."[28]

However, it was *not* the study of language and culture that would take center stage in the coming academic revolution. In 1959, Rickover blocked the implementation of the plan when he created an alternative curriculum review board. Rickover's review board was headed by Dr. Richard Folsom, the president of Rennsalear Polytechnic. Absent from this board was the balanced representation of liberal arts college educators. The Folsom Board, composed of a disproportionate share of technical educators (only one of the board members was a non-technical academic), initially included one navy admiral from the atomic energy division of the Navy staff, RADM (s) Frederick L. Ashworth (RADM H. Rivero would eventually join the board).[29] This outside board reached significantly different conclusions than those of the academy's 1957 review: they recommended a curriculum that strongly resembled that of a polytechnic.

For those who have studied the Naval Academy, there "…is a special fascination and a special significance associated with the years since 1959."[30] The reforms of 1959 have been described by leading scholars of the academy curriculum as "…the most

[27] Charles L. Melson, RADM USN,"Superintendent USNA to ADM W.F. Boone, USN dtd 10 April 1959", RG 405, USNA Special Collections, Records of Superintendent, General Correspondence Education and Training, Curriculum Studies 1915-1957, Box 3, Folder 4.
[28] Charles Leroy Melson, *The Reminiscences of Vice Admiral Charles L. Melson, U.S. Navy (Retired)* (Annapolis: U.S. Naval Institute, 1974), 250-251, 257. Melson explains that his reform plans had the support of both Admiral Burke and Secretary of the Navy Franke.
[29] The initial board composition was to include Dr. Folsom of Rensselaer Polytechnic, four college administrators, and one navy admiral (select) from the atomic energy division of the Navy staff, RADM (s) Frederick L. Ashworth. A non-nuclear admiral, RADM Horatio Rivero, was added later to the board.
[30] Robert McNitt, RADM, USN (ret), ""Challenge and Change"," *Shipmate*, no. 4, April 1972, 3-4. McNitt explains the changes at Annapolis, and begins his story with 1959, which he, along with many other scholars, considers as one of the most influential years since the inception of the academy in 1845.

important curriculum reviews at the Naval Academy since the establishment of the Naval School at Annapolis in 1845."[31] Though many histories on the Naval Academy in this period attach great significance to the Folsom visit of 1959, they give relatively little attention to the inspiration and origins of what became known as the Folsom Board.[32] The board was far less independent than appears on the surface. Rickover facilitated the creation of the Folsom Board, approved, and then guided the implementation of its recommendations. In later years, a senior admiral who served on the board, Admiral Rivero, admitted that *the board's results were submitted to Admiral Rickover for his approval*.[33] Rickover's goals were both pragmatic and principled. He sought to better prepare midshipmen to succeed in his demanding technical schools. But he was also motivated by his philosophy of technocracy and his belief in the determinism of technology. To that end, he sought to transform the minds of the young midshipmen to conform to the "discipline of technology", to become techno-centric in thinking and action.

Rickover realized he needed political support from Congress to reform the academy. Annapolis administrators were not as receptive to his persuasive powers as were fleet officers. In the fleet Rickover could use his new ships and increased opportunities for promotion to win over commanders and captains who coveted

[31] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 222.
[32] John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979). In chapter seven, Lovell implies that Folsom was invited by Melson and that further, that Folsom's board essentially endorsed the pre-existing academy's plans. As documents and further interviews have revealed, Rickover instigated the outside examination. Melson and the academy, as well as much of the Navy, opposed the Folsom Board as an intrusion. Furthermore, Folsom departed substantially from Melson's plans and Folsom's recommendations represented a strong shift in the technical direction.
[33] Horacio Rivero Jr., Admiral USN (Retired), *Reminiscences of Admiral Horacio Rivero USN (retired)* (Annapolis, MD: US Naval Institute Press, 1978), 469.

command of nuclear platforms. In contrast, senior admirals and veteran alumni had already had their commands, and these independent-minded officers exerted significant influence over the academy, both from the Superintendent's home and from the Alumni Association in the nearby headquarters in Annapolis. These combat veterans were not receptive to the ideas of an engineering duty officer.[34] For Rickover to effect his reforms, he needed non-Navy allies-- civilian scientific engineers and political officials-- to help implement his vision.

Rickover enlisted two sets of allies to transform the academy: engineering-minded academics and sympathetic elected officials. The first group included a young president of Notre Dame, Father Theodore Hesburgh. Hesburgh was the proximate cause for the Folsom Board: he called for an outside review of the academy program. His intrusion has been depicted as the action of a concerned citizen, a disinterested and objective outsider who took it upon himself to criticize the Naval Academy. His intervention began a chain of events that resulted in the most significant academy reforms in 115 years.[35] Hesburgh was not, however, disinterested. Rather, he was an associate of Rickover and maintained a friendship that lasted until Rickover's death.[36] There is little

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[34] Charles Leroy Melson, *The Reminiscences of Vice Admiral Charles L. Melson, U.S. Navy (Retired)* (Annapolis: U.S. Naval Institute, 1974), 312-314.

[35] Studies of the Naval Academy apparently were unaware of Rickover's influence over Hesburgh, and assumed Hesburgh's intervention in the Naval Academy curriculum was an unexplained act of a disinterested party. See Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 237.

[36] Theodore Hesburgh, Father, Interview with the Author, 25 Sept 2007. Hesburgh confirmed that he and Rickover had been friends since approximately 1956. The friendship continued up through Rickover's death. The relationship was close enough that this Notre Dame President conferred on the Jewish Rickover of an honorary degree in 1973. Furthermore, intimate members of Rickover's staff confirm the close relationship between Rickover and Hesburgh. John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007.

doubt that Rickover helped shaped his friend's views of the Naval Academy and prompted the priest's intervention.

Hesburgh intervened while he served as a member of the Secretary of the Navy's Advisory Board on Educational Requirements (SABER). In his capacity as a board member, Hesburgh in 1959 criticized the Naval Academy, a criticism that was conveyed to the Chief of BUPERS, VADM Harold P. Smith. In response to this complaint from a "respected academic", Smith suggested to a reluctant Naval Academy Superintendent that he permit an unprecedented review by an outside assessment team.[37] The Naval Academy superintendent resisted the idea, which prompted BUPERS to send a "hard line" letter of 31 March 1959 to force the issue. The Navy then appointed one of the nation's leading engineering educators, Dr. Richard G. Folsom, President of Rensselaer Polytechnic Institute, as the senior examiner.[38]

The Navy 'line' officers recognized the possible threat posed by an outside board of engineers. In a desperate effort to prepare a defense against the Folsom Board, the Superintendent sent out a questionnaire to thousands of USNA graduates asking for their opinion as to the sufficiency of their alma mater's curriculum.[39] One remarkable and cogent response came from the recent Commandant of Midshipmen, Captain Allen Shinn, who argued for the continuation of the broad and general educational program. The former commandant, who later promoted to admiral, explained that there was indeed

[37] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 237. Sheppard provides invaluable insight into the origins of these events based on lengthy and detailed interviews with senior BUPERS officials and members of the Folsom Board.
[38] Ibid., 239.
[39] Charles L. Melson, RADM USN,"Superintendent USNA to ADM W.F. Boone, USN dtd 10 April 1959", RG 405, USNA Special Collections, Records of Superintendent, General Correspondence Education and Training, Curriculum Studies 1915-1957, Box 3, Folder 4.

a time in history when West Point and Annapolis could distinguish themselves by their unique offerings in civil and steam engineering. However, that time had passed and now the country was "…dotted with fine engineering colleges of all kinds." Rather than return to teaching more engineering, it was now the duty of Annapolis and West Point to provide broadened officers capable of providing military leadership and exercising 'command.' Shinn anticipated Rickover's plans and strongly opposed what he expected might be a blueprint for a technocratic transformation of Annapolis. Shinn asserted: "Surely the Naval Academy's reason for being is to educate its graduates so that they can accept the broad responsibilities of the Line-of-the-Navy leadership and command, and to instill in these young officers a strong desire to pursue lifetime careers of such responsibility and service….the only vital curriculum recommendation is: Never allow the Academy to become, by default, a Polytechnic Institute; keep the Line-of-the-Navy aspect always paramount in any consideration of curriculum…"[40]

Rickover anticipated correctly that senior naval officers would resist his outside board and early on secured the support of powerful political allies, four United States' senators. In a letter from the Board of Visitors of April 13, 1959, the four senators issued an unprecedented appended statement that was most likely written by Rickover or

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[40] Allen M. Shinn, CAPT USN (Former USNA Commandant 1956-58)," From Captain Allen M. Shinn to RADM Charles Melson, dtd 14 August 1959", RG 405, USNA Spec collections, Curriculum Studies 1915-1957, box 3, folder 4, 1959. Shinn is generally correct in his assessment of the changing position of the service academies. West Point in 1802 was the country's first institution that offered "technical education", followed by Rensselaer Polytechnic in 1824, and the Naval Academy in 1845. By 1950, however, there were in the United States at least 160 colleges dedicated to engineering, and many more that included on their campuses highly competitive engineering departments. See John S. Brubacher, and Willis Rudy, *Higher Education in Transition: A History of American Colleges and Universities* (New Brunswick: Transaction Publishers, 1997), 61-62.

his staff.[41] The senators criticized the Annapolis curriculum and offered a novel and somewhat puzzling justification for reforms of a naval school for warriors. The senators complained that the Naval Academy, *when compared to civilian engineering colleges*, did not adequately prepare midshipmen to attend engineering graduate schools. As a consequence, the senators explained, "...Naval Academy graduates must take two years of additional undergraduate studies in order to compete with college counterparts in science and engineering graduate fields..." [42] But this argument was only puzzling for 'line' officers, not for those who might see the 'line' as a future technocracy. Rickover defined leadership by technical credentials, and engineering graduate schools were the new metric. Rickover's allies, the senators, were repeating Rickover's philosophy and arguments, almost verbatim. Unoriginal as they might have been, the four senators were crucial in overcoming the 'line' officer resistance and opened the door for the polytechnic review board.

The Folsom Board convened on 11 May 1959 and met several times between May until it completed the report on November 16th 1959. The Board of Visitors, which included the four senators sympathetic to Rickover, established a second new precedent when it convened a second time in a single year to review and endorse Folsom's findings.[43] The Folsom report offered a sharp contrast to the internal Naval Academy

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[41] House Committee on Appropriations Report on Russia by VADM H.G. Rickover, US Navy, 86th Cong., 2nd sess., August 18, 1959. Rickover excerpts a significant portion of the Senators' report, which in tone and structure appears quite similar to Rickover's own discussion of the subject in this testimony on education and technology. See page 72 of Rickover's testimony, wherein Rickover as much as admits that he submitted the language for the Senators to forward to the Naval Academy Board of Visitors.

[42] Board of Visitors,"Report of Board of Visitors, US Naval Academy, 17 April 1959", RG 405 USNA Special Collections, Reports of Boards and Committees, Board of Visitors, box 2, folder 1951-1964 1959, pages 10-11.

[43] Wayne P. Hughes, "New Directions in Naval Academy Education," *US Naval Institute Proceedings*, 86, no. 5 May 1960, 35.

review of 1957: the practice of universal language training, a bedrock of academy policy for over a hundred years, was not strengthened but recommended for termination; the humanities, social sciences, and linguistics were overshadowed by the strong shift in emphasis to scientific engineering; civilians were to occupy an increased proportion of the academic postings and in so doing displace military officers; and a civilian academic of national stature was recommended to occupy the position of dean, an action which would displace the military officer who was then Secretary of the Academic Board.[44] The significance of the Rickover-inspired Folsom Board is difficult to overstate, for it is generally recognized by all scholars of military education as the foundation for radical changes that followed at the academy. [45] However, the Folsom Board recommendations lacked support in the senior navy ranks, which were dominated by veterans of the Second World War, adherents of King's system of integrative and general education. It is doubtful, without Rickover's continued intervention, the old alumni and the serving admirals would have allowed the Folsom recommendations to be implemented.

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A Technocrat to Build the Polytechnic, 1961-1962

Uniform officers, in particular RADM Melson, the Superintendent, resisted

[44] Board of Visitors,"Report of the Board of Visitors to the United States Naval Academy", RG 405, Special Collections, USNA, Records of Boards and Committees, Board of Visitors, 1936-1977 Box 2. See Folsom Board Report, pg 15, for an example of the dismissive attitude toward foreign language training. The board suggested that foreign language education should be an elective not a core requirement, and should a midshipman be interested, he could attend the Naval Intelligence School in Anacostia. For further analysis of changes, see also Sheppard, pg. 251, Forney, pg. 113, Lovell, pg. 160.

[45] It should be noted that before completion of the Folsom Review, the academy had already begun to move beyond 'wrote' learning and lock-step curriculum. The first opportunity for midshipmen to validate course credits came *before* the Folsom Board. Thus, the academy's staff was not hostile to change, as Rickover may have believed, but were already moving toward adoption of more contemporary instructional practices.

implementing the Rickover-inspired and Rickover-approved recommendations.[46] In the face of such resistance, Dr. Folsom expressed pessimism that without "...strong, sustained outside support by higher naval authorities over a number of years..." his recommendations would not be implemented.[47] The reason for the resistance was evident both in Shinn's memo and in recent leading professional journals: officers perceived Folsom's recommendations as a threat to the mission and broad curriculum of the academy. Implementation of Folsom's recommendations was tantamount to the replacement of the time-honored, broadly educated, 'versatile" officer with Rickover's model of technical expert and specialist. While Rickover was not alone in his advocacy of specialization, he was the most influential advocate, and his nuclear officers were the leading exemplar of this new 'line' officer model.

The Naval Academy leadership was outspoken in its resistance to the polytechnic model of technical education and continued to subscribe to the goal of producing officers modeled in accord with the King system. RADM Melson acknowledged that advancing technology required some adjustments, but technology was NOT defining. Melson stressed repeatedly that the mission of Annapolis was "…preparing well-rounded career line officers…" Melson disavowed technical specialization in two successive alumni letters. He explained that the purpose of the letters was to "… remove any question that the Academy might be emphasizing technical specialties…"[48] Naval leaders, to include the Secretary of the Navy, John Connally, went so far as to reword the academy mission

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[46] John P. Lovell, *Neither Athens nor Sparta? : The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 162-163.
[47] Folsom, as quoted in Sheppard, 253-254.
[48] Charles L. Melson, RADM USN, "Superintendent Reports," *Shipmate*, no. 6-7, June-July 1960. See also Forney, pg. 121 for analysis of Melson's policies.

to "…emphasize that the Naval Academy goal is the preparation of officers for a career of naval service. There was to be no ambiguity which might result in misconstruing the mission as primarily the preparation of junior officers, of engineers, or of any other special Service need to the detriment of a balanced program for career naval officers." [49] Not just the senior admirals and Secretary Connally supported the integrative or versatile officers, but a large cross section of the active duty officers also expressed their support of the integrative officer. [50]

Melson's successor, RADM Davidson, inherited the dispute and challenged the Folsom Board "…particularly in regard to the foreign language program." [51] Davidson later countered Rickover in a bluntly worded memo, writing that "….there appears to be a major difference of opinion as to whether we should be graduating qualified engineers or well-rounded naval officers for future service in the Navy." [52] Senior officials beyond the academy joined Davidson in questioning the Folsom/Rickover push toward a technical curriculum. The third convention of the SABER Board described Folsom's plan as a manifestation of the current "…fetish for scientific education." The board

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[49] Wayne P. Hughes, "New Directions in Naval Academy Education," *US Naval Institute Proceedings,* 86, no. 5 May 1960, 1. It should be noted that the mission statement would be changed at the end of Admiral Calvert's term, published in 1973, and would eliminate the reference to higher service, and instead confine itself to a very sparse and pragmatic goal: "To prepare young men morally, mentally, and physically to be professional officers in the naval service." Calvert would assert in 1971 that one of main functions of the Academy was to produce engineers for the Navy in order to compensate for losses at civilian schools. See his statement to the Board of Visitors, 1971.

[50] W.D. Brinckloe, CAPT USN, "Is the Versatile Line Officer Obsolete?" *US Naval Institute Proceedings*, no. 6, June 1959. See response by Robert W. Clark, "Comment and Discussion--Is the Versatile Line Officer Obsolete?" *US Naval Institute Proceedings,* 86, no. 2, February 1960. Brinkloe's article was hotly debated, and has been referenced in several works as representative of the emerging debate. See Sheppard, pg. 261; Forney, pg. 130; Lovell, pp. 162-63.

[51] J. F. Davidson, RADM USN, Report to Board of Visitors, 5-8 December 1960, as quoted in Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974) , 252.

[52] J.F. Davidson, RADM USN, "Memorandum from Superintendent, USNA to Chief of Naval Personnel, dtd 20 Feb 1962, titled: "Comments Concerning Letter from Manager, Naval Reactors, USAEC, to the Secretary of the Navy Proposing changes to the Naval Academy"", Naval Historical Center, Operational Archives, 1966 Box 34, USNA file enclosure (1), 7-8.

recommended that foreign language training, not engineering, be expanded. The SABER Board also reiterated that the function of both USNA and NROTC was to produce the needed "generalists" of the officer corps. [53]

As the months wore on with no action on Folsom's recommendations, Rickover traveled to Annapolis to investigate. Rickover was disappointed that academy officers were not receptive to his ideas.[54] But to intervene again, Rickover needed a reason, an opening. Rickover got his opportunity when the Superintendent blundered on a fairly minor issue that allowed Rickover to reenter the academy debate and this time win the support of a new Secretary of the Navy.

The Superintendent of the Naval Academy attempted in 1961 to create a course in nuclear engineering without Rickover's participation, complete with a sub-critical reactor that had already been acquired by the academy (See Figure 6-1). Rickover was justifiably concerned and appealed to the Superintendent, RADM Davidson, to forgo his nuclear plans. Instead, Rickover suggested that he and his staff at Naval Reactors should oversee all nuclear education for naval officers at his nuclear training commands. The Naval Academy and senior navy officers denied Rickover's request to cancel what was a three-hour course and, by so doing, changed the history of the naval officer corps. Their intransigence compelled Rickover to appeal directly to the Secretary of the Navy. The result was that a three credit hour course for midshipmen was terminated by order of the

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[53]The Secretary's report of 1961 was most critical of the Folsom Board. See SABER,"Secretary of the Navy Advisory Board for Educational Requirements(SABER): Reports 3-7", Naval Historical Center, Operational Archives, Personal Papers of Arleigh A. Burke, Box 9, Folder: SABER.
[54] John P. Lovell, *Neither Athens nor Sparta? : The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), pg. 162-164, see also Charles Leroy Melson, *The Reminiscences of Vice Admiral Charles L. Melson, U.S. Navy (Retired)* (Annapolis: U.S. Naval Institute, 1974), 312-314.

Secretary of the Navy![55] However, something more important than a course cancellation resulted: 'line' officers had, once again, similar to 1953, forced Rickover to appeal to politicians where, again, he found critical support. The alliance, though it lasted only two years, was arguably the most important political-military relationship in the history of post-war naval educational reform. Not since 1899 when Dr. Ira N. Hollis, the Harvard engineering professor, persuaded neophyte navy secretaries Roosevelt and Long to amalgamate the engineers and the line had such a potent combination of technocrat and politician shaped the officer corps.

Rickover had larger ambitions than to terminate a three credit hour course and with the support of the Secretary of the Navy could now act on his agenda. He was determined to compel the adoption of the most radical of Folsom's recommendations: the replacement of the military dean by a civilian engineer, and a major expansion in the civilian composition and civilian leadership of the academy faculty. To effect this change at the academy, Rickover bypassed all uniformed officers and, with a door opened to him by the course credit fiasco, appealed directly to the inexperienced Secretary of the Navy, Fred Korth, who had recently replaced Connally.[56]

Both sides recognized the battle over the position of dean to be among the most important in the academy's recent history. All the military academies, beginning with West Point, had for over a century relied upon talented uniformed officers to oversee the curriculum. Though the Navy had had a long history of civilians on the faculty, to

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[55] John S. Connally, Secretary of the Navy, "Major in Nuclear Engineering at the US Naval Academy", ltr dtd 20 Dec 1961 to Chief of Naval Personnel ", Naval Historical Center, Operational Archives 00 File 1966, box 34, folder "USNA".

[56] Fred Korth, Secretary of the Navy,""Education at the Naval Academy", ltr from SECNAV to UnderSecretary of the Navy, Chief of Naval Personnel, dtd 22 May 1962", NHC Operational Archives 00 1966, Box 34, folder "USNA". Note, at both the USAFA and USMA uniformed officers serve as dean.

displace the naval officer with a civilian in the senior position (Secretary of the Academic Board) was anathema to the naval profession of arms. The debate quickly degenerated into a bureaucratic battle complete with a fusillade of memos, personal appeals, and even secretarial retractions and restatements. In the after-glow of SPUTNIK, however, education had been politicized, and with the National Defense Education Act of 1958, political activists happily waded into curriculum debates.[57] This political attention worked to Rickover's advantage as his strength was with Congress and senior civilians, not with the uniform Navy.[58]

In January of 1962, Rickover sent a personal letter directly to the Secretary of the Navy in which he pressed for the adoption of several recommendations that had originated in the Folsom Report, including hiring of a civilian dean.[59] A few months later, the new Secretary of the Navy, Fred Korth—inexperienced in the Navy and quite possibly under the undue influence of the sixty-year-old admiral[60]-- supported Rickover's proposals.[61] Korth's decision to endorse in total Rickover's recommendation, in

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[57] Barbara Barksdale Clowse, *Brainpower for the Cold War: the Sputnik Crisis and National Defense Education Act of 1958* (Westport, Conn.: Greenwood Press, 1981).

[58] John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 164. Lovell attributes Rickover's successful intervention on the issue of the civilian dean to his manipulation of Rep Clarence Cannon, who pressured Secretary Korth to support Rickover's proposals.

[59] Hyman G. Rickover,"Ltr from Rickover to Secretary of the Navy dtd 27 Jan 1962", NHC Operational Archives 00 1966 Box 34, folder "USNA".

[60] Robert Carney, ADM, USN (retired),"Ltr to Adm George W. Anderson, USN of 14 December 1962", NHC Operational Archives 1966 Box 34, USNA Folder. In this letter, Carney clearly identifies Rickover as the force behind the efforts to civilianize the academy. Carney launched a bitter attack on Rickover's credentials as both an educator and as an officer 'in command.' Carney wrote that Rickover was by "...no means universally accepted by civilian thinking as an authority on education, and not widely accepted in military circles as a knowledgeable and experienced authority on the requirements for operational commands."

[61] Fred Korth, Secretary of the Navy,"Education at the Naval Academy", ltr from SECNAV to UnderSecretary of the Navy, Chief of Naval Personnel, dtd 22 May 1962", NHC Operational Archives 00 1966, Box 34, folder "USNA". Forney describes Korth's letter as almost 'regurgitation' of Rickover's arguments.

particular the decision to place a civilian as dean, generated a wave of protest. Retired four-star admirals and former CNO Carney, representing the Naval Academy Alumni

Subcritical nuclear reactors.

Figure 6-1: Annapolis Subcritical Reactor Training. Midshipman training on an apparently sub-critical reactor filled with 5,500 pounds of uranium in Annapolis, Maryland, in the early 1960s. Such 'training' did not particularly please VADM Rickover. Note concerned expression of midshipman on the right of the photo, who is apparently holding the reactor with right thumb. The concerned midshipman may have agreed with Rickover that this type of activity might be better supervised elsewhere, though his classmate with the control mechanism does appear to be fully focused on his delicate task. [62]

[62] Photo taken from USNA Catalogue 1960-61, pg 16, USNA Special Collections, Annapolis, MD.

Association, articulated the case for a military dean. [63] The admirals believed, correctly, that Rickover's recommendations struck at the very core of what it meant to be a naval officer.[64]

Carney took the lead and expressed concern that a civilian dean might come to be the second ranking person in the Naval Academy and could thus exert "disproportionate influence" and could "raise hob with the basic objectives of the Naval Academy." Carney undermined his argument, however, when he levied a generalized attack on civilian academia and expressed a fear of the "professorial mind" that would eventually dominate the "military mind". He did yet more damage to his otherwise strong case for a military dean when he fretted that civilian academics could insert "divisive thinking" into the minds of the "experimenting youth".[65] An argument that invoked as justification the danger of civilian influences was not the best tactic by which to enlist the support of a *civilian* secretary.

During this critical period of debate, senior line officers at the Pentagon and Bureau of Personnel were relatively passive. Some interpret this passivity as tacit consent for Rickover's reforms. However, later testimonies show that the serving admirals were

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[63] For representative view of retired officers and academy alumni, as well as insight into the views of active duty senior leadership, see exchange of letters between ADM Carney (retired CNO, views endorsed by Navy league), ADM Wright (who was president of USNAAA), and the serving CNO, ADM Anderson. For this exchange, see NHC 00 files 1966 box 34, USNA file, letter Carney to Anderson , 14 Dec 1962; ltr Anderson to Carney 12 Oct 1962. Carney's personal analysis of USNA faculty reforms endorsed by Navy League, 24 Sept 1962; Carney ltr to Anderson 5 Dec 1962; Carney ltr to Anderson 17 Oct 1962.

[64] Todd Forney, "Charting Institutional Change: The United States Naval Academy During the 1960s," in *New interpretations in naval history : selected papers from the Twelfth Naval History Symposium held at the United States Naval Academy, 26-27 October 1995*, ed. William B. Cogar (Annapolis, Md.: Naval Institute Press, 1997), 141.

[65] Robert Carney, ADM, USN (retired),"Ltr to Adm George W. Anderson, USN of 14 December 1962", NHC Operational Archives 1966 Box 34, USNA Folder. The statement by ADM Carney, endorsed as it was by the Navy league and the USNA Alumni Association, provides a valuable insight as to the opponents Rickover faced in his attempts to reform education. While Carney's fears of the "professorial mind" are, by today's standards almost comical, they nonetheless strike close to a core issue: what is a modern naval officer and what are his educational requirements in the later half of the 20th century.

quiet on the issue because they had been deceived by Secretary Korth. According to RADM Davidson, senior leaders had remained quiet because the Secretary of the Navy had told them that he would take no action to replace a military officer with a civilian dean. Just days after receiving this assurance from Korth, senior navy admirals would read in the *Washington Post* that the Secretary had, despite his assurances, replaced the military officer with a civilian dean for the Naval Academy.[66] It is also possible that the active 'line' preferred the alumni to lead the charge at Annapolis while they focused on the CNO battle with Rickover over diesel officers and the selection of nuclear ship captains.[67] For whatever combination of reasons, deceit or tactical miscalculation, the 'line' officers were outmaneuvered, and the inexperienced Korth signed the order that appointed a civilian as Dean of the Naval Academy.[68]

The consequences of this decision were significant. Not long after Rickover's victory, the 'line' officer who served as Secretary of the Academic Board—the military dean—was replaced by a civilian engineering professor, Dr. Bernard Drought, a former engineering department chair at Marquette University. There then followed the dilution

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[66] John F. Davidson, RADM USN (retired), *The Reminiscences of RADM John F. Davidson, USN (ret)* (Annapolis, MD: US Naval Institute Press, 1986), 357-58. Davidson relates that Korth had misled both the Chief of Naval Personnel and himself as to the plans to appoint a civilian dean: "I mean, it turned out it was really a falsehood to tell us that nothing would be done..." Further, it appears that Korth did not inform the CNO of his plans. See Paul R. Schratz, Captain, USN, "Fred Korth, 4 January 1962 to 1 November 1963," in *American Secretaries of the Navy, 1913-1972*, ed. Paolo E. Colletta (Annapolis, MD: Naval Institute Press, 1980), 937. Thus, without 'line' officers able to express their views, Rickover seemed to have the stage to himself.

[67] George Anderson, ADM, USN,"Personal Papers", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Boxes 40, 43, 51-53 MFR 13 July 1962. Why did not Anderson intervene on the Naval Academy issue, especially given that it had already been elevated to the secretarial level? See in particular Anderson's MFR of 13 July wherein he appears to support Korth, which is at odds with other memos Anderson sent to the alumni group. It may have been that Anderson feared the power of Rickover, and sought to oppose him on only the most crucial issues, which to Anderson was not educational policy but Rickover's personnel policies regarding ship captains and the diesel force.

[68] Fred Korth, Secretary of the Navy,""Education at the Naval Academy", ltr from SECNAV to UnderSecretary of the Navy, Chief of Naval Personnel, dtd 22 May 1962", NHC Operational Archives 00 1966, Box 34, folder "USNA."

of the military faculty by means of a large number of civilian hires.[69] With the civilianization came many highly qualified engineering professors who were eventually protected by the power of tenure. This favored cohort then imparted to the academy an increased polytechnic character. In the Dean's office, the new engineer leaders began to supplant 'line' officer educational goals with those more characteristic of an engineering college. Before the decade was out, Dean Drought would seek to position the academy as a good, second-tier polytechnic, thus confirming the worst fears of Captain Shinn.

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Redefining the Goal of an Annapolis Education

With a civilian engineer designated to take the helm in the Dean's office and a major civilianization of the faculty underway, Rickover may have been expected to turn his attention elsewhere. Leading scholars of the academy, in particular Lovell, note that Rickover continued, however, to intervene at the academy. Rickover remained deeply involved in academy affairs for three reasons. First, Rickover was an apostle for a technocratic philosophy of command and wanted the academy to conform to his new model. Second, Rickover still needed more officers for his expanding nuclear fleet, and midshipmen attrition remained too high, hovering around 25%.[70] Finally, the loss of

[69]K.W. Moorhead,"From Public Information Officer to Heads of Academic Departments, Subj: Recent Academic Improvements at the Naval Academy (October 1965), ltr dtd 27 Oct 1965", RG 405, US Naval Academy Special Collections, Reports of Boards and Committees, 1965. Between 1962-1965, following Rickover's intervention, the percentage of civilian faculty increased dramatically, by almost 40%. A few years later these civilians augmented their numerical strength with promotion to department heads, a heretofore key billet reserved exclusively for military officers. The numbers of civilian faculty would have been even greater if the Navy had not made a last minute, worldwide search for officers with advanced degrees, which yielded approximately fifty, who were mostly reservists. See Lovell, pg. 165.

[70] Joint Committee on Atomic Energy, Statement by VADM H.G. Rickover,USN, during Joint Committee Tour of USS ENTERPRISE (CVN-65), 87th Cong., 2nd sess., 31 March 1962, 45.

THRESHER in the spring of 1963 reinforced the importance of the first and second reasons: with the more rigorous technical requirements levied on nuclear officers after 1963, it was even more urgent for Annapolis to produce talented technical experts and engineers. The civilian dean proved unable, however, to fully effect the changes Rickover desired. Conservative officers at Annapolis remained deeply committed to the old model and fought a delaying, rear-guard action to preserve vestiges of general education.

Rickover needed to convince more navy leaders to support a polytechnic undergraduate program and to abandon the old Annapolis general education. However, the shift to a polytechnic model could not be justified, at least in these early years, by the manning needs of the nuclear fleet alone. Until the middle 1960s, diesel submarines still significantly outnumbered nuclear submarines, and the nuclear surface fleet was still small. To gain support for his type of reforms, he needed to obtain a fundamental redirection of ALL undergraduate education, not just for those headed into his still relatively small program. To justify Annapolis curricular reform by claiming it would improve engineering performance on conventional ships did not convince. Most engineering plants in the fleet had been operated for decades quite satisfactorily by Annapolis graduates who did not possess scientific engineering education. Unable to justify a redirection of the curriculum based on fleet engineering performance, Rickover used another justification for his proposed reforms: midshipmen suitability for civilian engineering graduate education.

Rickover advocated that the Naval Academy adopt the requirements of elite civilian engineering graduate colleges as the metric by which to judge curriculum.

Rickover defended this shift in standards by claiming that Annapolis graduates took too long to get through engineering graduate school. Rickover expended extraordinary energy to convince leaders of the validity of his new metric and new model of 'line' officer education. Rickover spoke publicly, testified, and wrote and published nationally distributed works on education.[71] He called and harassed the Superintendent regarding the slow pace of changes. Sometimes he would send his staff to Annapolis to evaluate midshipmen for his program and reject most of them. Through this process of evaluation and rejection, Rickover communicated to the academy that it had a mission to produce scientific engineers, and it was failing at that mission.[72] After years of agitation, the Secretary of the Navy finally afforded Rickover the opportunity to argue his view of education before the highest educational body in the Navy. For the first time, Rickover was invited by the Secretary of the Navy to brief the Secretary of the Navy's education review board meeting on Treasure Island, California, in November 1962.[73]

At Treasure Island Rickover argued that modern technology necessitated more 'line' officers (not EDOs) earn advanced scientific engineering degrees.[74] A central assumption in Rickover's argument-- that technical requirements in graduate school should drive the undergraduate education of the 'line'-- was an assertion rather than an argument. While line officers at the conference did not rigorously challenge Rickover's

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[71] Hyman George Rickover, *American Education, a National Failure: the Problem of our Schools and What we can Learn from England*, [1st ed. (New York,: Dutton, 1963).
[72] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007; William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007.
[73] Dec 1962 SABER Report,"Secretary of the Navy's Advisory Board on Educational Requirements", NARA 24-470-54-26 Box 1
[74] Ibid. In addition, this was corroborated by Rickover's assistant who also attended the conference. John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007.

assertion,[75] others soon exposed the weakness of his claims. Opponents of the proposed changes showed a few months later that the data did not support Rickover's justifications. The number of ‘line’ officers required to operate and command the ships and squadrons of the fleet dwarfed the number of scientifically educated engineer billets that a line officer (URL) with a subspecialty must fill. The argument to reorient the purpose of USNA curriculum toward graduate school preparation was a classic case of a small minority shaping the larger majority. A dissenting panel member of the curriculum review committee argued that a "...study of quotas for Post Graduate school indicates 740...in technical billets. However, this can hardly be taken as a cue for a ... commitment of present and future graduates of the Naval Academy to these quotas which are designed to affect over 10,000 officers within certain zones."[76] These dissenting faculty members exposed the fact that the entire USNA curriculum, the cognitive preparation of thousands of line officers, was being changed ostensibly to produce a modest number of 'line' engineers from NPGS.

Other than Rickover, it was unclear who was agitating for radical curricular reform. There was scant evidence that the EDO community was calling for such changes to ‘line’ officer education at Annapolis. In contemporary publications the EDO community, most of whom held civilian engineering degrees, expressed an apparent

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[75] Line officers may have been susceptible to Rickover's assertion because in 1959 the Navy had agreed to reduce the number of EDOs and make up the shortfalls with 'line' officers with technical subspecialties--the 'line could do it all' solution. To obtain these 'line' sub-specialists more quickly, further reform in ‘line’ officer education at Annapolis and in NROTC was required.

[76] C.P. Lemieux,"From Professor C.P. Lemieux to Chairman of Curriculum Committee, subj: Objections to Core Curriculum, dtd 4 December 1963", RG 405, US Naval Academy Special Collections, Reports of Boards and Committees, Curriculum Review, 1963, enclosures 10, 11. The report did not explain the basis for the 10,000 number. However, it seems reasonable from the context of the argument that the number was the aggregate of several year groups of line officers. If both NROTC and USNA officers were combined, they would in a few years graduate approximately 10,000 young ensigns.

satisfaction with the quality of Naval Academy graduates.[77] Even if there had been a shortage of engineering officers, radical reform at Annapolis was hardly the only solution to the problem. One alternative that would seem less disruptive to 'line' education, and arguably more cost-effective, would have been to recruit more engineering specialists from civilian colleges. Why alternative solutions were not pursued is unclear. Perhaps a latent rivalry between 'line' and 'staff' made the operational officers reluctant to expand the EDO community. Perhaps navy leaders were still influenced by the precedent of 1899 that "all 'line' officers were to be engineers". For whatever combination of reasons, senior leaders did not support an increase in the size of the EDO community, but began instead to shift their support to Rickover's recommendation that the 'line' should become increasingly technically educated.[78]

To those responsible for making midshipmen more technical but still 'broad', the irreconcilability of such a mission soon became apparent. The Superintendent of the Academy was being asked to do something much more difficult than that envisioned in 1899: to educate midshipman as both scientific engineers and well-rounded officers who

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[77] Bureau of Personnel Navy Department,"The Engineering Duty Officer (General)--NAVPERS 10814-B", US Naval Academy, General Collection, VM623.A6 1963. See page 2.

[78]The Franke Board of the late 1950s considered a massive reduction or possible elimination of an independent ED community. In the end, the board proposed a 30% reduction in EDO officers. The unfilled technical billets that would result were to be filled URL officers with technical sub-specialties. To gain these technically educated URL officers required an increasing number of URL officers to pursue advanced engineering and scientific studies. Albert G. Mumma, *The Reminiscences of Rear Admiral Albert G. Mumma, U.S. Navy (Retired) / interviewed by Paul Stillwell* (Annapolis: US Naval Institute, 2001), 191. See also Smedberg's comments in Court of Inquiry: Loss of the USS THRESHER (SSN-593), Testimony of 21 May 1963, VADM Bernard L. Austin, USN, Presiding", Office of the Judge Advocate General, National Security Litigation and Intelligence Law Division, Washington, D.C., 1610. Consequences of the reduction in EDOs for the Naval Academy became manifest with implementation of SECNAV INST of 7 March 1963. William B. Franke, Under Secretary of the Navy, Chairman,"Report of the Committee on Organization of the Department of the Navy, 1958-59", US Naval Academy, General Collections, VA52.A184.

could speak foreign languages, hone skills as mariners, and learn about joint integration. Fleet operations in three dimension, joint operations with the Army and Air Force, combined operations with allies, in addition to operation and maintenance of scientifically engineered machines, all levied increased demands on the future 'line' officers. Echoing critics earlier in the century, some officers in the 1960s questioned again whether or not the 'line' officer could meet all these demands and at the same time master the complexities of scientific engineering. Hesitant to change the curriculum for all midshipmen just to produce a few more engineers, the Superintendent suggested that it might be necessary to split the Naval Academy into two components. One would produce the traditional ‘well rounded officer’ who would focus on operational and broader knowledge, and the other would serve as an engineering school to produce the technical specialists Rickover wanted: “It is conceivable that only by the establishment of a Naval Academy University could VADM Rickover's requirements be satisfied and the Naval Academy still continue to turn out naval officers in accordance with the existing mission.”[79]

RADM Kirkpatrick, like his predecessor Davidson, resisted the shift to a polytechnic model. Kirkpatrick remained committed to the "...retention of the precept that midshipmen must receive a well-rounded education..." He explained that USNA had refused to join the trend in academia toward further specialization in undergraduate programs and would continue to do so in the future: "American education was off on a specialization spree which the Naval Academy refused to join. It steadfastly maintained

[79] J.F. Davidson, RADM USN,"Memorandum from Superintendent, USNA to Chief of Naval Personnel, dtd 20 Feb 1962, titled: "Comments Concerning Letter from Manager, Naval Reactors, USAEC, to the Secretary of the Navy Proposing changes to the Naval Academy", Naval Historical Center, Operational Archives, 1966 Box 34, USNA file.

that the general education and the general scientific courses offered at Annapolis were best suited to the needs of the navy and of undergraduate education in general."[80] Furthermore, the admiral believed the emergence of many technical schools after WWII did not impose additional burdens on the academy, but in fact relieved the academy of many of the pressures for technical training. These schools afforded more time for a "...foundation for a better rounded and more complete undergraduate curriculum..." He went on: "Our present position is analogous to Columbia College and Columbia University." [81] By this, he meant that most officers should start at the college (USNA), but would be expected to comply with the ideals of the King plan and pursue education at the ‘navy’ university, at the general line school, graduate school, and war college. Specialization, even if it were necessary in a 'line' officer's career, would not begin at Annapolis.

Rickover continued to criticize the Naval Academy as inadequate. Kirkpatrick bristled at the criticism in part because the navy pilot *misunderstood* the challenge posed by Rickover and his technology. Kirkpatrick praised Rickover's technical schools as the “…most modern and notable…” and interpreted them to *relieve* the academy of responsibilities, *not* add to them.[82] But in fact, Rickover’s schools did not relieve the academy of a burden. Instead, the nuclear schools posed a technically rigorous academic challenge to future ‘line’ officers that in turn placed a greater burden on Annapolis to become more technical. In the face of the Superintendent's resistance, Rickover turned again to politicians to further the technocratic transformation of the academy curriculum.

[80] C. C. Kirkpatrick, RADM USN, "Rhode Scholars? Yes! But Naval Officers First: A Century of Academic Achievements," *Shipmate*, no. 9-10, Sept-October 1963, 6-10.
[81] Ibid., 9.
[82] Ibid., 7, 9.

In early 1963, the Secretary of the Navy Korth gave official backing to Rickover's ideas of engineering priority and set as a goal that 75% of midshipmen would concentrate in engineering. [83] Kirkpatrick could not refuse a direct order, especially one emanating from the Secretary of the Navy, and dutifully convened yet another curriculum reform effort under the supervision of Dean Drought.

Dean Drought, the former dean of engineering at Marquette, armed with the SECNAV instruction for a larger quota of engineers, pushed for a more strongly polytechnic curriculum. Opposition flared again, but this time it was not the Superintendent and 'line' officers but veteran members of the faculty who objected. Senior professors objected to the curricular shift for two reasons. First, they expressed concern that the plans narrowed midshipman education, a shift in policy that was as profound as it was ill advised. Second, the professors protested that the plans were bureaucratically driven, hastily assembled, and not supported by rigorous analysis. The professors were trained as researchers and were masters of argument and analysis. They quickly grasped that the proposed technocratic shift in academy curriculum was not justified by either the numbers or even the documents cited in support of the change. The professors were blunt as they unraveled Drought's tenuous justification: "SECNAV

[83] SECNAV INST 1520.4 OP-09 of 7 March 1963, as quoted in Lemieux, page 2. The Secretary may have been persuaded by the SABER board meetings in late 1962 at which Rickover spoke, and though likely, there is no direct evidence linking the two. It is noteworthy, however, that the SABER boards that followed in 1964 reiterated Rickover's arguments in which he linked technical requirements at NPGS and the curriculum at USNA. See SABER,"Secretary of the Navy Advisory Board for Educational Requirements(SABER): Reports 3-7", Naval Historical Center, Operational Archives, Personal Papers of Arleigh A. Burke, Box 9, Folder: SABER.

INST 1520.4 OP-09 7 March 1963 has been cited as a basis... (but it) hardly calls for a revolution in the Naval Academy curriculum." [84]

The faculty's primary concern was the loss of balance in the curriculum should Rickover's proposals be adopted. They feared the changes would produce a "…program similar to those of most engineering schools..." and that such a program crowded out the broadening function and "…affords no place for other basic education needed to satisfy the criteria for a broad intellectual formation consistent with the mission of the Naval Academy."[85] The demise of the century-old language education requirement illustrated how engineering was 'crowding out' the broader components of the curriculum. Dr. C.P. Lemieux, a senior faculty member, argued: "A major weakness of the (proposed) core program is that is crowds out the foreign language requirement. The naval service more than any other has obvious need for wide experience in foreign languages. It is well known that this lack is acutely understood at the highest levels of the military and government."[86] In the expansive faculty critique, several annexes went into further detail and argued the displacement of language by engineering was inconsistent with the goal of producing the versatile and generalist officer: "Curtailment of foreign language study at the USNA would create an image inconsistent with that of the 'well-rounded'

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[84] That these requirements originated from bureaucratic pressure and not deliberate study is evidenced in Lemieux's response to the curriculum plans: "The need for a program designed to graduate 75% of the midshipman with engineering degrees has not been made clear. If this is the basic task of the (curriculum) committee, it should have been determined by exhaustive research..." See pg. 2. Lemieux goes on to question why the SECNAV instruction, which included no research or justification, is used as guidance. Lemieux points out: "SECNAV INST 1520.4 OP-09 7 March 1963 has been cited as a basis for this need...(but it) hardly calls for a revolution in the Naval Academy curriculum."

[85] C.P. Lemieux,"From Professor C.P. Lemieux to Chairman of Curriculum Committee, subj: Objections to Core Curriculum, dtd 4 December 1963", RG 405, US Naval Academy Special Collections, Reports of Boards and Committees, Curriculum Review, 1963, enclosures 10, 11, page 1.

[86] Ibid., 2.

naval officer."[87] Further, the faculty noted that the academy's plans ran counter to the goals of the National Defense Education Act of 1958, which had called for more, not less, language education. [88]

The professors quickly realized the proposed changes were not the product of analysis and study, but driven by powerful bureaucratic forces. The source of the bureaucratic driver was not hard to discern. The quotas came down from Rickover's ally in the Secretariat, not from a study group of educational analysts or operational 'line' officers. Such high-level, unstudied intervention seemed to the veteran faculty rash and risky as compared to a deliberate, though time-consuming study of the problem. The faculty, however, failed to appreciate the immediate challenges Rickover faced: the President of the United States was calling for more ballistic missile submarines, each of which required more than double the crew and officer complement of the retiring diesel submarines. Furthermore, USS THRESHER had been lost around the same time as the academy curricular debate. As discussed in the last chapter, Rickover interpreted the loss of THRESHER to have both material and human causes. He believed the human failure derived from inadequate understanding of technology, a failure he sought to remedy by more advanced and narrow engineering training. After THRESHER, every nuclear officer would be required to pass additional, even more rigorous, engineering certifications. To pass the exams required an even more technically educated 'line' officer. Thus, by extension, the THRESHER incident and the demands of a growing

[87] Ibid., enclosure 11, pg. 4.
[88] Ibid., enclosure 11, pg. 4. The letter to the curriculum review board notes that between 1958 and 1960, modern foreign language enrollments in high school increased 44% and a significant number of colleges adopted more stringent foreign language admissions requirements.

POLARIS fleet compelled Rickover to demand an even more rigorous engineering program at Annapolis.

RADM Kirkpatrick did not act on Dean Drought's latest reform proposals. Rather, the task fell to Kirkpatrick's relief, the new flag officer RADM Minter who had moved directly from the commandant's office to assume the position of superintendent. Confronted by the combination of Rickover's aggressive interventions (including several face-to-face meetings)[89] and Dean Drought's sophisticated pedagogical arguments, the inexperienced and very junior Minter was at a great disadvantage. In the spring of 1964, Minter approved Drought's plans to shift the midshipman curriculum to one more consistent with specialization and increased engineering content (views consonant with Rickover's exhortations). RADM McNitt, a former dean of admissions at Annapolis and a former President of the Naval Post Graduate School, described Minter's proposals in 1964 as a "…fundamental change in the educational philosophy at the Naval Academy…"[90] The decline of the 'broad' officer, which Dr. Lemiuex lamented, did not this time go unnoticed by the 'line'. Senior active duty line officers recognized immediately the implications of the specialist trajectory and rallied to protect what was left of the King system of broad officer education and development.[91] The two line

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[89] Charles Minter, VADM USN (retired), *Reminiscences of VADM Charles S. Minter, USN (Retired)*, vol. II (Annapolis: US Naval Institute Press, 1981), 531-545. RADM Minter, '37, was thirteen years junior to Rickover. Rickover called Minter repeatedly and requested several meetings with the young Superintendent. Minter met with him to discuss academy curriculum on at least two occasions. Minter had neither the educational experience nor the rank to oppose Rickover's ideas.

[90] Robert McNitt, RADM USN (ret), "Challenge and Change", *Shipmate*, no. 4, April 1972, 5; Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 294. Sheppard concurred with McNitt and others, describing the proposed changes of 1964: "This change meant that specialization….was ensured for all midshipmen by 1964."

[91] Charles S. Minter, RADM USN,"Ltr from RADM Charles S. Minter to Secretary of the Navy dtd 24 March 1964", Naval Historical Center Operational Archives 1966 Box 34, folder "USNA". While public documents at the time reveal little of the debate, CNO papers recently indexed and now more readily

officers who engaged the debate were well placed to make their case: the CNO Admiral David McDonald and the Secretary of the Navy’s Executive Assistant, Bud Zumwalt, a future CNO.

Admiral McDonald and Captain Zumwalt were alarmed that a junior admiral, Minter, would propose such radical changes, and therefore the two men carefully studied the plans and criticized the proposal's underlying philosophical arguments. They both challenged Rickover's argument that 'line' officer education must be measured against civilian engineering graduate schools. McDonald and Zumwalt strongly opposed the proposals to specialize midshipmen education. In response to the unstudied assertion that the goal of Annapolis curriculum should be to prepare midshipmen for engineering graduate school (the Rickover justification for a polytechnic), Zumwalt countered that the midshipmen ‘major’ was not engineering, rather “…the major is Navy. The entire class should major in command and leadership.”[92] McDonald also challenged Rickover’s core argument—that academy graduates required two years more engineering education to compete with civilian engineers on an equal basis—writing: “What is wrong with that (two years of additional education)?” McDonald was asking the obvious but profoundly important question: Why were naval officers being evaluated against a metric of civilian engineering college students? To McDonald it was entirely appropriate that young 'line' officers, if they decided to pursue engineering graduate degrees, would

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accessible provide insight to the competing visions of officer education. The CNO and the SECNAV's EA, future CNO Elmo Zumwalt, reviewed and in excruciating detail dissected Minter’s plan for increasing midshipman specialization.

[92] Ibid. See Captain Bud Zumwalt comments in margins of Minter’s proposed reforms. The comments in the margins of the CNO’s copy of Minter’s proposal are striking for the insights they offer, both as to senior leaders' advocacy of the “well rounded officer”, but also the suspicion and animosity these line officers showed not just to Rickover, but to other technical specialists, including the astronaut alumni of the academy. Zumwalt expressed a fear of not just Rickover, but other specialists in the Navy, writing: “Who is behind this proposal: Shriver, Glenn, Sheppard, McDonald, Green, Rickover?”

require additional study as compared to their civilian counterparts. Zumwalt, too, rejected the comparison between the midshipmen program and that of a civilian engineering college, penning the note: “Comparison is invidious. Likening a peach (USNA) to a brick (civilian engineering colleges).” Both McDonald and Zumwalt were of a like mind that, in an effort to make every ‘line’ officer competitive with civilian engineers, the Navy might inadvertently put too much emphasis on engineering academics at the risk of neglecting their broader education as a naval officer. [93]

This rear-guard action by the ‘line’ was partially effective and did ameliorate the most aggressive aspects in the shift to a more scientific-engineering curriculum. Also helpful was the fact that Korth had resigned and had been replaced by the more independent-minded Paul Nitze. The Minter-Rickover plan had hoped to achieve a 30% greater technical concentration in the curriculum, but due to opposition by the CNO and by order of the Secretary of the Navy, the curriculum concentration was limited to 15%.[94] Foreign language content was reduced by 50%, a reduction that was soon criticized by an outside, non-technical review board.[95] However, the partial victory for general and non-technical education was to prove only temporary. Forces more powerful than admirals and policy makers were at work transforming midshipman ideas and values.

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[93] Ibid. Comments by McDonald are less spirited than Zumwalt, but are of a deeper analytical quality.
[94] Robert McNitt, RADM USN (ret), ""Challenge and Change"," *Shipmate*, no. 4, April 1972, 5.
[95] Charles Paul Sheppard, “An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974” (Thesis Ph D --George Washington University, 1974), 300. The criticism emanated from the visit by Middle States Association of Colleges and Secondary Schools, February 1966.

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The Reactor as Recruiter: the Appeal of the New Machine, the Tedium of 'old' ideas of Operational Integration

While admirals and politicians debated educational policy, something was happening in the minds of midshipmen. With Rickover's rise to prominence, the midshipmen were being asked to choose between two models of the 'line': the well-worn model of the "well-rounded officer" and something that appeared new, the technical specialist in control of revolutionary new technologies. The former was advocated by older officers who used war stories and 'tradition' to argue their case, the strongest proponents of which were now dead (King died in 1956, Nimitz in 1966). The King concept of officer—the versatile generalist-- possessed no physical artifact around which to represent the ideal. Moreover, with the termination of the general 'line' promotion examination, the old model had also lost one of its most effective enforcement mechanisms.[96]

In contrast to the ideas of the King system, Rickover's program had a tangible advocate in the fleet: the newest submarines, ships, and aircraft carriers, tons of shining steel and shielded uranium.[97] To serve aboard or command one of the Navy's newest

[96] The nuclear reactor-education dynamic seems to echo the pattern of the early 20th century when large steam engines and the engineers compelled the establishment of the NPGS. The lesson: organizations that combined ideas with large, manpower intensive machines could mobilize support for educational change. The King model was at a great disadvantage: it was both 'old' and by its nature not linked to any one platform or manpower- intensive machine around which to organize. King's philosophy was enforced through officer policies such as the written promotion exam that emphasized general knowledge, a practice that was, perhaps not coincidently, terminated in the late 1950s or early 1960s.
[97] By 1963, USS LONG BEACH and BAINBRIDGE were the most impressive ships in the surface fleet, and ENTERPRISE the exemplar in the carrier fleet. The 'around the world' cruise of nuclear ships, and the operations of a 'all nuclear task force' further foreshadowed the future as nuclear and by extension reinforced the perception that Rickover's technocratic philosophy of education was the way of the future.

ships, an officer had to pass through Rickover's nuclear schools. Rickover's reactors and demanding technical schools thus worked as 'carrot and stick': nuclear reactors and their ships enticed the midshipmen, but the nuclear training schools held the keys to command. The combination of labor-intensive reactor technology and the high-attrition training schools became an important tool in reforming midshipmen educational values and norms.[98]

All the phases of nuclear selection and training reinforced the value of a strong academic background in engineering, mathematics, and a techno-centric mindset for problem solving. The midshipmen who most readily took on the new values did not have to await assignment to the coveted nuclear ships to reap their reward. The most successful midshipmen who concentrated in engineering enjoyed the support of the increasingly powerful engineering faculty, who through their connections to industry and the Navy's industrial organizations funneled research grants and internships to the aspiring engineers.[99] In contrast, the midshipmen who concentrated more in the humanities or social sciences received little support. This combination of 'carrot and stick' -- Rickover's public personae, the rigorous demands of the nuclear schools, the

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By 1967, the USS NIMITZ would be authorized for construction, and by 1968, the next line of cruisers, CGN 36, would be nuclear.

[98] The allure of machines as a factor in social change is not a new phenomenon. Several works attest to the allure of artifacts on the minds of men. See Elting E. Morison, *Men, Machines, and Modern Times* (Cambridge, Mass.,: M.I.T. Press, 1966). For the Air Force experience, see R. Michael Worden, *Rise of the Fighter Generals: the Problem of Air Force Leadership, 1945-1982* (Maxwell AFB, AL: Air University Press, 1998).

[99] K.W. Moorhead,"From Public Information Officer to Heads of Academic Departments, Subj: Recent Academic Improvements at the Naval Academy (October 1965), ltr dtd 27 Oct 1965", RG 405, US Naval Academy Special Collections, Reports of Boards and Committees, 1965. Engineers were showered with research funds and coveted research fellowships (the Trident Scholar program). Moorhead catalogues the multiple grants provided to midshipmen who specialized in engineering, and the relative dearth directed to non-engineers. The funding flowed from the Office of Naval Research (ONR), Bureau of Ships (later known as NAVSEA), and even BUPERS. In contrast to the engineers, for several years almost no research money was earmarked for work in the humanities or social sciences. Furthermore, of the midshipman selected for the new and coveted Trident Scholars in the first two years, *eleven of twelve were in scientific or engineering fields.*

physical allure of the nuclear ships, and the grants and internships for engineers-- threatened to overturn King's old model and ideas of the 'generalist'. Todd Forney, in his authoritative account of the Naval Academy in the post-WWII period, observed: "The effect of nuclear power's popularity on Bancroft Hall's military culture was astounding."[100] However, Rickover enjoyed yet one more advantage that ensured that his influence was more than a fad: his technology was labor intensive.

Forney noted that the number of midshipmen entering the nuclear program was rapidly increasing, and the best were volunteering: "Over the next five to seven years (starting in 1960) the numbers of midshipmen going nuclear power would swell to a total rivaling that of naval aviation and surface line. Moreover, nuclear power could truly claim that its exclusive screening process gave it the best and brightest of the Brigade."[101] An important mechanism of value transmission was midshipmen 'word of mouth' that communicated the threat of attrition but reminded them of the reward of engineering duty on the newest ships. What was essential to this 'word of mouth' transformation was the power of numbers: technologies manned by larger numbers of officers were favored in the competition for the ears of the midshipmen. Of the three major technological innovations of this period-- POLARIS missiles, digital data links, and nuclear reactors-- nuclear power was the least automated and was the most manpower-intensive. Greater manpower carried greater transformative power. Forney explained: "The growing power and needs of nuclear power program would help make the recent changes (at USNA) permanent. Growing numbers of midshipmen participating in the new curriculum would

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[100] Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004), 134-135.
[101] Ibid.

eventually create a new academic culture."[102] The culture was becoming that of the specialist. However, the quality and number of midshipmen concentrating in engineering still disappointed Rickover, and he monitored academy reforms with concern.

Dean Drought continued his efforts to increase the credit hours midshipmen spent studying engineering. To encourage midshipmen to study engineering, Drought offered electives in specialized engineering fields. However, in the early years the number of midshipmen who volunteered to pursue more engineering electives proved disappointing. The midshipmen may have wanted to go into nuclear power, but when it came to electives, those who concentrated in literature, history, government, and language outnumbered engineers in all but one of these years. In 1964, the midshipmen who took most electives in engineering were outnumbered more than 2 to 1 by those who preferred social sciences/humanities electives.[103] Faced with continued shortages of acceptable officers for his program, Rickover in March 1964 blasted the academy's lack of progress in testimony before Congress. At the academy, Rickover explained "…the appearance of education is there, but not the reality."[104] To Rickover, the academy was still inadequately rigorous and technical. Yet, the midshipmen refused to respond in large numbers to the exhortations of the new engineer dean.

The midshipmen continued to be influenced by the 'line', the Superintendent and Commandant, and many other lower ranking officers who had been products of the old

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[102] Ibid., pp. 134-135. Forney supports his research with a survey of over a thousand graduates of the Naval Academy.
[103] "Report by the USNA to the Commission of Institutions of Higher Education." The Middle States Association of Colleges of Secondary Schools, Annapolis, MD Feb 1966, pp. 167-168)**, a**s quoted in Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 285.
[104] John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 168.

King model of education. Even occasional official statements about the academy continued to praise the need for the well-rounded and versatile officer and invoked analogies to liberal arts programs. The Naval Academy mission statement continued to focus the midshipmen on the goal of command, for the "...highest responsibility of citizenship and Government…" The official Naval Academy public information officer exhorted the midshipmen as late as 1965 to study language and culture.[105] The best efforts of Dean Drought and Dr. Folsom,[106] who continued to be closely involved with academy curricular policy, failed to remake the midshipmen. The bald truth was that midshipmen responded to military role models, and the two professors in their civilian suits adorned with not medals but lapel pins were poor models. Rickover needed a charismatic military role model who was sympathetic to his technocratic philosophy. In the person of James Calvert-- perhaps one of the most dashing officers of his generation-- he hoped he had his man.[107]

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[105] K.W. Moorhead,"From Public Information Officer to Heads of Academic Departments, Subj: Recent Academic Improvements at the Naval Academy (October 1965), ltr dtd 27 Oct 1965", RG 405, US Naval Academy Special Collections, Reports of Boards and Committees, 1965, pg. 12. The residual King-like emphasis on the non-technical education still survived, as represented in the sections of this memo regarding humanities and language. This guidance document emphasized as late as 1965 the need for all midshipman to take seriously their work in the humanities, because, as they argued, "...to work effectively in overseas areas, officers must also understand the problems of world societies, particularly the many smaller nations which are struggling for a place in history."

[106] Folsom was an influential figure at the Naval Academy for more than a decade after his first intervention in 1959. He was a member of the Engineering Council for Professional Development (ECPD, which certified USNA engineering majors), and was a particularly strong advocate for engineering. He was soon placed in several key positions at the academy and in the Navy. He served on the influential SABER board from 1958 to 1960s; on the first Academic Advisory Board at USNA beginning in fall 1966; and on the Navy's Curriculum review board. In recognition of his contribution to the reform of navy education, he was awarded the Distinguished Public Service Award, among the highest the Navy may bestow on a private individual. The award was given by VADM James F. Calvert in 1970. See Sheppard, 244, for a summary of Folsom's involvement at the academy.

[107] There is no documentary evidence that Rickover personally orchestrated Calvert's selection as Superintendent. At the same time, there is also no evidence that Rickover opposed Calvert's selection. What is clear is that Rickover remained in close contact with Calvert through Calvert's tenure at Annapolis. Though Calvert maintained his official independence from Rickover, and in fact instituted some reforms that Rickover did not favor, Calvert's thinking may have been shaped by his many years of education and close association with Rickover.

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The Shift to Specialization:

The Majors Program and Civilian Control of Engineering Accreditation

Calvert was one of Rickover's men. Rickover had personally selected Calvert for his program and had mentored him for more than thirteen years as he promoted from young commander to become one of the Navy's youngest admirals. After completing his nuclear training, Calvert was chosen to lead a highly acclaimed nuclear submarine polar exploration, the events of which were published in a book authored by Calvert.[108] When he was selected for flag, he was one of the two youngest admirals in the Navy, and his early promotion may have been facilitated by his unique status as a first generation nuclear officer. Calvert was a versatile, 'well rounded' officer, but he was nevertheless a 'nuke'. Rickover attempted to take full advantage of their relationship, and throughout Calvert's tenure, Rickover called frequently to broadcast his views on educational matters.[109] However, Rickover was more than just another flag officer interested in Annapolis: Rickover was the senior 'nuke' who controlled to a great degree Calvert's future. If Calvert wanted to maximize his chances for promotion to four stars, it would not be unreasonable that Calvert would be open to Rickover's requests.[110] Policies sympathetic to Rickover and his program, however, would carry significant implications

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[108] James Calvert, *Surface at the Pole* (New York: McGraw Hill Book Company, 1960). Calvert would also go on to publish a widely read book on the naval profession, written before he became the Superintendent. James Calvert, *The Naval Profession,* 1st ed. (New York: McGraw-Hill, 1965).

[109] James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007.

[110] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007. According to Wegner, Rickover did not approve of all of Calvert's initiatives, especially the inclusion of liberal arts as an optional academic major. Rickover preferred increased specialization as long as it was in the technical or engineering fields. Thus, Calvert proved to be a mixed blessing for Rickover and not as controllable as perhaps the older admiral had hoped. Calvert was, after all, a 'versatile' or 'well rounded officer' if there ever was one: a first generation nuclear officer with years in the diesel force and had commanded a surface group. He was also a prolific writer and student of history. He was not the type of nuclear officer Rickover would produce later.

for Naval Academy midshipmen and for the navy 'line'. Calvert reshaped the future 'line' with four unprecedented actions: he established a specialized majors program, committed the academy to pursue engineering accreditation, established quotas for technical degrees, and modified admissions metrics to favor the technical over non-technical applicants.

The idea to adopt a specialized academic major's program, a radical departure from 125 years of past academy policy, did not originate with Calvert. Rather, Dean Drought had quietly worked on such a proposal for several years. Drought's health, however, was failing by the summer of 1968, and thus the new superintendent turned to the Academic Advisory Board, chaired by Dr. Richard Folsom, to formulate and help implement the majors program.[111] The specialized academic majors program powerfully reinforced the idea that line officers were, from the start, expected to be specialists. Among the specialties, engineering would be the most favored of fields.[112] Calvert did allow for a small number of non-technical degrees, a liberal arts concession opposed by Rickover.[113] However, within the system of academic majors, Calvert elevated the engineering degree to elite and favored status, and he would adopt policies to compel more midshipmen to become engineers.

Some have defended Calvert's specialized majors program as a necessary break with a 'lock step' system of the past, a system that had failed to recognize the modern requirements for an increasing number of specialized officers. Calvert invoked the need

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[111] James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007.
[112] John P. Lovell, *Neither Athens nor Sparta?: The American Service Academies in Transition* (Bloomington: Indiana University Press, 1979), 215. The USAFA in 1964 and USNA in 1969 adopted specialized majors, but West Point did not.
[113] James F. Calvert, VADM USN (retired), Interview with the Author, 21 November 2007.

for specialization of 'line' officers when he explained: "We had to stop asking, 'What must every Naval Academy graduate be able to bring to the Fleet' and start asking, 'what must every Naval Academy *class* bring to the Fleet.'"[114] But in reality, the advocates of the old system of general education had not been ignorant of the need for specialized skills. Admiral King and his generation of reformers in 1920 had fully recognized the need for a range of specialties.[115] The difference was that King wanted specialization built on a common undergraduate foundation so that the young officers had the flexibility to pursue a range of specialties in training commands and graduate school *after* they had a better understanding of their own strengths. The older generation—King and Nimitz—believed early specialization limited the flexibility and adaptability of the officer corps.

In a moment of reflection, Calvert acknowledged that adoption of an academic majors program constituted a further shift down the road to a specialist conception of the officer. Furthermore, Calvert recognized that this shift toward greater specialization brought with it some risk. He explained his reasoning in taking the risk. Though there are some midshipmen who may "… tend to think of themselves as future mechanical engineers or oceanographers, or whatever they major is, rather than as future professional officers... I recognize this as a calculated risk of the program. It was our carefully considered opinion that we had to improve the variety and spice of our academic programs if we were to meet *today's* competition…."[116] The "today's competition" to

[114] Jack Sweetman, *The U. S. Naval Academy: an Illustrated History* (Annapolis, Md.: Naval Institute Press, 1979), 232.
[115] Ernest J. King, Knox, Dudley W., Pye, William S., "Report and Recommendations of a Board Appointed by the Bureau of Navigation Regarding the Instruction and Training of Line Officers," *US Naval Institute Proceedings,* 46, no. 8, August 1920, 11. See King's 1919 discussion of 'exchange theory' of specialization.
[116] James F Calvert, VADM USN, "Thoughts Upon the Conclusion of a Four Year Tour," *Shipmate,* no. 4, April 1972, 8.

which Calvert referred was different from the competition previous generations of officers thought was most relevant.

To Calvert, the competition was not potential enemies in the fields of Vietnam (the 'limited' war then raging in South East Asia). Rather, the competition was civilian engineering colleges and, to a lesser degree, the engineering programs at the Air Force Academy that might lure away prospective engineers who were needed for the SSBN fleet. The risk to which Calvert alluded was an imbalance between general ‘line’ education and that of technical specialization.

If engineering excellence and specialization were to be gained, they would have to come at the expense of linguistic, social sciences, and humanities education. RADM Kirkpatrick, Admiral McDonald, and then Captain Zumwalt only a few years before had feared such an imbalance of officer requirements. These war veterans were convinced that the older, broader conception of ‘line’ officer education remained valid. However, these non-nuclear officers had only an idea around which to justify their argument. The generalist idea was that of 'command' and the need to inculcate into the officer the capacity to integrate disparate factors on an unknown field of battle that lay in the future. The technical specialist model of officer education, in contrast, focused on the immediate needs of filling specific billets on complex machines that existed in physical form now. Moreover, the specialist model of education, by narrowing an officer, tended to presuppose knowledge of the future: future officer requirements would not be too different from those of the present. Rickover’s reactors and his nuclear junior officer requirements were the machines and billets of the 1960s, and his technocratic ideology radiated confidence that the technocratic officer model would endure in perpetuity.

The choice to embrace specialization at the undergraduate level was risky in the long term, but in the short term met the urgent need for nuclear-trained officers. The growing fleet of reactors and the attrition at nuclear training schools became the explicit 'demand signal' for more scientifically educated engineers. The dearth in nuclear officers reached such dire levels that Rickover resorted to a de facto draft in the 1967-1968 to make up for the shortfall.[117] Confronted by short-term shortages of line officers who could or would pursue engineering, especially nuclear engineering, Calvert felt compelled to support Rickover's demand for a more technically specialized Brigade of Midshipmen. By the end of Calvert's tenure, academy leaders would proclaim the college's new goal: prepare *every* midshipman to become a nuclear engineer.[118] The cradle of the officer corps, Annapolis, had embraced a techno-centric identity of the 'line'.

Guided by the objective that every midshipman should be able to be a nuclear engineer, the academy administrative apparatus became highly sensitized and responsive to nuclear program officer requirements. Whereas visual acuity had been a driver in the pre-war period, accounting for almost 40% attrition of midshipmen in the Class of 1940,[119] now the metric had become nuclear school acceptability. The outcome the academy most feared was the failure of midshipmen to meet nuclear training school

[117] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007. As Wegner explained, the actions taken by Rickover's officer in 1967-68 were not a 'prescreening', as described in other general histories of USNA. Rather, it constituted a draft of midshipmen into the program. If Admiral Rickover selected a midshipman, the midshipman was committed to several years in the program. The midshipman did retain the option, however, to choose between surface and submarines.
[118] Bruce M. Davidson, Academic Dean, USNA, "The Academic Dean Looks at the Academy," *Shipmate*, no. 3, March 1973, 26.
[119] Chester W. Nimitz, RADM USN (Chief of Bureau of Navigation),"Committee of Naval Affairs, 21 April 1941, testimony of RADM Chester Nimitz on HR 4368 (to shorten USNA course from 4 to 3 years)", NARA RG 405, USNA Special Collections, General Correspondence, Education and Training , Curriculum 1939-55, Box No 6, Folder No 7.

standards. As Rickover demanded more technical rigor, the academy was compelled to oblige. As Forney explained, "The worst scenario was a person reporting to the training commands and washing out of those programs."[120] Moreover, the nuclear program was not only the toughest academic training school but also the fastest growing. Rickover wanted for his program approximately 25% of each class in the later 1960s[121], and this percentage would grow in the 1970s as civilian colleges temporarily produced fewer NROTC midshipmen engineers due to the disruption of the Vietnam War. Once again, urgent short-term conditions--first it was POLARIS construction schedules, in the later 1960s it was the Vietnam War and NROTC shortfalls-- drove officer development policies that carried generational implications.

Calvert, like his mentor, became an apostle for the idea of the academy as a leading scientific-engineering undergraduate college. In various venues, he vocalized his belief that scientific engineering was the most important field of study for a young officer. In ten short years after Commandant Shinn pleaded "…never allow the Academy to become, by default, a Polytechnic Institute…" Calvert asserted "…Annapolis must take its place among the nation's foremost undergraduate engineering schools." The depth of Calvert's commitment to engineering became even more apparent in the words he used to describe the construction of Rickover Hall, the new engineering building: "The engineering building design (Rickover Hall) is nearing completion and authorization of the first portion of this sizable undertaking is now under study by the Congress. The laboratories of the new engineering complex will be appropriate to the advances in engineering curriculum which have occurred at the academy during the

[120] Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004), 212.
[121] Ibid., 212.

1960s... This magnificent structure, when completed, will be perhaps the most symbolic of all the new buildings at Annapolis. It is built for, and suited to, the advances in engineering education which have been part of the reforms of the 1960s..." [122]

Calvert was not always comfortable being Rickover's revolutionary, and sometimes he attempted to minimize the significance of the changes he was making. On one occasion, Calvert asserted, not quite accurately, "...despite all the requirements placed on it for other academic skills, the Naval Academy must always remain, primarily, an engineering school."[123] In fact, before Rickover's intervention, Annapolis had *not* been primarily an engineering college. Rather, the goal of the Naval Academy had been to provide a broad and general foundation for 'line' officers who would rise to command. The mission statement of 1960 had been specifically worded to emphasize the command orientation and to minimize the idea that midshipmen were being prepared to be specialists. Calvert recognized the disconnect between his goals of technical specialization and the generalist goals of command. To eliminate the cognitive dissonance that might result, Calvert changed the Academy mission statement. The older statement had been oriented toward attainment of command, "...toward educational needs of senior rather than junior officers..."[124] Calvert's mission statement, in contrast, directed midshipmen to prepare for their first years of duty in the naval service. In

[122] James F. Calvert, VADM USN, "The Fine Line at the Naval Academy," *US Naval Institute Proceedings,* 96, no. 10, October 1970, 64.
[123] Ibid., 64. The debates of 1899, the reforms under Hart of the 1930s, and even the diplomas awarded until the 1960s, provide evidence that the Naval Academy curriculum since early in the 20th century was a general education program that produced leaders of the 'line' more than it was an engineering college.
[124] John D. Yarbro, PhD,"USNA Curriculum Development Report Dtd January 1974", NARA RG 405 USNA Special Collections, Studies and Reports, Curriculum 1970-75, Box 5. The mission statement of 1960: "To develop midshipmen morally, mentally, and physically and to imbue them with the highest ideals of duty, honor and loyalty in order to provide graduates who are dedicated to a career of Naval Service and have potential for future development in mind and character to assume the highest responsibilities of command, citizenship and government."

Calvert's redefinition, references to the higher duties of command, or of a midshipman education as the foundation for more senior service, were eliminated.[125]

Calvert supported many of Rickover's ideas for navy education, and he worked for their implementation with few exceptions.[126] Calvert's writings echoed the Rickover belief that technology was the dominant driving force in history and in the Navy. Calvert espoused technocratic core beliefs when he stated that the education of the officers must conform to "…the new requirements for engineering excellence posed by the ships and aircraft of the modern navy…" He argued, "Technology and the state of the art in the utilization of the environment...will be determinant factors in our curriculum and teaching methods."[127] In his letters to critics, he propounded the new orthodoxy, a technocratic vision of the academy. Calvert asserted, without argument or justification, that Annapolis must become a leading scientific engineering college, a leader in "...propulsion systems, naval architecture, and the allied nuclear, electrical and mechanical systems. Additionally, we will have to be among the top few institutions in aerospace and aeronautical engineering." [128]

Calvert realized that he was constructing an academy curriculum that would mold generations of leaders for the entire Navy, not just those officers who would take up more technically specialized careers. And though he was aggressively remaking the academy

[125] Calvert's modified statement in the late 1960s: "To prepare young men morally, mentally, and physically to be professional officers in the naval service."
[126] Calvert did not embrace every Rickover recommendation. Rickover believed that officers should read history and literature on their own time or in high school before they entered college, but that midshipmen should not take classes in liberal arts at the academy. Calvert, however, preserved the option for a modest percentage of students to major in the humanities, though the 'core' curriculum remained heavily technical. The existence of humanities majors at the academy was an annoyance to Rickover for the next fifteen years. Calvert's independent streak, perhaps on this issue, may have cost him his fourth star.
[127] James F. Calvert, VADM USN,"Ltr to Mr. Paul Schratz dtd 11 March 1970", RG 405, USNA Special Collections, Office of the Superintendent, General Records, Series: Educational Organizations, Middle States Association of Colleges and Secondary Schools, 1970-76, Folder 9, Box 4.
[128] Ibid., 2.

into an engineering polytechnic, in a moment of candor he admitted that "...there is not necessarily a correlation between advanced technical education and success as a naval officer."[129] In a moment of further philosophical reflection, Calvert observed that the Naval Academy reforms were "...as much the product of their times as any other institution in this land. This is at once frightening as it is comforting..." He went on to remind future leaders that they, too, had the duty to change the institution, to preserve the "…the flexibility to adapt to their times."[130] In the depths of the Cold War when the primary strategic weapon was a complex engineering system (the SSBN), Calvert chose to make specialized engineering majors the centerpiece of his new academy curriculum.

Calvert's second precedent-setting policy was engineering accreditation. As a 'nuke', Calvert was deeply influenced by Rickover's life-long struggle for excellence in engineering. Rickover had this effect on people. Rickover's most celebrated student, a future president of the United States, titled his book in honor of Rickover, "*Why not the Best.*" Rickover's biographer, Francis Duncan, titled his last book, "*Rickover: The Struggle for Excellence.*"[131] Calvert, already by nature a fierce competitor but influenced by Rickover and his ideas of technological primacy, sought to institutionalize the Navy's commitment to excellence in engineering.

When compared to MIT and CALTECH, academy engineers in the 1960s were *not* the best and may have been, as Rickover repeatedly claimed, significantly

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[129] Calvert, Address to Board of Visitors, May 1969, as quoted in John D. Yarbro, PhD,"USNA Curriculum Development Report Dtd January 1974", NARA RG 405 USNA Special Collections, Studies and Reports, Curriculum 1970-75, Box 5, 27.
[130] James F. Calvert, VADM USN,"Ltr to Mr. Paul Schratz dtd 11 March 1970", RG 405, USNA Special Collections, Office of the Superintendent, General Records, Series: Educational Organizations, Middle States Association of Colleges and Secondary Schools, 1970-76, Folder 9, Box 4, 2.
[131] Jimmy Carter, *Why not the best?* (Nashville: Broadman Press, 1975).

substandard. When civilian engineers in the Naval Academy engineering department proposed that the academy pursue engineering accreditation, Calvert did not hesitate but became a strong supporter of their proposal.[132] At the urging of civilian faculty members, Calvert committed the Naval Academy engineers to compete for certification by the Engineer's Council for Professional Development (ECPD). Dr. Drought and Dr. Folsom, who continued to serve on Navy and academy academic advisory boards, were familiar with such certifications and advocated them as the sine qua non of membership among the engineering elite.[133] Folsom was a member of the ECPD leadership. The engineering mindset of these two early civilian leaders meshed well with Calvert's nuclear and engineering bias. In explaining his decision to pursue the ECPD, Calvert explained that such a prize would symbolize the academy's commitment to pursue "in depth learning" in the technical fields,[134] a rationale very much in line with Rickover's emphasis on engineering education.

Calvert's decision to pursue engineering accreditation, though perhaps a natural step for a civilian educational institution, established for the academy a second new precedent. Accreditation, like the establishment of specialized technical majors, communicated the idea of 'midshipman as specialists'. Moreover, the decision to

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[132] Vincent Lopardo, PhD, (senior engineering professor at USNA, from 1960 to approximately 1995), Discussion with the Author, 13 December 2007.

[133] James F. Calvert, VADM, USN,"Ltr dated 29 Feb 1972 from VADM Calvert to J.H. Howard, American Chemical Society", RG 405, USNA Special Collections, Office of the Superintendent, General Records, Series: Educational Organizations, Middle States Association of Colleges and Secondary Schools, 1970-76, Folder 9, Box 4. Calvert discusses the importance for the academy to pursue further technical and scientific certifications, the next being in chemistry. At no place in these documents is there any discussion of any disadvantages of the certifications or what implications they might carry with them. For references to continuing role of Dr. Folsom, see pg. 9, James F. Calvert, VADM USN, "The Fine Line at the Naval Academy," *US Naval Institute Proceedings,* 96, no. 10, October 1970.

[134] James Calvert, VADM USN,"Progress Report To Executive Secretary of Middle States Association of Colleges and Secondary Schools dtd 7 October 1969", RG 405, USNA Special Collections, Office of the Superintendent, General Records, Series: Educational Organizations, Middle States Association of Colleges and Secondary Schools, 1967-69, Folder 8, Box 4 pg. 4 of enclosure one.

compete for accreditation tilted the academy's payroll and hiring priorities toward the goal of securing better engineering faculty, a goal that came at the expense of non-technical faculty. The decision to pursue engineering accreditation placed this military institution even more firmly on a polytechnic and techno-centric foundation. However, even with accreditation, there existed some latitude as to how specialized the accredited degrees could be defined.

The U.S. Coast Guard had been one of the first of the federal academies to seek accreditation, but they did so in the broad field of 'general engineering.[135] In 1968 at Annapolis, however, accreditation was used to subdivide the discipline and further require engineering students to specialize more narrowly. This was not the preference of military officers, but was instead the desire of the highly specialized engineers who had come to the academy as a result of Rickover's first intervention earlier in the decade. These tenured civilian engineers took control of the accreditation effort and worked to make the engineering program even more specialized than military officers had envisioned. To achieve greater specialization, the civilian professors undermined the more general degrees, in particular, naval engineering, and worked to replace it with three narrowly focused majors found more frequently in civilian colleges.

To prepare for the accreditation, the academy invited outside engineering professors to serve as advisors. The professors came not from other military colleges, but from the University of Maryland, a major research university and one of the best

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[135] The Naval Academy may have been following the Air Force Academy pattern of academic specialization followed by engineering degree accreditation, but the records available to the author were not conclusive. The Coast Guard Academy was apparently the first academy to pursue ECPD accreditation as far back as the 1930s, but the degree was "General Engineering", hardly the field of a specialist.

engineering colleges in the nation. Building on the Maryland program and experience, the academy successfully won accreditation in the specialized majors of mechanical engineering, electrical engineering, systems (weapons) engineering, and aeronautical engineering. However, the more general degree of naval engineering failed to earn accreditation. The reason for the failure: the academy's own civilian professors undermined the major. Apparently, the civilian faculty in private discussions with the accreditation board complained that naval engineering was too broad. The civilian engineers preferred instead to establish majors that were more specialized. As a consequence of the failed accreditation, in 1971 the naval engineering major was disestablished and replaced by three more specialized majors--naval architecture, marine engineering, and ocean engineering-- all three of which were promptly accredited.[136] The replacement of a naval engineering degree by three more specialized degrees further reinforced among the midshipmen a specialist identity. In addition, this blatant case of faculty influence made clear the growing power of specialized civilian engineers to remake the curriculum in their image.

The implications of engineering accreditation for the identity of the midshipmen were significant. To continue to win such a prized certification required the academy to absorb the certifying board’s criteria, internalize the standards in the teaching plans, hire the best possible engineering faculty, and direct the best students to the engineering fields. An increasing share of the academy’s curriculum and its best students were thus shaped more by the standards of highly specialized engineers, and less so by ‘line’ officers and leaders tested in war. With the elevation of engineering to the academy’s

[136] Vincent Lopardo, PhD, (senior engineering professor at USNA, from 1960 to approximately 1995), Interview with the Author, 13 December 2007.

highest academic priority, professional, academic engineers would solidify their privileged position in the intellectual and professional development of midshipmen, a position once held by 'line' officers. The academy dedicated itself from 1969 onward to the highest attainment in engineering excellence and created a continuing pressure on the institution that would direct financial and intellectual resources to ensure the academy would continue to win accreditation.[137] Perhaps not coincidently, for the generation to follow, with but a single exception, engineers would hold the position of academic dean.

Accreditation required midshipmen to perform at a level established by the examining boards made up of specialist engineers. The needs for continued successful accreditation thus imparted a tendency by the academy to encourage the most academically gifted midshipmen to become engineers. To increase the likelihood the best students went into engineering-- an outcome that pleased both Rickover and the rapidly professionalizing civilian faculty-- the plebe curriculum was modified to favor engineering. Specifically, the freshman curriculum was re-designed to encourage midshipmen to look favorably on technical degrees. In the first year, students would take an introductory course in engineering. In contrast, language was in most cases eliminated in the first year for all midshipmen, a dramatic reversal from the past policy of 'language first'. As Sheppard observed, the early engineering bias in plebe year was not accidental, rather the "…principal objective of the Common Plebe Year was to obtain an increased

[137] The Naval Academy today continues in this pattern established under Calvert, though the composition of accredited majors has changed in the intervening years. The academy is now recognized as one of the best undergraduate engineering colleges in the country. For more current status of Naval Academy policies, see USNA engineering department websites, http://www.usna.edu/MechEngDept/history.htm.

number of engineering majors."[138] The effects of such a policy were cumulative: the best midshipmen became engineers, who then recruited the best incoming midshipmen to become engineers too. With the gathering momentum and self-reinforcing logic, the culture of the academy moved further down the road to that of a polytechnic and an officer identity as a technical expert and specialist.

However, even with a charismatic, nuclear- trained superintendent and the elevation of engineering majors to a most favored status, the midshipmen did not choose engineering in adequate numbers. When engineering majors fell to only 22.9% of the brigade, a 40% shortfall,[139] Calvert no doubt fielded more phone calls from his mentor at Naval Reactors. More directive or coercive action was required to push midshipmen into the engineering and technical majors. Shortly after his decision to pursue accreditation, Calvert established a third precedent when he set quotas on midshipmen curricular choice and dictated strict limits on the number who could pursue a humanities, social sciences, or management degree. Calvert justified the new policies by invoking the needs of the Navy subspecialty system and by referencing a general shortage of engineers in the Navy.[140] To justify 'line' officer education policy by invoking these three technical-

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[138] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974), 333. Calvert quote from page four of Board of Visitor's Report of 1971, as quoted in Sheppard, 335.

[139] U.S. Government,"USNA Distribution of Majors By Class and Number", RG 405 USNA Special Collections, Command History 1972-73, Annex 86.

[140] James F. Calvert, VADM USN, "The Fine Line at the Naval Academy," *US Naval Institute Proceedings,* 96, no. 10, October 1970, 67. Calvert justified the ceilings based on specialty requirements at graduate school: "Ceilings have been established on all general areas of majors programs in order to ensure that the proportion of graduates in the various disciplines in general consonance with the Navy's P-coded subspecialty structure, the overall Postgraduate program, and the available studies giving projections of naval officer skill requirements in the years ahead." See also Forney, pg. 213 for further discussion of implementation of the ceilings and quotas. However, one must be reminded that the billets at NPGS, and the very concept of the URL subspecialty, had itself only been changed recently. The General Line School had been absorbed by the large technical program of the NPGS in 1962, and the sixty year old option of a subspecialty in 'navy operations' was displaced by subspecialties more typically held by EDOs. Yet, it was

specialist requirements, requirements not normally associated with the development of combat leaders, marked another step on the path that led to a more techno-centric naval command. However, Calvert had a point: the numbers of reserve officers volunteering to become engineers was falling, dramatically.

The problem was the Vietnam War (mentioned previously) and the declining propensity of NROTC midshipmen on civilian campuses to pursue engineering degrees. Calvert was concerned about the drop in numbers of NROTC engineers, even though the drop would prove to be temporary. In the depths of the Vietnam War, Calvert would admit the decisions he made about the academy were "...a product of their time..."[141] Calvert justified his Annapolis reforms: "I am more convinced than ever that we made the right decision when we set the ... majors distribution as our goal. The problems being faced by the engineering schools throughout the country in attracting students are reflected in the serious shortage of young engineers entering the Navy through the NROTC and OCS program. The necessity for the Navy to depend on the Naval Academy to provide it with its engineers is becoming a reality."[142] However, it was not a general shortage of engineers that concerned Calvert, but the shortage of NROTC midshipmen who chose to become nuclear engineers in Rickover's program.

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not the EDO Corps but the URL who was tasked by the Franke and Keith studies to meet the new technical requirements. The EDO Corps was slated for reduction in time of technological system growth. One is tempted to ask: what were navy leaders thinking when they sought to cut back on the EDOs. The reduction soon proved problematic, as evidenced in Smedberg's criticisms. See Smedberg testimony in THRESHER inquiry.

[141] James VADM USN Calvert,"Ltr to Mr. Paul Schratz dtd 11 March 1970", RG 405, USNA Special Collections, Office of the Superintendent, General Records, Series: Educational Organizations, Middle States Association of Colleges and Secondary Schools, 1970-76, Folder 9, Box 4.

[142] James F Calvert, VADM USN,"Statement to the Board of Visitors Submitted by the Superintendent of the US Naval Academy, James Calvert", RG 405, USNA Special Collections, Board of Visitors Report, 1971, pg. 4. See also Sheppard, 1974, pg. 335, for a further discussion.

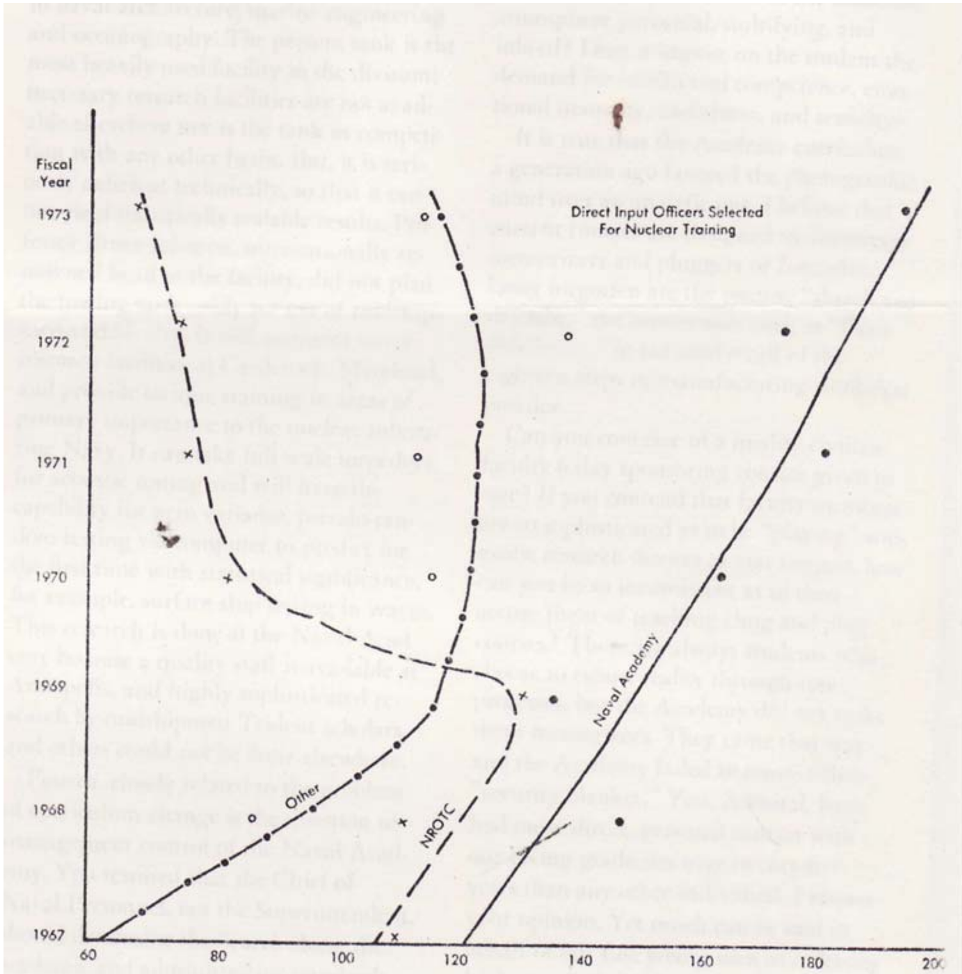

Figure 6-3: Sources of Nuclear Power, Direct-Input Officer Accessions. Horizontal axis is number of ensigns entering directly into nuclear power from college. Vertical axis is time in calendar year. The sharp drop in NROTC officers coincides with Vietnam Era college campus unrest. In contrast to the collapse of NROTC recruiting, USNA numbers increased, and academy grads made up much of the shortfall to ensure the reactor fleet remained adequately manned. Source: *Shipmate*, April 1974.[143]

It was not just the navy-wide need for more scientists and engineers that concerned the admiral. Rather, Calvert was concerned about filling nuclear power billets. As the historical record of officers inducted into nuclear power show, the Naval Academy

[143] Paul R. Schratz, Captain, USN (ret), "An Open Letter: Dear Admiral Rickover," *Shipmate*, April 1974, 19.

in the depths of Vietnam War filled a growing percentage of nuclear billets. Whereas in 1967 both NROTC and USNA provided roughly the same number of nuclear officer accessions, by 1972-73 the Naval Academy provided almost three times the number as did NROTC (see Fig 6-3).

In hindsight, it is apparent that the large quota of engineers, which became a semi-permanent fixture at Annapolis, was prompted by the confluence of two unique events: a rapidly expanding POLARIS fleet, on the one hand, and Vietnam War campus strife that reduced NROTC nuclear officer recruiting on the other. POLARIS expansion was a one-time event. Vietnam was an unpredictable and unanticipated event. However, together these two events cemented at Annapolis a curricular policy that would persist long after the last POLARIS submarine was retired and after Vietnam had become not a war but a destination for American tourists.

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Changing Admissions Metrics to Produce More Engineers: the Decline of the Non-technical Midshipman

Even with Calvert's quotas, many midshipmen did not measure up to the higher, accreditation-driven engineering standards. Midshipmen were failing out of the accredited majors in such numbers that a ‘fall back’ major was created, a non-accredited ‘general engineering’ degree. But despite the difficulties experienced by the midshipmen in meeting the higher standards, Rickover would not lower his technical requirements and continued to drive academy policy. For more midshipmen to succeed in the accredited majors and in the nuclear engineering schools, the academy required more midshipman candidates with stronger abilities and inclinations in technical fields. However, the admissions office could not say which applicants were likely to choose engineering and ultimately be more competitive for nuclear power. Running out of options, senior academy leaders concluded that *all* midshipmen had to be more technically inclined.[144] The search for solutions turned to admissions where Calvert established a fourth precedent.

The admissions process as it stood in 1968 could adequately identify and select students that would receive a general education. However, following Calvert's reforms, the academy now had a more rigorous specialized engineering major and a curriculum focused to prepare midshipmen for Rickover's schools. Such a program required applicants more technical in their outlook and preferences. The persistent failure of midshipmen to meet these higher technical standards in adequate numbers finally prompted officials to examine the utility of shaping admissions decisions based on psychological profiling. Academy admissions officials began to explore the use of the 'Strong Interest Inventory', [145] a tool by which a person's interests and inclinations were measured.

Prior to Calvert's tenure, the admissions system was not oriented to produce future scientific engineers and made little attempt to measure the propensity of

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[144] Bruce M. Davidson, Academic Dean, USNA, "The Academic Dean Looks at the Academy," *Shipmate*, no. 3, March 1973, 26. Dean Davidson stated "... any midshipman, regardless of his major, qualifies for selection to the Nuclear Power Program."

[145] Thomas F. and Kamyar Pashneh-Tala Foster, ""The Utility of Personality Measures in the Admissions Process at the US Naval Academy"" (2002), 21. The Strong Interest Inventory (SII) is a psychological test used in career assessment. The test was developed in 1927 by psychologist E.K. Strong, Jr., and revised later by Jo-Ida Hansen, and David Campbell.

midshipmen to study any particular subject. Consequently, though technical and mathematical performance was highly valued, the academy admitted candidates without undue regard to their non-technical (often referred to as 'verbal') or technical *inclinations*.[146] To be sure, the admissions process by the middle 1950s had become relatively sophisticated and was geared to accept applicants distinguished by high athletic and scholastic achievement. In the late 1950s, the admissions process had become more academically discerning when it required applicants to submit College Entrance Examination Board (CEEB) scores.[147] By 1959, the academy developed a metric known as the "Whole Man", a measurement that attempted to ensure balance between the military, athletic, and academic qualities of the applicant.[148] The formula considered and weighted academic, extracurricular, and leadership-related achievement. The "Whole Man" metric was reevaluated yearly, adjusted based on the previous year's cohort performance. Formulated to yield well-rounded officers, the "Whole Man" construct did not determine which midshipmen might be particularly inclined to pursue rigorous technical subjects like engineering. Not surprisingly, as Rickover and the academy

[146] Kendall Banning, *Annapolis Today*, 6th ed. (Annapolis,: United States Naval Institute, 1963). Banning produced a series of books over a quarter century, which included a discussion of admissions requirements. Prior to Calvert's tenure there appears to be no evidence of an admissions system that tried to discern an applicant's propensity to embrace technical interests. The admissions tests gave scores in various subjects, but these were not correlated to a propensity to pursue engineering over literature, for example. Rickover scored lowest in math on his admissions tests, and higher in literature, yet he became one of the Navy's most influential and innovative engineers. One may speculate that had Calvert's profiling system existed in 1919, it may have rejected Rickover.

[147] Charles L. Melson, RADM USN,"Superintendent's Statement to the Board of Visitors 1959", RG 405, USNA Special Collections, Boards and Committees, 1959.

[148] Charles Paul Sheppard, "An analysis of curriculum changes at the United States Naval Academy during the period 1959 through 1974" (Thesis Ph D --George Washington University, 1974) 263; Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004), 93-94.

pushed more young midshipmen to identify themselves as specialized engineers, an insufficient number chose to pursue engineering majors.[149]

To increase the share of incoming midshipmen who were inclined to pursue technical studies, the Naval Academy admissions office attempted for the first time to apply psychological screening (Strong Interest Inventory) of midshipman applicants in 1967, just prior to Calvert's arrival. This effort to shape the applicant pool was rejected by Calvert's predecessor, RADM Draper Kauffman, a founder of the Navy SEALS, who believed the tests to be inconclusive and "overly invasive".[150] Calvert, more than his predecessor, was willing to take risks with the midshipmen pool of applicants and resurrected the profiling.[151] In 1971, Calvert began to reconstruct the admissions metrics to favor engineering and the technical over the non-technical.[152] Calvert left Annapolis before his profiling initiatives could bear fruit, but Naval Reactors and Admiral Rickover built on Calvert's precedent. By the middle of the 1970s, Naval Reactors staff began the practice of quietly communicating their officer requirements to the academy's Dean of

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[149] BUPERS,"Study of Resignations, 6 Dec 1966", Naval Historical Center, Operational Archives, 00 Files, 1967, box 32. The study observed that most officers leaving the navy pursued a graduate degree. However, officers were significantly less likely to pursue engineering studies, even among the group who had served as engineers in the Navy. Specifically, of officers who resigned and pursued graduate education, 67% of them had served as engineers in the Navy. Yet only 43% of all former officers pursued graduate degrees did so in engineering. This study provides some evidence of a generally low propensity of naval officers, admitted and educated in pre-Rickover educational institutions, to identify themselves as engineers of the type Rickover sought. This study was found filed in the CNO's records and was obviously read and analyzed. It is highly likely that Rickover had access to this same study.

[150] Thomas F. and Kamyar Pashneh-Tala Foster, "The Utility of Personality Measures in the Admissions Process at the US Naval Academy" (2002), pg. 21.

[151] John D. Yarbro, PhD,"USNA Curriculum Development Report Dtd January 1974", NARA RG 405 USNA Special Collections, Studies and Reports, Curriculum 1970-75, Box 5. See pg. 28 of the report.

[152] Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004), 210-13; See also Superintendent's Statement to the Board of Visitors, April 1971, RG 405, USNA Special Collections; Bruce M. Davidson, Academic Dean, USNA, "The Academic Dean Looks at the Academy," *Shipmate*, no. 3, March 1973, 26.

Admissions, Robert McNitt, who would then adjust admissions metrics using the profiling technique to produce more engineers.[153]

The nuclear fleet continued to expand in the 1970s and with it the requirement for yet more technically educated officers. In the middle 1970s, Admirals McKee and Holloway took command of the Naval Academy and Navy respectively, and instituted a hard requirement for an 80-20 ratio of technical to non-technical majors. To support this explicit goal, the academy resurrected Calvert's initiative and altered admissions to favor those applicants who exhibited a propensity to pursue technical studies.[154] In the years that followed, the modification of the admissions metric became more pronounced until it proved to be a highly effective tool that consistently produced the high percentage (98-99% of the goal) of elite engineers so important to Rickover's program.[155] Even though the admission's policy increased the number of midshipmen who pursued engineering degrees--and reduced the non-technical share of the Brigade of Midshipmen-- Rickover agitated for yet more engineers. The demand for engineers remained high, and when shortages spiked in the middle 1970s, Rickover called for the elimination of *all* humanities and social science majors at the academy.[156]

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[153] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007. The long serving Deputy Naval Reactors explained that Rickover and staff refrained from direct contact with McNitt (written directives or formal meetings) but that by use of phone calls McNitt was fully aware of the technical needs of the nuclear power program and adjusted admissions metrics to accommodate the programs' needs. See also Robert W. McNitt and Paul Stillwell, *The Reminiscences of Rear Admiral Robert W. McNitt, U.S. Navy (Retired)* (Annapolis, Md.: U.S. Naval Institute, 2002).
[154] Thomas A. Sheppard, "A Validation of the Strong Campbell Interest Inventory As Part of the Admissions Process at the US Naval Academy" (NPGS, 2002).
[155] Robert W. McNitt and Paul Stillwell, *The Reminiscences of Rear Admiral Robert W. McNitt, U.S. Navy (Retired)* (Annapolis, Md.: U.S. Naval Institute, 2002). McNitt explained that the metric based on the Strong Interest Inventory became so effective and accurate that he could adjust admissions to consistently yield within 1-2 percent the "80-20" ratio of technical to non-technical majors.
[156] Eric P. Woelper, "The Impacts of Academic Background on Submariner Performance, Retention, and Promotion" (NPGS, 1998), 1.

Rickover and his political, military, and academic allies established the academy on a technocratic course that remained in force for a generation, well into the 21st century. Though the conditions that gave birth to the polytechnic program proved temporary and have long since passed away, the academy curriculum still complies with Dean Davidson's foremost requirement of 1973: a curriculum that ensures "…any midshipman, regardless of his major, qualifies for selection to the Nuclear Power Program."[157] Though Rickover's new Annapolis produced a growing number of technical officers, there was another source of midshipmen. This source of midshipmen, the NROTC program, could possibly infuse into the naval service more officers educated in language, the social sciences, and humanities. However, by 1971 NROTC fell under Rickover's influence and was restructured to produce a higher percentage of technical specialists for the nuclear power program, thereby reducing yet again the number of non-technical officers who would rise to command.

Navy ROTC: Mirroring the Annapolis Polytechnic

Although the archival material is less comprehensive than that of USNA, there is strong evidence that Rickover and his engineers reshaped important priorities of the NROTC program. NROTC had at one time helped to broaden the 'line'. In the Second World War, the reservist program had infused a large percentage of liberal arts students into the officer corps. But by the later 1970s, NROTC would become a rigorous technical program, one that mirrored more closely the technocratic requirements of Annapolis as defined by nuclear power. To shape NROTC Rickover used tools and

[157] Bruce M. Davidson, Academic Dean, USNA, "The Academic Dean Looks at the Academy," *Shipmate*, no. 3, March 1973, 26.

tactics similar to but not identical to those he used to shape the Naval Academy. He needed different tools because NROTC was less susceptible to his direct influence as was the federally controlled academy.

NROTC had been for most of its history a supplemental source of officers for the 'line' and the 'staff'. Confronted with consistently high manpower needs associated with the enlarged Cold War navy, NROTC began to supply an increasing number of 'line' officers eligible to serve as ship commanding officers and therefore took on added significance in Rickover's priorities.[158] Rickover needed these officers for his program and took decisive action to change NROTC. Rickover reshaped the NROTC program with three interventions: his personal involvement at the Secretary of the Navy's educational review board of 1962; his interventions with individual colleges and students over a twenty-year period; and his successful effort to persuade the Navy to adopt nuclear officer performance measures as the yardstick by which to judge NROTC educational programs.

The first intervention came in 1962 at the Secretary of the Navy Advisory Board on Education Requirements (SABER), during which time Rickover led the discussion and deliberations concerning officer undergraduate education requirements. Rickover proposed that all officer candidates, to include the future 'line' officers, be required to graduate with a technical degree. The Board resisted Rickover’s most aggressive recommendation of "...putting pressure on the state selection committees...” to select only technically inclined applicants. However, the board did take the first steps toward a

[158] Holloway Board on Naval Training, Naval Historical Center and USNA General Collection, V411.H65, 1945.

policy that placed a premium on students who excelled at physics and advanced mathematics. The panel endorsed the recommendations—which Rickover may have penned himself— that preserved student choice of majors but gave "…preferential treatment, financial or otherwise…" to engineering and science students.[159] In addition, the Board issued a statement that exhorted faculty and NROTC staff members to encourage midshipmen to pursue the technical and engineering fields. The Board further recommended that the Navy pursue legislation to require more NROTC midshipmen (both future 'line' or 'staff' officers) to study engineering.[160]

Rickover also shaped NROTC through a series of interventions at individual colleges. Similar to his approach at Annapolis, Rickover called and pressured college officials to improve their engineering and technical curricula. When confronted by a reluctant college administrator, he used as evidence his mass of nuclear officer performance data. Rickover or his staff linked the performance of a college's nuclear recruits back to the officer's undergraduate alma mater and academic major.[161] Rickover

[159] Dec 1962 SABER Report,"Secretary of the Navy's Advisory Board on Educational Requirements", NARA 24-470-54-26 Box 1.

[160] Dec 1962 SABER Report,"Secretary of the Navy's Advisory Board on Educational Requirements", NARA 24-470-54-26 Box 1. The very explicit question was addressed to this influential panel: whether or not to require of ALL officer candidates a technical education. The board appears to have resisted the nuclear advocate's most aggressive recommendations, but did take the first steps on the road of shaping admissions and offering inducements for engineering or science-oriented line officers.

[161] John W. Crawford, Jr., (Deputy Manager of the Naval Reactors Program), Interview with the Author 11 July 2007. John Crawford had observed these interventions from a privileged position: he was both a long-time interviewer of midshipmen candidates, but also Rickover's deputy for six years. According to Crawford, the interviews were the key instrument to control quality, but there was also an unwritten consideration called the "Good School Effect". Crawford explained that there existed an elaborate tracking system that monitored officer performance in the nuclear program, and linked this data back to the student's alma mater to produce an unwritten metric of judgment, the "Good School Effect (GSE)". Crawford observed: "Rickover and, I suspect, a good many of the interviewers had their own estimates of the academic status of the NROTC colleges and universities from which we selected graduates into the program. For example, Rickover did not have a high regard for southern colleges and universities. There were two exceptions, Duke and Rice. On the other hand Rickover was inclined to place too high a value on having been to an Ivy League school. On one occasion, I 'down-checked' a Princeton football player whose record and interview justified my action. Rickover and I disagreed strongly with HGR reminding me that

also compiled the performance data of all nuclear students by their undergraduate college. When a certain number of officers from a college performed poorly, he would call university officials to complain. If student performance from these universities did not improve, Rickover adopted a policy of retribution: he would continue to interview future applicants from such schools but secretly refuse to select some of them, regardless of an individual's own merits. There were, no doubt, some unfortunate officer applicants who failed to select for nuclear training not because of their own performance, but because, unbeknownst to them, their predecessors had ruined the reputation of their alma mater.[162]

Rickover's third intervention in the NROTC program was his most successful. In the early 1970s, the Navy established a command to help organize the Navy's collective education and training programs: the Commander of Naval Education and Training (CNET). Rickover successfully persuaded the new organization to adopt his metrics of officer measurement as well as his recommendations for a change in midshipmen requirements. In 1971, VADM Malcolm Cagle, the Navy's lead educator (CNET), convened a board to study naval education.[163] A key issue was the relationship between midshipman preparation and follow-on officer performance in technical schools and fleet

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this guy wouldn't have even gotten into Princeton had he not been in the top one percent intellectually." With regard to the widely used but unwritten metric of school evaluation (GSE), Crawford further explained: "I should mention that the collected views of interviewers led to the development of what was termed the GSE - Good School Effect. You won't find it in the records, but it was an ever-present reality. For example, Mississippi State had a low GSE. When a MSU grad failed miserably at the Bettis School (one of the nuclear schools), Rickover informed me that we wouldn't interview any more MSU graduates. I objected and Rickover said. "OK, we'll interview them, but not take any." I said that in that event I would have to refer any calls from Senator Stennis (MS) to Rickover's office. Since Stennis was Chairman of the Appropriations Committee ,we continued to interview. But don't think that elevated the MSU GSE."

[162] William Wegner, (Deputy Naval Reactors Manager, 1963-1979), Interview with the Author, 17 July 2007.

[163] M.W. Cagle, VADM, USN, CNET,"Memorandum: Actions Proposed by Ad Hoc Committee to alleviate shortages of technically educated officers in the Navy: implementation of", NARA RG 24-470-54-25-6 Box 1.

assignments. After some deliberation, the board adopted as the metric for officer performance the relative success or failure of 'line' officers in Rickover's nuclear schools. Thus, the ability of a former NROTC student to succeed in Rickover's highly technical schools became a measure of how well the college had educated the former midshipman. By adopting this metric, the study essentially adopted nuclear attrition rates at Rickover's school as the metric by which the health of the entire 'line' officer undergraduate education system would be judged. Rickover's metrics became the root justification for later NROTC curricular and admissions changes that continue to shape NROTC today.[164] Armed with statistical reports that appeared to show the need for additional engineering education for the midshipmen, nuclear program managers successfully lobbied for a restructuring of NROTC curriculum, which was given force through the CNET policy directives.[165] Thus, by 1972, Rickover and his allies at the academy and CNET had realigned the academy and NROTC to become polytechnic institutions and programs, and the top priority for both was the production of engineers for the nuclear power program.

[164] M.W. Cagle, VADM, USN, CNET,"Memorandum: Actions Proposed by Ad Hoc Committee to alleviate shortages of technically educated officers in the Navy: implementation of", NARA RG 24-470-54-25-6 Box 1. VADM Cagle, the Director Naval Education and Training, in this 1971 study of technical requirements of officers, tasked the personnel organizations of the Navy to take action to implement recommendations of expanded technical education. Included in the actions are fairly significant curricula actions, including the shift of NROTC seamanship/navigation in undergraduate programs to summer school so as to accommodate more math and sciences. However, most importantly, this memorandum provides documentary evidence that the technical standards of nuclear reactor schools were beginning to shape the entire Navy's approach to education. In particular, this Navy-wide board cites in its calls for changes to curricula the statistics of officer quality provided by VADM Rickover and the NR staff. Specifically, see enclosure 1, paragraph 1, where the nuclear program asserts that only 30% of surface officers could complete the nuclear power training program; that only 60% of NROTC officers could meet requirement in 1967, and only 20% of the officer year group of 1962 (which apparently included both USNA and NROTC) could complete the nuclear program requirements.

[165] Ibid. The 1971 study considered eliminating in its entirety the professional military courses for any engineering or science majors in NROTC. While CNET stopped short of this for NROTC, this goal was eventually achieved with the establishment of a highly technical undergraduate program for nuclear officers call the 'NUPOC' program.

The model of the technical expert officer had displaced the generalist at Annapolis and at NROTC units around the country.[166]

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Consequences of the Nuclear Reconstruction of Undergraduate Education

Rickover began in the early 1960s to reshape the Naval Academy and NROTC curriculum to become more technical and specialized. Rickover needed scientific engineers to man his growing nuclear fleet, a manning problem made more acute by low retention of nuclear officers and the collapse of NROTC nuclear recruiting on college campuses during the Vietnam War. By 1973 the transformation was complete and the academy curriculum, and to a lesser extent NROTC, had been reformed to meet the needs of the reactor. Dean Davidson, the civilian engineer who was the academy's second dean, stated bluntly: "With the increased dependency on nuclear power plant systems, every major must include sufficient math, science, and engineering so that any midshipman, regardless of his major, qualifies for selection to the nuclear power program." [167]

Preparing all midshipmen to be nuclear engineers had unintended consequences. A significant cost of the Rickover curricular changes was declining language proficiency among academy graduates. Prior to the reforms of the 1960s, every graduate of the

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[166] Thomas B. Buell, "The Education of a Warrior," *US Naval Institute Proceedings,* 107, no. 1, January 1981, 41-45. To this day, NROTC continues to levy a heavy requirement of math and science on its midshipman. Anecdotal evidence argues that more verbal and less technical officers have gravitated away from NROTC to the Marine version of ROTC, which does not carry the Rickover requirements.

[167] Bruce M. Davidson, Academic Dean, USNA, "The Academic Dean Looks at the Academy," *Shipmate,* no. 3, March 1973, 26. In addition, the dean also desired higher percentages of the class to pursue the more demanding engineering majors. To achieve such a goal, he advocated shaping admissions standards or criteria to ensure midshipman were inclined by 'free choice' to select the more demanding engineering majors.

Naval Academy was expected to study one to two years of a foreign language. First in 1964, when mandatory language education was reduced to a single year, and then in 1968 when it was made optional, the numbers of midshipmen with collegiate education in at least one foreign language plummeted. With adoption of strict quotas, only 20% of the student body could study social sciences or humanities, a restriction that had the effect of further reducing the number of midshipmen who received an education in a second language. The loss in undergraduate language training created a generational dearth of 'line' officer language proficiency that persisted into the first years of the 21st century.

More difficult to measure is the effect Rickover's policies may have had on the personality types of midshipmen. As early as 1970, the Naval Academy detected that midshipmen who had a higher performance in verbal tests were resigning in larger numbers than those who were more technical in their preferences.[168] Later studies echoed the Navy findings and linked the loss of verbal-type officers to the increased technical requirements of the academy program. More studies have shown that, as the academy program became more technical, it tended to weed out persons gifted in the non-technical fields.[169] Some scholars of the officer corps conclude that the academy became such a technical-oriented institution that the more "intuitive" types of midshipmen resigned from the academy at a 2/1 ratio over the technically inclined midshipmen.[170] One might argue that the loss of the intuitive type person was more than

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[168] W.S. Shields, Dean of Admissions, US Naval Academy,"Memorandum to Superintendent, U.S. Naval Academy, "Comments on Report of Recruitment Research Study Group of 4 November 1970", dtd 23 Nov 1970, RG 405, Office of the Superintendent, VADM James Calvert, Box 3, Folder 18, "Midshipman Resignations". Forney, in his analysis, pp. 221-222, interprets the decline in verbally and linguistically inclined midshipman as the consequence of both military and engineering curricular changes in this period.
[169] Kendra M. Bowers, "The Utility of the Myers-Briggs Type Indicator and the Strong Interest Inventory in Predicting Service Community Selection at the US Naval Academy" (NPGS, 2002).
[170] Thomas F. and Kamyar Pashneh-Tala Foster, "The Utility of Personality Measures in the Admissions Process at the US Naval Academy"(2002).

compensated by the increase in highly technically educated midshipmen who became 'better' officers. However, such a conclusion is difficult to prove. Even VADM Calvert admitted "...there is not necessarily a correlation between advanced technical education and success as a naval officer."[171]

Not surprisingly, Rickover's technocratic transformation of the Annapolis curriculum exerted a measurable effect on those midshipmen inclined toward service in the Marine Corps. A statistical study of the changes in academy majors and admissions metrics evidenced a decline in the propensity of the Naval Academy to produce officers who wanted to serve in the USMC.[172] This study, completed by an academy professor who later died in combat in Iraq, discovered a statistically significant relationship between USMC officer selection and academic major. The study showed that, as the academy curriculum and admission's process favored the more technical-oriented person, then the percentage of both applicants and midshipmen graduates who were inclined to become Marine officers declined. With fewer midshipman inclined to choose the Marines, selectivity would necessarily fall, and a lower quality midshipman-turned-Marine might result (or fewer USMC officers who were Annapolis graduates might result).

The 1960s witnessed an 'academic revolution' at Annapolis, implemented by a myriad of officers, academics, and political leaders. Rickover, more than any other single person, and the reactor, more than any other technological system, inspired and

[171] VADM James F. Calvert as quoted in Report to Board of Visitors, May 1969).
John D. Yarbro, PhD,"USNA Curriculum Development Report Dtd January 1974", NARA RG 405 USNA Special Collections, Studies and Reports, Curriculum 1970-75, Box 5.
[172] Richard J. Gannon, "The Naval Academy-Marine Corps relationship: an examination of the Marine Corps' influence on the Academy and the Academy's professional impact on the Marine officer corps" (Thesis M S --Naval Postgraduate School 2000).

drove these changes. Despite the opposition of several superintendents, commandants, veteran professors, at least one Secretary of the Navy, and two CNOs, the academy in the space of a decade was profoundly transformed. What had been a naval college that measured its success by the production of ‘well rounded officers of the line' became a college that measured itself against civilian engineering graduate programs. Commandant Shinn in 1958 would claim the first goal of the academy was to provide a general education ‘of the line’ and to avoid, at all costs, becoming a de facto polytechnic. However, by 1973, the Dean would assert that the curriculum must ensure that *every* midshipman could qualify for selection as nuclear engineer.

The reorientation in objectives produced a changed curriculum, admissions metrics, and ultimately, a changed officer of the 'line'. When midshipmen proved hesitant to embrace engineering, quotas were established. When the Brigade continued to prefer the study of humanities and language over engineering, Rickover's protégés changed the midshipmen intellectual DNA: personality profiling was adopted and admissions metrics were recalculated to favor the 'technical' over the 'verbal' person. Rickover intervened to reshape NROTC such that it would no longer serve as a welcoming conduit for the lesser-technical student who hoped to be a naval officer. Under such new metrics, one may wonder if some of the Navy's leaders in the Second World War, most of whom scored highest in their verbal studies, [173] or even Rickover himself could have gained admission to the academy.[174]

With the reforms of the 1960s, the vast majority of midshipmen were directed toward a specialized, technical major. These highly specialized majors reinforced midshipmen identity to be a technical specialist, an identity that would shape their follow-on decisions about education and the value they attached to the study of non-technical subjects, including foreign languages and culture. The effects of this shaping were amplified by the fact that the shaping came so early in life for the future officer. Like the Royal Navy of an earlier time, the U.S. Navy recognized the power of formative educational and professional experiences in the making of senior officers. VADM Semmes, the Personnel Chief in 1966, studied the influence of formative experiences on officers. He concluded that the young officer "...will probably select his post-graduate area of study based upon his past operational and academic experience, without too much thought or understanding of how this selection will effect his future..."[175] When the academy was reshaped to meet urgent but temporal nuclear requirements, the die was cast for a generation. Some officers understood what was happening and warned that "…in surrendering to contemporary

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[173] Carroll Storrs Alden, PhD, "Outstanding Naval Officers Once Midshipmen," *US Naval Institute Proceedings*, no. 72, Feb 1946. Most of the leading admirals of the Second World War—the four stars--excelled in the non-technical portion of their studies. It is debatable whether all would have survived in the new academy. Rickover himself scored lowest on his math entrance examinations.

[174] Thomas B. Buell, "The Education of a Warrior," *US Naval Institute Proceedings,* 107, no. 1, January 1981, 43.

[175] B.J. Semmes JR., VADM USN,"Policy on Education for Unrestricted Line Officers, Memo from Chief of Naval Personnel, dtd 9 Feb 1966, to all Unrestricted Line Flag Officers," Naval War College Archives, RG 27, Box 1966, folder "Educational Policy", 4.

pressures, the academy had alleviated some of it immediate problems but only at the cost of its soul."[176]

Calvert, a key architect of many of these changes, later pondered whether he had been correct in his actions. He wrote to a fellow academy graduate: "Perhaps the correct balance among all the factors has not yet been found; perhaps the military and the naval professional will have to be more drastically reshaped than we can yet foresee in order to respond to the needs of our society."[177] Calvert was reflective and mindful of his time in history, but the model he and his mentor had put in place became with each succeeding year more permanent and resistant to change. Like the technological system that inspired the changes, the academy changes took on a type of momentum. The mass of civilian hires, many of them engineers, became tenured faculty and thus an increasingly permanent and powerful fixture at Annapolis. Moreover, each year, the academy produced approximately a thousand officer-leaders imbued with the new values more sympathetic to technical specialization rather than the non-technical, cultural, and linguistic experience valued in King's model of broad education. The new mindset, when combined with Rickover's additional interventions in assignment and promotion policies, diffused through the fleet and became the reigning conception of the 'line'. The future commander and admiral

[176] Todd Forney, "Charting Institutional Change: The United States Naval Academy During the 1960s," in *New interpretations in naval history: selected papers from the Twelfth Naval History Symposium held at the United States Naval Academy, 26-27 October 1995*, ed. William B. Cogar (Annapolis, Md.: Naval Institute Press, 1997), 311.

[177] James VADM USN Calvert,"Ltr to Mr. Paul Schratz dtd 11 March 1970", RG 405, USNA Special Collections, Office of the Superintendent, General Records, Series: Educational Organizations, Middle States Association of Colleges and Secondary Schools, 1970-76, Folder 9, Box 4; See also James F. Calvert, VADM USN, "The Fine Line at the Naval Academy," *US Naval Institute Proceedings*, 96, no. 10, October 1970, 68.

from Annapolis was not King's generalist 'line' officer but became instead a more techno-centric and platform-centric expert in command.

Chapter Seven

Diffusion of the Technocratic Model to the Fleet: The Decline of the Integrative Commander

"... in connection with the loss of the USS THRESHER, I and other members of the Joint Committee expressed our concern over the lack of continuity and the frequent turnover of military personnel... advise me at its earliest convenience as to what actions it (the Navy) has taken to change its past rotational practices..."

Congressman Chet Holifield, Chairman of the Joint Committee on Atomic Energy, letter to the Secretary of the Navy, 16 March 1965[1]

"...I have directed, if periodic automatic rotation of our officers has ever been our assignment policy, that such a policy be totally disregarded as a personnel management concept."

Paul Henry Nitze, Secretary of the Navy, letter to Chairman, Joint Committee on Atomic Energy, 1965[2]

"...if service college training is valuable, then it must follow that billets wherein such training is a prerequisite could be readily identified."

Vice Admiral B.J. Semmes, Jr., USN, Chief of Bureau of Personnel, 9 February 1966[3]

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Summary

In the 1960s, Rickover transformed both the submarine force and the U.S. Naval Academy. Both organizations abandoned the generalist model and adopted a technical

[1] Chet Holifield, Chairman, Joint Committee on Atomic Energy,"Letter from Holifield to the Secretary of the Navy, 16 March 1965", NHC, 00 Files1965, Box 29, JCAE file.

[2] Paul Nitze,"Letter to Chet Holifield, Chair, Joint Committee on Atomic Energy", Naval Historical Center, Operational Archives, CNO Records, 1965, Box 29, JCAE file. This copy of Nitze's letter was preserved in the CNO files. It is not the signed original, and thus it is possible later changes were made but not communicated to the CNO, but that would seem unlikely. The fact that this copy was retained by the CNO argues strongly that this is a copy of the actual letter sent to Holifield, and thus accurately represents a shift in thinking to Rickover's model of officer development. At issue was Rickover's recommendation to discontinue the practice of frequent assignment rotations which was so essential to creating the generalist officer. Instead, Rickover desired longer assignments in fewer assignments which helped the officer master a single, typically technical, specialty.

[3] B.J. Semmes, Jr., VADM USN,"Policy on Education for Unrestricted Line Officers, Memo from Chief of Naval Personnel, dtd 9 Feb 1966, to all Unrestricted Line Flag Officers," Naval War College Archives, RG 27, Box 1966, folder "Educational Policy", 5.

expert model of the 'line'. As he emerged the victor from these bureaucratic battles, Rickover called on senior military and political leaders to help him diffuse his model through the larger fleet. By the middle of the next decade, the vast majority of the 'line' officers--to include surface and aviators-- would also abandon the generalist tenets of King's system and adopt instead a more specialized conception of command. Rickover was so unpopular that few surface or aviation officers would credit Rickover’s policies as the inspiration for their own abandonment of the generalist. Though Rickover did not directly compel the adoption of the new model by the surface and aviation communities, he more than any other single officer was the inspiration for the change.

Rickover used both 'carrot' and 'stick' to persuade the remainder of the 'line' to abandon the King model. Rickover offered the 'carrot' of command. If officers wanted command of the newest ships, they would have to adopt his philosophy that technology trumped tactics; technical expertise was preferred over breadth of experience. But if a 'line' officer could not become a 'nuke', he would face the 'stick', the fate that befell many a diesel officer. The fear of an expanding nuclear navy spurred aviators and surface officers to fight ‘fire with fire’, and they chose increased specialization as a defensive strategy. This pattern of specialization-as-defense was evidenced by the rise in the surface navy of the AEGIS community, and in the aviation community by creation of a new career path that eschewed carrier command.

The changed officer development system ultimately produced a different type of senior commander in the flag ranks. By the last years of the Cold War, navy high command would witness an almost complete inversion as compared to the Second World War generation: the platform specialist came to dominate the Navy’s senior flag ranks and the integrator, the 'well-rounded' officer educated at a war college, became a small minority. The changed model required almost three decades for the new kind of officer to promote to the top, but the transition in the high command from generalist to the technical expert was by 1990 complete.

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Technical Expert as a Universal Model for Navy Leaders

Rickover would use three tools to diffuse his ideas of the technical expert officer in command: the exemplar of his nuclear ships, his speeches and books, and direct intervention by his allies in Congress. The specialist notion of command progressively displaced the generalist model first in naval literature, then in personnel manuals, and ultimately in the minds of officers. The specialist identity, once in place, became a cultural fixture of the line and proved resistant to attempts by senior admirals who decades later sought to re-unify and re-integrate the 'line'.

Ships are persuasive symbols and have been used frequently to shape human perceptions of power and influence. Perry's steamships which sailed into Tokyo in the mid 19th century; Roosevelt's Great White Fleet which sailed around the world; nuclear SSBNs that prowled the deep, all conveyed to potential enemies the idea of American power and thus shaped adversaries' perception and action. Elting Morison, a leading naval historian in the 20th century, was among the first to explicate the power of technologies to shape *internal* organizational perceptions and values in the U.S. Navy.[4]

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[4] Elting E. Morison, *Men, Machines, and Modern Times* (Cambridge, Mass.,: M.I.T. Press, 1966). Morison was among the first to write of the power of ships to shape values and ideas in the later 19th and early 20th century. For a more recent discussion of the American battleship exemplar, see William M. McBride,

Rickover’s ships of the 1960s not only intimidated the Soviets with their putative power, but shaped the values of the U.S. Navy officer corps. The nuclear ballistic missile submarine first displaced the carrier and battleship as the most influential ship in the American inventory, a change manifest for every young officer when he opened the pages of *Jane's Fighting Ships*.[5] The power of the nuclear ship to influence perceptions was widespread in the early 1960s and swayed the career choices of American officers seeking to command the sleek hulls. While it is well known that four of the Navy's CNOs were Rickover's officers, less well known is that three others sought to have nuclear command but were denied.[6] The appeal of the nuclear ships also swayed even those being paid to be dispassionate judges of their capabilities. In a moment of candor, a ship-design team in the Pentagon confessed that they endorsed plans for nuclear ship construction less so due to the persuasiveness of technical arguments, than by the ships' unique aura and appeal.[7]

The 'elite' officers who commanded the nuclear reactors became highly effective boosters of the new nuclear navy and its system of technical training and assignment. The nuclear commanders were treated as heroes in the early years of the program. Rickover’s nuclear officers captured the imagination of the nation and the Navy when

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Technological Change and the United States Navy, 1865-1945 (Baltimore: Johns Hopkins University Press, 2000).

[5] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 332. Spector observes that the submarine had moved to the front of fleet guides as the new capital ship, reversing the order of priority that had existed since the Second World War.

[6] The best officers vigorously sought assignment to nuclear ships. Future CNO Zumwalt sought command of USS BAINBRIDGE, but was turned down. Similarly, future CNO Thomas B. Hayward sought command of a nuclear aircraft carrier, but couldn't even get an interview with Rickover. Thomas B. Hayward, Admiral, USN (former CNO), retired, Discussion with the Author, 24 January 2008. Sources who know of the third CNO's preferences for nuclear power have requested that the identity of this CNO remain anonymous.

[7] OP-090,"Assessment of Surface Nuclear Program, OP-090 study dtd 28 July 1964", Naval Historical Center, Operational Archives, 00 files, 1964 Box 19, folder 9000B.

they sailed under the polar ice cap and were welcomed home with ticker tape parades.[8] A popular television series in the 1960s--*Voyage to the Bottom of the Sea*-- also glorified the nuclear trained officer who sailed around the world in a submarine named after Rickover's first nuclear ship!

The personal influence nuclear officers exercised over shipmates who were *not* nuclear qualified was also considerable. There is some evidence that, when non-nuclear naval officers and sailors served alongside the nuclear officers and men, the values and standards of Rickover's organization were observed to "...spread through the ship". [9] The decision *not* to retrofit reactors to older ships was also important in raising the profile of nuclear power. Nuclear command was closely associated with *everything* new. With each nuclear reactor came a nuclear captain, and with him came a *new* ship which in turn carried the newest radars, missiles, and computers. The nuclear ships posed a stark contrast to the Navy's rapidly aging fleet of ships, 80% of which were of WWII vintage.[10]

A critically important factor that helped diffuse Rickover's ideas about officer development was the notion that the entire fleet would one day become nuclear powered.

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[8] The second commander of NAUTILUS who sailed beneath the polar icecap--CDR Anderson-- received a ticker tape parade in New York, and was recognized by President Eisenhower in a ceremony at the White House. Skippers Calvert and Beach both wrote popular books about their nuclear adventures. Rickover was featured on the cover of *Time* magazine.

[9] RADM John T. Hayward, USN, testifying before the Joint Committee on Atomic Energy, Testimony of VADM H.G. Rickover on the U.S. Lead in Nuclear Propulsion Experience, 88th Cong., 2nd sess., 30 October 1963, 61.

[10] R. L. Schreadley, *From the Rivers to the Sea: the United States Navy in Vietnam* (Annapolis, Md.: Naval Institute Press, 1992), 47. By the beginning of the 1960s, four out of five ships were of Second World War vintage, and most were near the end of their service life. In contrast, the nuclear ships were ALL new. Thus, the nuclear surface ships were the first to receive the first mobile digital data link, NTDS. The nuclear surface ships were also among the first to carry TOMAHAWK cruise missiles. The author recalls more than once overhearing sailors from older steam ships comment admiringly on the appearance, capabilities, and size of the USS TEXAS (CGN 39), a modern nuclear cruiser built in the middle 1970s, and the author's first sea-going assignment when it was commanded by George Miller and William Gautier.

In a 1963 study, the Secretary of the Navy reported to the Secretary of Defense that "...we have come to the conclusion that all new major warships should be nuclear powered..." [11] The next year the nuclear powered carrier ENTERPRISE, cruiser LONG BEACH, and frigate BAINBRIDGE made an 'around the world' demonstration, steaming without logistic stops for 65 days at an average speed of 22 knots. Such a feat of engineering and navigation gave physical form to the idea of an all-new nuclear fleet that would be unmatched by the old navy ships.[12] The idea that the officer corps, too, would be nuclear trained was disseminated through the ranks when the officers who commanded the nuclear ships quickly promoted to flag rank.[13] Officers knew from the scuttlebutt and sea stories that an officer could command one of the futuristic ships only if the officer conformed to the Rickover model of 'line' officer, which meant supreme technical proficiency in the field of scientific engineering.[14] In addition to the 'carrot' was the

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[11] Secretary of the Navy Fred Korth as quoted in Paul R. Schratz, Captain, USN, "Fred Korth, 4 January 1962 to 1 November 1963," in *American Secretaries of the Navy, 1913-1972*, ed. Paolo E. Colletta (Annapolis, MD: Naval Institute Press, 1980), 934.

[12] See Ibid. , 948. Note also that in 1964 the world's first nuclear powered merchant ship, *Savannah*, made port calls to Europe, see pg 947. The portrait of Secretary Korth which hangs in the Navy Corridor in the Pentagon also contains a hint of the allure and significance of nuclear ships as exemplars of the fleet: in Korth's portrait he is depicted standing in front of a painting of the first three surface nuclear ships steaming on an open ocean, unaccompanied by an oiler or other auxiliary ships.

[13] Almost all the commissioning captains of the first nuclear ships made flag as well as most of those who followed in the first and most formative years of the program. The first nuclear submarine, surface, and aviation officer all made three stars: Wilkinson, Depoix, and Peet. Selection to command for nuclear officers was also among the highest in the Fleet (90% for XO, 80% for CO) and remained at this level well into the 1970s. See page 49 in N.R. Thunman,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197.

[14] The first nuclear submarine commander Eugene Wilkinson, who had also served on surface ships, was selected to command the first surface ship, USS LONG BEACH. The first nuclear officer who was a *non-submariner* was CDR Ray Peet, who was an accomplished engineer but also a decorated WWII combat veteran with significant tactical and operational experience. Surface officers who Rickover picked for later commands were, however, more engineering experts than they were tactical experts. A member of a surface group staff in the early 1970s recounted an interaction between Rickover and a non-nuclear admiral (RADM Walters) who was in command of a group of nuclear surface ships. Rickover directed Walters to accept a certain nuclear engineer to command one of the admiral's nuclear cruisers. The surface admiral apparently demurred that he preferred another nuclear-trained officer who was more tactically and operationally experienced. Rickover responded that if Walters did not accept the technically stronger surface officer, then Rickover would place a submariner in command of the nuclear surface ship. Walters

'stick': the example of diesel officers showed that, if an officer did *not* receive nuclear training, his chances for promotion would be reduced.[15]

The lure of the ships may have been enough to change younger officers' career conceptions, but to persuade older officers to abandon the generalist model and adopt a specialist model of command required Rickover to win the intellectual argument. His tools of argument were speeches, books, and articles that enjoyed a remarkably wide circulation. He wrote extensively on education and argued that the artificial world of technology now required a new kind of man and new kind of officer. He argued forcefully that technically specialized officers should command the new fleet: "The operation of modern warships becomes daily more of a technical job. Even their use in naval combat now requires scientific and engineering skill rather than the skills of a professional naval officer." He asserted that the generalist was out: "This may have worked in the past when such versatility had to do with what might be called strictly naval qualifications of the naval officer; that is, when this versatility did not have to include competence to direct highly technical, scientific and engineering work." Rickover went on: "Theoretically, a competent team from GE or Westinghouse could operate a nuclear submarine or launch a missile…these ships are comparable to our most

accepted Rickover's choice. Glen Gottshalk (staff assistant to RADM Walters), Interview with the Author, 16 October 2006.

[15] There remained for several years a group of submarine officers made up of the diesel and missile officers, however their command opportunities evaporated rapidly and as such had no long-term future. The 1970 year group of officers was the last with any hope of an at sea command, see pg. 50 in N.R. Thunman,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197.

advanced industrial plants….To run them is essentially an engineering rather than a naval job."[16]

Rickover addressed the public with several full length books, some of which sold widely and are read even today.[17] He cultivated friends among the writers and opinion makers who more often than not adopted his technocratic arguments and published supportive pieces in major publications.[18] Senior officers who read national magazines or who had to answer to the powerful congressmen sympathetic to Rickover couldn't help but take note of the admiral's arguments.[19] But despite Rickover's rigorous arguments and national following, he failed to sway many of his fellow admirals. As late as February 1963, six weeks before the sinking of THRESHER, senior officers completed a major study of officer policy that endorsed again the King model of the generalist 'line' officer. The report was considered so authoritative that the Secretary of the Navy transmitted the report to every ship and station in the U.S. Navy.[20]

In early 1963 the Secretary of the Navy and Chief of Naval Operations, concerned by the "... escalating technical developments in years to come, and the increasing

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[16]Hyman George Rickover, *American Education, a National Failure: the Problem of our Schools and What we can Learn from England*, [1st ed. (New York,: Dutton, 1963), 181-182.

[17] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959); Hyman George Rickover, *American Education, a National Failure: the Problem of our Schools and What we can Learn from England*, [1st ed. (New York,: Dutton, 1963).

[18] Clay Blair, *The Atomic Submarine and Admiral Rickover*, [1st ed. (New York,: H. Holt, 1954).

[19] George W. Anderson, Jr., ADM, USN,"Analysis of Rickover Article on English Education System, 10 Sept 1962", NHC Operational Archives, Collection 439, ADM G.W. Anderson, Jr., Box 52. Anderson's file included marked copies of Rickover's speeches and articles.

[20] Fred Korth, Secretary of the Navy,"SECNAV NOTICE 1412, From Secretary of the Navy to All Ships and Stations, Subject: Criteria for Selection to Flag Rank in the Navy, dtd 1 May 1963," NARA RG 24, Box 6.

requirements for officers conversant with the fundamentals of political science..."[21], tasked a group of senior flag officers to study the best system to prepare an officer for high command. The board, chaired by aviation pioneer and decorated combat veteran, Admiral Alfred M. Pride USN (retired), and made up of several active vice-admirals and rear admirals, examined the question to what extent future "...flag officers should be trained in science, engineering, management, international relations, and other special fields..." [22] The board of admirals described the question as fundamental not only for flag officers but for the entire officer corps, for those "...lesser ranks through which every flag officer passes."

The Pride Board identified three basic skill sets an officer-leader must possess: the "technical, human, and conceptual." The board pondered the appropriate phases and priorities for officer development and education and placed modest emphasis on technical skills: "...insofar as technical skills are required, the input occurs primarily at the bottom of the rank structure."[23] When considering the needs of the more senior commanders, those who rose to higher command, the board stated that "...the need for the broadest conceptual skills is overriding." As to how to attain this balance of skills throughout an officer's career, the board concluded that the existing "...Navy's education programs now supports the three types (technical, human, and conceptual) at the appropriate career points." The career points to which the board referred were, of course, King's phases of integrated education. In advocating the integrative or generalist model of 'line' officer,

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[21] Fred Korth, Secretary of the Navy, letter to Admiral Alfred W. Pride, USN (retired) dated 21 January 1963. See cover letter in file for Alfred W. Pride, ADM USN (Ret),"Criteria for Selection to Flag Rank in the USN, Report of Board 20 February 1963", NARA RG 24-470-54-25 Box 6.
[22] Ibid., part 3, page 1.
[23] Ibid., part 3, page 2.

the board advocated not one rigid career pattern, which would be impossible for all officers to follow, but a process that produced a generalist type of mindset, an officer with a "...frame of mind, free of parochial fetters..." [24] The report was not, moreover, an isolated and un-read report that gathered dust in the Navy Yard, but was on the contrary disseminated to "...all ships and stations..." of the entire Navy![25] But the 1963 victory for the King's generalist and integrative 'line' officer would prove short-lived. Rickover had not yet called upon his political allies to support his model, a call that he would make following the loss of USS THRESHER.

In hindsight, THRESHER was a contingent event that Rickover used to garner political support for his ideas about the officer corps. In the post-disaster analysis, Rickover convinced powerful political leaders that the Navy's traditional officer development system was flawed and partly to blame for the disaster. In particular, he attacked the practice of 'broadening' officers by rotational assignments and asserted that it left officers with inadequate expertise in any one field.[26] United States Senators Pastore and Jackson and Representative Holifield, convinced of Rickover's argument, questioned the Navy and demanded changes. Senator Pastore of the Joint Committee on Atomic Energy (JCAE) asserted: "The committee reaffirms there should be no relaxation of existing procedures used in the selection, training, and assignment of nuclear propulsion personnel." Senator Pastore saw the nuclear navy as an example for the larger organization to emulate and urged the Navy adopt Rickover's recommendation of longer

[24] Ibid., part 3, page 2.
[25] Fred Korth, Secretary of the Navy,"SECNAV NOTICE 1412, From Secretary of the Navy to All Ships and Stations, Subject: Criteria for Selection to Flag Rank in the Navy, dtd 1 May 1963," NARA RG 24, Box 6 Report of the Pride Report of 20 February 1963.
[26] Joint Committee on Atomic Energy, Testimony of VADM H.G. Rickover on the U.S. Lead in Nuclear Propulsion Experience, 88th Cong., 2nd sess., 30 October 1963, 97. Well before THRESHER Rickover had drawn attention to the Navy's practice of short tour lengths in contrast to his system of longer tours.

tour lengths for officers: “There is no doubt that a policy which requires military officers to be transferred every 2 to 3 years is not conducive to efficient technical management….” [27]

When the Navy appeared to make no changes to the old 'generalist' policy, the Joint Committee pressed the Navy to change. Chet Holifield, the Chairman of the JCAE, wrote to the Secretary of the Navy and invoked the loss of THRESHER as justification for change. The politician demanded a report on what he saw as the flawed practice of frequent assignment changes that the Navy used to broaden its 'line' officers: "... in connection with the loss of the USS THRESHER, I and other members of the Joint Committee expressed our concern over the lack of continuity and the frequent turnover of military personnel... advise me at its earliest convenience as to what actions it (the Navy) has taken to change its past rotational practices....furnish the committee a report, as complete as possible, covering assignments and responsibilities for the major technical and line commands of the past five years. Please indicate the tenure of each of the commanding officers..." [28] Ominously for the survival of the King model, neither the CNO, Admiral McDonald, nor the Secretary of the Navy challenged Holifield's repetition of Rickover's criticisms of the officer system. The Secretary of the Navy Nitze was either convinced of Rickover's arguments or caved to political pressure. Nitze informed Holifield that henceforth key “...management and technical billets will lengthen to 4 to 6 years.” He went further to assert that, if ever it had been the Navy’s personnel policy to encourage frequent rotation (which it had been--frequent rotation was a key tenet of both

[27] Joint Committee on Atomic Energy, Hearings on Loss of USS THRESHER, 88th Cong., 2nd Sess., 26, 27 June, 23 July 1963, and 1 July 64, ix.
[28] Chet Holifield, Chairman, Joint Committee on Atomic Energy,"Letter from Holifield to the Secretary of the Navy, 16 March 1965", NHC, 00 Files1965, Box 29, JCAE file.

King and Holloway plans), then henceforth he ordered "...that such a policy be totally discarded."[29]

After Nitze' pronouncement of a new officer policy, there followed shortly thereafter information briefings and an exchange of letters between the CNO and his senior officers concerning changes to the traditional system of officer development. Senior leaders first discussed plans to lengthen the duration of command tours, a key concession to Rickover's concept of technical specialists in command.[30] Even more indicative of changing officer models, in January of 1966 the CNO quietly directed his leading education and training admirals to re-examine the entire system of 'line' officer education and development.[31] McDonald's memo marked a remarkable 'about face', coming as it did less than three years after the Pride Report had validated the King system of officer development.

Why McDonald, the senior uniform officer of the Navy, failed to oppose Holifield's ideas is unclear, but two factors, both leading back to Rickover and THRESHER, seem important. McDonald was close friends with the CNO Anderson and would have been

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[29] Ibid., Tab B holds a file copy of Secretary Nitze' response.

[30] F.M. Radel, Captain, USN,"CNO/VCNO briefing, Subj: Qualifying Command and Major Command Tour Lengths for Captains, briefer Capt F.M Radel, 13 May 1965. "NHC 00 Files 1965 Box 29. In the months after JCAE wrote to the Secretary complaining of the short tours in the Navy, the CNO/VCNO held a briefing to discuss command tour lengths. As Rickover had accused them, notes from this meeting confirm that the shorter tours were a means to facilitate more promotions by giving more officers command experience, which resulted in a loss of readiness. The brief explains: "Our policy of 12-15 months in command provides the maximum number of captains with command experience…..however longer tours would probably increase unit readiness." The fact that this brief was produced and provided to the CNO so soon after the Congressional inquiry is further evidence of the shift in attitude toward a Rickover philosophy of officer development.

[31] CNO McDonald sent out a tasking letter on 20 January 1966 to the President of the Naval War College and Superintendent of Post Graduate School, ordering them to re-evaluate officer education and development. The actual letter is missing from war college archives, but is referenced in B.J. Semmes, Jr., VADM USN,"Policy on Education for Unrestricted Line Officers, Memo from Chief of Naval Personnel, dtd 9 Feb 1966, to all Unrestricted Line Flag Officers," Naval War College Archives, RG 27, Box 1966, folder "Educational Policy".

aware of Anderson's belief that Rickover was a primary cause of his professional demise. Rickover was thus perceived as powerful if not politically immune in any battles with a new CNO. Secondly, McDonald was desperate to win the support of the Capitol Hill "Atomic extremists" as he called them.[32] Two of the extremists were Senator Pastore and Congressman Holifield who had become, in the wake of THRESHER, supporters of Rickover's technical expert model of command. Wary of Rickover's power and anxious to curry favor with powerful Capitol Hill politicians, McDonald showed none of Anderson's fight when it came to issues of officer development. Evidence of McDonald's surrender to Rickover is manifest by what is *not* found. After 1963, there is little CNO criticism of any of Rickover's nuclear manning policies.[33]

No longer opposed by the CNO,[34] or perhaps with the CNO's tacit support, key components of the Rickover officer model began to be adopted by the larger officer corps. By later 1965 and early 1966, command tours had been lengthened by 50 percent, a move Rickover had long advocated. Less obvious but possibly more significant was a shift in flag selection guidance: selection was incrementally adjusted to promote younger

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[32] David L. McDonald, Admiral, USN (retired), *The Reminiscences of Admiral David Lamar McDonald USN (retired)* (Annapolis, MD: US Naval Institute Press, 1976), 350.
[33] H.G. Rickover, ADM USN,"Congressional Testimony: Problems in Retention of Qualified Personnel", JCAE 92nd Congress, 10 March 1971, Testimony of HG Rickover, Washington DC: Government Printing Office, 89. There is a complete absence of any further mention of the demands for shorter tours or lowering standards, the major complaints Rickover voiced in his 1962-63 testimony. The CNOs after McDonald also accepted Rickover's authority. Admiral Moorer resigned himself to Rickover's unique authority, and recalled that during his tenure he would "...agree, never fight, and then forget..." when dealing with Rickover. See Elmo R. Zumwalt, Interview with Norman Polmar 4 April 1979.
[34] John T. Hayward, VADM, USN (ret), "Comment," *US Naval Institute Proceedings*, 107, no. 4, April 1981, 21-22. Hayward levied a spirited attack on Rickover's legacy and recalled that eventually no one challenged Rickover, not just on nuclear issues, but on issues where Rickover had little expertise: "He (Rickover) is right where he belongs, running a complex technical program and doing it well. However, few in the Navy hierarchy have challenged his forays in fields where he lacks the competence to make valid judgments."

and more junior officers.[35] The decision to promote captains sooner to flag, a practice that mimicked the Air Force, was a significant shift toward a specialist model of admiralship. To 'round out' an officer took time. To select officers for flag earlier in their career meant the officer had had less time to 'broaden'. Flag officers selected after 1966 were thus marginally more specialized than they were broadened. The cumulative effect of these many changes— more specialized undergraduate education, the demise of the less technical diesel culture, the diffusion of reactors into the surface fleet, longer command tours, earlier promotion to flag, and decline of war college matriculation rates— spelled the coming end of the generalist and the rise of the technical specialist in command.

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Educational and Assignment patterns, Promotion Exams, and Officer Discourse

In the early 1960s, the Navy eliminated several pillars of King's system of integrative officer education. Within a decade not only would Annapolis become a specialized engineering college, but integrative educational institutions and examinations would be terminated. The General Line Course, established by King in 1920 endorsed again in 1948 in the Hartman-Sprague Report, was terminated in the early 1960s.[36] While

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[35] Paul R. Captain Schratz, USN, "Paul Henry Nitze," in *American Secretaries of the Navy, 1913-1972*, ed. Paolo E. Colletta (Annapolis, MD: Naval Institute Press, 1980) 952-953. Command tours were lengthened from 12 to 18 months, a change very much in line with Rickover's criticisms. Flag officer selection was moved earlier, a change that followed Nitze's observation in 1965 that "…our (Navy) flag officers are generally older by several years than their counterparts in the other services."

[36] Harry Depue Train, ADM USN, Interview with the Author, 2 November 2007. Admiral Train attended the course in 1956, and noted that it was a highly integrative course in planning and operations, not in any

the proximate reason for the termination of the GLC is unclear, it is probably no coincidence that it was terminated around the same time Rickover first participated on the educational review board—the SABER Board. This board included the Under Secretary of the Navy who had the authority to terminate the course if he was so persuaded.[37] The changes at the Naval Academy, as discussed in the last chapter -- begun quietly in 1959-- had by the end of the decade yielded a very different product. Annapolis no longer produced the all-around naval ensign with a general college degree, but many a young officer with an accredited engineering major. Through these changes the very identity of young officers began to move from that of general line officer to that of technical expert and platform specialist.[38]

A shift in criterion for flag promotion, from 'well rounded' to 'specialist', also began to emerge coincident with Rickover's rise to prominence. A study of flag promotions noted a gradual shift in priorities from an emphasis on officer 'versatility' to a growing emphasis on officer specialization: "Despite general satisfaction with the past results and a firm belief in the essential soundness of the selection system, every senior officer interviewed, whether unrestricted line, restricted line or staff corps, showed an awareness of the growing importance of the sub-specialist to the conduct of the Navy's affairs." [39]

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way a technical course like that which would come to dominate the graduate school curricula in the 1960s. Train recalled the GLC course was large and well attended despite the fact that it was not mandatory.

[37] It might also be relevant to note that Rickover's deputy, Jack Crawford, recalled that Rickover despised the General Line Course. Though he could not recall a specific instance where Rickover intervened to cancel the school, Crawford thought such an intervention by Rickover would have been totally consistent with his views of the school.

[38] Todd A. Forney, *The Midshipman Culture and Educational Reform: the U.S. Naval Academy, 1946-76* (Newark, Del.: University of Delaware Press, 2004), 135. Forney's extensive survey of midshipman attitudes is crucial in measuring this shift in loyalties and identification. According to Forney naval officers began to shift their loyalties to their group of specialists associated with the machine communities (surface, aviation, submarine).

[39] Alfred W. Pride, ADM USN (Ret),"Criteria for Selection to Flag Rank in the USN, Report of Board 20 February 1963", NARA RG 24-470-54-25 Box 6, see page v.

The increasing value attached to specialized knowledge, as opposed to integrated knowledge, was further manifest in changing promotion examination policies. In the early 1960s the Navy terminated the practice of written promotion examinations. Navy policy had traditionally required as a pre-requisite for promotion the completion of common examinations. The requirement for promotion exams was in force from the 1920s to the early 1960s, interrupted on a large scale only by the Second World War. [40] The Bureau of Personnel administered the examination to all line officers. The test included sections on tactics, operations, strategy, international law, and in the versions after WWII, a section on aviation tactics. The Navy promotion exams symbolized a common, integrated body of professional knowledge, required of all unrestricted line officers. The exam was discontinued sometime between 1960 and 1964[41] around the same time Rickover won decisive clashes with the CNO, Bureau Chief, and Naval Academy Superintendent.

The termination of the general promotion exam no doubt affected officer perceptions and priorities, though to what degree is difficult to measure. Without the exam, the requirement that each officer maintain general knowledge of the naval profession – operations, strategy, international law and the like—was unenforceable. For young and mid-grade officers who were short of study time, the termination of the exam was no doubt welcome. But with the end of a general line exam, career advancement became even more the exclusive domain of the specialized, technological communities

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[40] Arthur Ainsley Ageton, CDR, USN, *The Naval Officer's Guide*, 1st- ed. (New York,: Whittlesey House, 1943) see 1960 edition, article 702. BUPERS,"BUPERS Manual", see 1934 version, pg 242. See also BUPERS Manuals from 1942 to 1959, most copies of which are held in the Naval Historical Center library, general collection.

[41] Arthur Ainsley Ageton, RADM, USN (ret) and William P. Mack, RADM, USN, *The Naval Officer's Guide*, 6th ed. (Annapolis, MD: US Naval Institute, 1964), 218.

that reinforced community priorities through their respective technical training programs.[42]

The termination of the exam requirement also reduced the appeal of navy service schools. The old exam had tested material taught by the service schools. Navy regulations permitted more junior officers (0-4 and below) to substitute war college correspondence and classroom courses in lieu of tactical and strategic sections of the promotion exam.[43] This option, if exercised by the younger officers, reduced the possibility of exam failure. In the old system, then, War College coursework was directly relevant and helpful to an officer's effort to gain promotion. But with the termination of the exam, the direct linkage between promotion and advanced professional military education (war college) was severed. The balance between education and specialized technical platform training swung further in the direction of the latter.[44]

The training requirements dictated by platform communities took almost complete control of an officer’s career. The platform communities controlled both the detailing of the officers and, through their selection for command, the de-facto control of their promotion prospects as well. The Naval War College no longer provided any measurable benefit to an officer’s promotion prospects. The idea of a navy officer as being responsible for general tactical, operational, and strategic knowledge faded. An officer was increasingly responsible for only specialized knowledge associated with his

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[42] James L. Holloway, III, ADM USN (CNO), Interview with the Author, April 26, 2007. Admiral Holloway noted that in the middle 1950s the promotion system was more selective than the ‘command screen’ process. He observed that many former squadron commanders who successfully completed 'commander command' did not, however, win promotion to the rank of captain (0-6). After 1960, Holloway observed this pattern was reversed: it was more difficult to select for command than it was to promote in rank, and the vast majority of successful squadron commanders did promote to 0-6. Whether or not this inversion and the demise of promotion examinations are related phenomena is open to speculation, but the coincidence in timing is potentially significant.

particular platform machine, not for knowledge of other platforms, let alone other services.

Navy leaders in the 1960s adopted another policy that moved the 'line' away from an integrative model and closer still to Rickover's model of technical expert in command. In the first years after the Second World War, the Navy had been an enthusiastic proponent of joint education. The best officers for a half generation had willingly attended joint war colleges. But in the late 1950s and early 1960s, the Navy downgraded its support of joint education. The proximate cause was the decline in numbers of EDO officers. This decline prompted the Navy to prepare more URL officers to fill billets for the EDOs.

It was never clear how URL officers could replace EDO officers, command navy ships, and fulfill their growing 'joint' responsibilities. The Navy in 1959 tasked RADM R. T. S. Keith to study the education requirements of line officers. Keith concluded that it was not likely, if not impossible, that ‘line’ officers could be trained as mariners, educated as technical specialists, and also prepare to serve as joint commanders.[45] Shortly after Keith's study, the Navy shifted its priorities away from joint education toward URL technical education. So important were the perceived

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[43] Bureau of Personnel Navy Department,"Bureau of Personnel Manual, 1959", Naval Historical Center, general collections, call number VA 52.A65.

[44] VADM John T. Hayward, President of the Naval War College, concluded that the Navy had swung in favor of specialized education to the detriment of non-technical, integrative education. He noted that 1967 would be the first year naval officers constituted a minority at NWC. He also observed this naval phenomena spreading to all war colleges, e.g., only 129 of 168 seats filled; only 59% naval officers service college graduates compared to 98% of Army, yet at same time 1442 navy officers at graduate school, all indicative of the rising power and influence of specialization. See John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 259.

[45] R.T.S. Keith, RADM, USNR,"Billet and post-graduate educational requirements in the specialty areas in the line of the Navy, Report of Board 1 October 1959", NARA RG 24-470-54-25-6 box 5

technical education requirements that in the early 1960s the Navy adopted a policy that required a mandatory two year ‘payback tour’ for URL ‘line’ officers in technical assignments. The Navy adopted no similar mandatory ‘joint tour’ or joint education requirements.[46] By the end of the decade, navy officer matriculation at joint educational institutions began to fall off.[47]

Some senior line officers perceived the shift toward a technical specialist model and complained to the Superintendent of the Naval Post Graduate School.[48] Official studies questioned the decision to embrace technical specialization for URL officers. One study pointed out that the rapidly rising demand for technically educated URL officers was not founded on any empirical research, but was instead the result of an uncontrolled bureaucratic competition between technical bureaus as each attempted to grab the most technical officers in anticipation of future needs.[49] Despite these concerns and criticisms, the Navy did not change its policy. Rather, the Navy continued to assign line officers to more technically specialized assignments and training at the expense of broader, integrative, and non-technical education at the war colleges.

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[46] Ibid.

[47] *Directory of National War College Graduates*, (Washington, D.C: The National War College Alumni Association, 2003)

[48] Robert RADM McNitt, USN "Ltr from President, NPGS, to Superintendent of the Naval Academy, VADM James F. Calvert, USN ", RG 405, US Naval Academy, Special Collections, Superintendent Correspondence, files 1968-1981, Subj: NPGS, File number NC 1500-4.

[49] H.S. Heire, and H.M. Worth, BUPERS Research Activity,"US Naval Officer Billets Requiring Post-Graduate Training: Task Assignment W17-02-01 dtd December 1959", NARA RG 24-470-54-27-3/4 Box 65. The report noted that the tilt toward a technical coding of billets arose from the conviction that such billets and technical training would be the way of the future: "Predictions for the future indicated, without exception, a rapid and continuing increase in technical complexity of naval equipment which will necessitate a corresponding increase in technical competency among officer personnel. An outgrowth of these conditions has been a large increase in the number of officer billets reported as requiring postgraduate education." The report noted that a more standardized and valid means to determine technical training was, however, needed. The number of technically coded billets had increased at an unjustified pace, rising 50% in just three years, from 4,500 technical URLs to 6,700 between 1956 and 1959, over a time period of only 36 months!

The credibility of the old King model in the eyes of 'line' officers was dealt a final blow when the Chief of the Bureau of Personnel, VADM B.J. Semmes, openly questioned the validity of the generalist model. In a 1966 policy memo from the Navy’s Chief of Personnel, distributed to *all* URL Flag officers, Semmes titled the memo with a simple sounding but troubling question: “Does the Navy have an approved, accepted, widely understood policy on educational (career development) requirements for unrestricted line officers?” [50] Semmes went on to remind the flag officers that until recently the Navy had an official policy of progressive and integrative education. He observed that the policy had been highly effective in producing the 'well rounded officers' in high command. In 1966 a remarkably high percentage (176 of 217) of URL flag officers had attended a senior war college, a level of participation similar to King’s generation on the eve of the Second World War! [51] Though Semmes pointed to the large number of broadly educated admirals, he was uncertain in his support for the continuation of the King model. He explained that the old policy had proceeded on the "...general premise that service college is broadening and valuable for career officers..." But then Semmes questioned the premise, noting that no specific billets could be found to justify such a system of broadening education. Semmes articulated the idea that for education to be valuable, it had to be linked to a coded billet of some sort. If education could not be linked to a coded requirement, then the value of the education was questioned: "...if

[50] B.J. Semmes, Jr., VADM USN,"Policy on Education for Unrestricted Line Officers, Memo from Chief of Naval Personnel, dtd 9 Feb 1966, to all Unrestricted Line Flag Officers," Naval War College Archives, RG 27, Box 1966, folder "Educational Policy".
[51] Ibid., 4.

service college training is valuable, then it must follow that billets wherein such training is a prerequisite could be readily identified."[52]

The mere fact that the highest ranking personnel admiral would ask the question as he did, and then fail to endorse the old model, undermined the old model. Semmes' memo was tantamount to an admission that the King model no longer enjoyed wide support in the 'line'. Semmes' memo sparked a wave of responses, but most officers seemed uncertain which Navy policy best developed leaders of the future.[53] VADM Fitz-Hugh Lee was perhaps representative of the responses when he asserted that there no longer existed an agreed-upon policy for officer development, but that one was badly needed.[54]

As the 1960s wore on, the Rickover-inspired officer model began to gain more adherents. Though the larger non-nuclear navy might never admit what it was doing, the unrestricted line officers were moving toward the technical expert model propounded by Rickover. One of the Navy's most senior officers, Pacific Fleet commander, ADM Roy Johnson, noted that in this period Navy promotion boards began to penalize officers who left the platform community to pursue any sort of education or training not associated

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[52] Ibid., 5.

[53] It is interesting to note that Admiral Nimitz, the last great war-hero exemplar of the King model, died 20 Feb 1966, about the same time Semmes sent out his memo of 9 Feb 66. One of the important factors in paradigmatic change according to Kuhn is generational change, the physical death of the preceding generation, which thereby provides an opportunity for new ideas and patterns to take hold. But again, the Navy's transformation did not conform neatly to any one pattern. When Rickover was most powerful as a transformative leader (he promoted to four stars at the age of 73), he was past retirement age and if he had been an 'average' officer, he should have been dead.

[54] Fitzhugh Lee, VADM USN, Letter to CNP, 11 March 1966: "Comments on Policy on Education for Unrestricted Line Officers". In response to Semmes' question as to whether or not a recognized policy of officer development existed, he answered: "No (there is no policy), and it badly needs one (a policy)."

with the platform community.[55] Navy planners also noted the decline in the number of officers interested in graduate and service education and proposed several policy changes to reverse the trend.[56] The myriad attempts to increase service school attendance rates were, like Semmes "all flag" message, a further sign of professional confusion surrounding the identity and qualifications that should define the 'line' officer.[57]

The aviation and surface communities began in this period to refocus their officers on the narrower needs of the platform community. Community detailers began to downgrade general education in their order of priorities. Within two years following Semmes memo, line officers going to the war college dropped off dramatically. As a consequence, the navy officer share of the student body reached the lowest on record.[58] Furthermore, the most 'promotable' line officers increasingly avoided graduate education at Monterey, a decline that persisted into the latter years of the century. [59]

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[55] Roy Johnson, ADM USN,"Ltr to Chief of Naval Personnel, dtd 17 March 1966", NWC archives, RG 27, PME policy 1964-1966, Johnson ltr 17 March 1966 to CNP. Johnson argued that the navy penalized officers who pursued education. What is noteworthy is that Johnson was not an academic admiral, but a fleet commander who had oversight of South East Asia. He was, so to speak, on the 'Front Lines', yet he still considered education to be a matter of critical importance.

[56] Multiple reform efforts were initiated by successive war college administrations in an effort to stem the slide in student numbers and quality, but to no avail. For a detailed explanation of the various reform attempts in the 1960s and 1970s, see John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984).

[57] It is important to note that this shift in values to specialization, away from integrated knowledge, as represented by falling war college and graduate school attendance, occurred before the full weight of the Vietnam War was felt. Thus the crisis in officer models did not originate with the Vietnam War, though the war may later have aggravated the tendency of community leaders to limit officers to community assignments.

[58] A. Pickert, and D. Morgiewicz,"NWC Staff Study 1968: Comparison of NWC and NPS Quotas", NWC Archives, RG 17, box 3, Staff Study 8 Aug 1968. The study shows that the Naval War College in 1967-1968 experienced its lowest navy enrollment in history: naval officers were outnumbered by other services and organizations 57-38. Specifically, see pg. v., see also NWC briefing of May 1968, chart showing dramatic drop in attendance beginning mid 1960s, pg. iii-1; The document makes the point that the secular decline in C&S school was especially significant given the closure of King's General Line Course in 1962.

[59] The most academically gifted officers in the late 1950s were nuclear officers and many went to graduate schools under the Burke Scholarship. In the early to mid 1960s, up to 60% of navy line PhDs in the Burke program were nuclear officers. However nuclear officer participation would drop off in the later 1960s. This pattern of falling attendance by the 'best' officers in graduate school would persist to the end of the century. See Linda C. Cavalluzzo,"Navy Line Officer Advanced Education Requirements for 21st

Admiral John T. Hayward, the President of the War College in the middle 1960s, saw the declining enrollment as a sign of the ascendance of the specialist model. The declining naval enrollment was spreading to other war colleges: navy officers filled only 129 of their quota of 168 seats at the senior joint war colleges. Some might attribute the vacancies to the Vietnam War. But the decline in attendance began before the war and, if comparisons with the Army are considered appropriate, the drain of the war as an explanation seems even less persuasive. While the Army was arguably more heavily committed to the war than were naval officers (with the exception of naval aviators flying in Vietnam), the Army filled 98% of their senior war college seats, while the Navy filled only 59% of navy seats.[60] It was also noteworthy that during this period the number of authorized war college student billets declined while those for educating technical sub-specialists increased.[61] If the war had been the main cause of declining officer education, it seems it would have affected both the integrative education at the war colleges and technical education. But criticisms from VADMs Hayward and Fitz-Hugh Lee, the commandant at the National War College, could be dismissed as complaints typical of 'educators', perhaps exaggerated in an effort to gain more funding.

Century", Center for Naval Analyses Report, 1998 Linda C. Cavalluzzo, *A Bottom-up Assessment of Navy Flagship Schools* (Alexandria, Va.: Center for Naval Analyses, 1998). Cavaluzzo shows that in the last two decades of the 20th century, graduate education was undersubscribed by those who were on the path to command. Furthermore, promotion was negatively influenced by attendance at graduate school. See Cavalluzzo, pg. 20.

[60] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 259. The year of 1967 is the first class wherein naval officers are in a minority at NWC. At the same time enrollment in technical degrees at NPGS climbed to 1442, an inversion further indicative of the shift to a specialist notion of the officer corps. Hattendorf's numbers, however, do not provide complete fidelity in that it is unclear how many line officers, and of what quality, were attending the joint service schools.

[61] A. Pickert, and D. Morgiewicz,"NWC Staff Study 1968: Comparison of NWC and NPS Quotas", NWC Archives, RG 17, box 3, Staff Study 8 Aug 1968, 193. Study shows comparison of change in quotas for specialization versus those of service school training. From 1958-1968, Post-graduate quotas for specialized education increased 100% while at the same time quotas for NWC increased only 20%.

But their assessments were corroborated by another source: a shifting conception of line officer captured in the officer manuals and career guides of the period.

The Navy's leading publication for officer career planning, Ageton's *Naval Officer's Guide*, which has remained in print and been periodically reissued for six decades, captured the shift in officer models in the 1960s. The authority of the document as a reflection of navy personnel policy is unquestioned: navy officials reviewed the text for accuracy, and the 'forward' to each edition was written by either the Chief of Personnel in 1960-67 or the CNO in 1970.

A first indicator of shifting officer models was a change of frequency in revisions to the career guides. The 1960s witnessed the rapid release of multiple revisions of the *Naval Officer Guide*, a dramatic increase in the frequency of revision that was symptomatic of the professional confusion and change of the period.[62] The multiple revisions reflected Ageton's attempt to stay abreast of an officer system that was in flux. Whereas during the thirteen year period from 1946 to 1959 revised editions were infrequent (updated only once, in 1951), the 10 year period from 1960 to 1970 witnessed no fewer than four revised editions (1960, 1964, 1967, 1970). Whereas in the 1960 edition all three communities adhered to King's system of integrative and progressive education, by the end of the decade the impending collapse of the King model is evident. The 1970 edition broke with the old King model and displayed for the first time a new model of technically specialized and platform-centric career paths.

[62]Periods of confusion and uncertainty within a professional body are sometimes associated with changing models or paradigms of thought. See Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2d ed. (Chicago: University of Chicago Press, 1970). Kuhn explains that a period of professional anxiety often preceded a 'paradigm shift' to follow.

The change in photographs and their placement telegraph a period of professional flux and the ascendance of nuclear power and the supremacy of technical specialization. Whereas from 1943 to 1959 the guide features the image of a single unifying technology--an aircraft carrier-- the 1964 edition features images of three platforms that corresponded to the three officer communities. The changing dust jacket of the book also tells a story of changed values. In contrast to earlier covers that featured a single officer crest and the star of the 'line' officer, the 1970 edition dispensed with the officer crest and replaced it with three separate images: a submarine officer at the periscope, a flight deck officer on a carrier, and officers on the bridge of a surface ship (see appendix, A-4, A-5). The three photos of the three platforms with their different officers operating their machines posed a stark contrast to past covers which featured the star of the 'line'. The changed cover conveyed the idea that the ‘line’ officer corps was no longer unitary and integrated but was instead three fragmented social groups identified by their platforms.

Graphical charts of the notional officer career path were included in every *Naval Officer’s Guide* after 1946. The changes in these charts, perhaps more than any other discursive element, capture the professional turmoil and change in the 1960s and attest to the diffusion of Rickover’s model into the broader profession. The submarine officer chart in the editions from 1951 to 1967 represented the submarine career as the *least* specialized of all officer communities in the Navy: the submarine officer served first on surface ships, was broadly educated as King recommended, and shared a career progression common with the surface officers later in his career.[63] Furthermore, the idea that all combat commanders (surface, submarine, air) were first and foremost members of

[63] Arthur Ainsley Ageton, RADM, USN (Ret) and William P. Mack, RADM, USN, *The Naval Officer's Guide*, 7th ed. (Annapolis, MD: US Naval Institute, 1967), 394.

a “general unrestricted line” officer corps was captured by a chart in 1951. The 1951 chart represents all 'line' officers as sharing a common educational experience.[64] The chart shows that all URLs are to be educated at graduate school *and* at the war college. The 1960, 1964, 1967 editions include a similar chart that depicts elements of *unified* officer education, which are almost identical in content with King’s model (1920). But the continuity reaching back to King is decisively broken in the 1970 edition.

The 1970 edition (8th) communicates a model of line officer who is specialized, a technical and platform expert. The most compelling evidence of the eclipse of the King model is found in the depiction of the General Unrestricted Line Officer (GURL) career: it is deleted from the guide! The GURL career had been charted in every guide between 1951 and 1967. The 1970 edition, however, eliminated the GURL career path in its entirety. The image is gone completely and with it in the minds of the readers is the general line officer. By implication, there is no 'well rounded', versatile officer, but only increasingly specialized officers.

The changes evident in Ageton’s series are echoed in the official *Bureau of Personnel Manual* and other career guidance documents. Changes in the official *Bureau of Personnel Manual* show the model of officer shifted decisively in the late 1960s and early 1970s. Successive editions of the manuals from 1925 to 1968 had consistently endorsed integrative education.[65] All editions from 1934 to 1968 used almost identical language to describe the knowledge all officers should aspire to attain: “A thorough

[64] Arthur Ainsley Ageton, RADM, USN (Ret), *The Naval Officer's Guide*, 4th ed. (New York: McGraw-Hill Book Company, 1951), 212.
[65] The Bureau of Personnel Manual of 1959 remained in print until approximately 1970. The latest copy found was a version from the Naval Historical Center which was updated with changes as late as 15 August 1968, by Charles K. Duncan, VADM USN. See copy of BUPERS Manual in Naval Historical Center.

knowledge of our nation's policies and the correct conception of the strategy necessary to secure our national success are essential parts of the mental equipment for higher command (defined in the manual as 0-5 command). Every experienced naval officer should possess, as a necessary component of his technical ('technical' added in 1951) knowledge, a thorough grounding in the principles and methods of naval strategy and tactics and of joint operations with other branches of the armed forces. Every commission officer should have sufficient knowledge to interpret correctly strategic dispositions, and the tactical decisions of our leaders. Education for supplying such knowledge and for the development of doctrine and good military character is necessary throughout our naval service." [66] The 1968 version went on to describe the phases of an officer's career and when such education should occur. The sequence in the 1968 manual approximated the sequence first laid down by King in 1920. Thus, the Navy, in this authoritative policy document and manual that was carried aboard every ship and station, continued to affirm the essentials of the well rounded officer, the King system, until approximately 1968.

After 1968, the *BUPERS Manual* made minimal mention of the general line officer. The official career guidance after 1968, preserved in a 1970s edition of the *Unrestricted Line Officers Guide,* contains no reference to the existence of the general line officer. The new guidance conveyed the idea of the unrestricted line officer corps as fragmented into three warfare specialties.[67] The elevated value attached to specialization

[66] Bureau of Personnel Manual, editions 1925, 1934, 1942, 1948, 1959. See in particular the 1968 updates to the 1959 edition, pg. 503.
[67] The BUPERS library collection was eliminated in 1998 when the bureau moved to Millington, TN. However, versions of the BUPERS manual from 1925 to 1968 were preserved at the Naval Historical Center. After 1968 the career guidance document that was preserved is a "NAVPERS" publication, entitled Unrestricted Line Officer's Guide, change one (1976). The preserved version echoes in even

was incorporated into the very structure of the manual. Unlike the *BUPERS Manual* of 1968 or Ageton's earlier editions of *Naval Officers Guide*, the 1970s *Unrestricted Line Officer's Guide* included but perfunctory remarks concerning the common qualities or capabilities of a "naval officer". In discussions of education or training, there was almost a complete absence of any reference to the words 'breadth", "broaden", or "general'.[68] Rather, in both structure and content, the officer career was depicted as that of the specialist who concentrated his attentions on the mastery of a single platform technology. The machine was central, as was single-platform training. Diversions from either the primary platform or platform training were implicitly discouraged. Not surprisingly, the practice wherein officers first served on surface ships before moving onto aviation or submarines was rare if non-existent by the early 1970s.[69]

Officer education, as opposed to training, appeared to be devalued in the 1970s manual when compared to the language of earlier BUPERS manuals. The introductory section of the later manual noted that a specialty and specialized training are necessary to a career, but advanced education was not a necessary part of an officer's development.[70] Graduate school was quietly discouraged since "…sufficient experience and exposure in a given field may obviate the requirement for graduate level education." [71] Non-technical graduate education fell further down the list of priorities. If an officer pursued

stronger terms the shift detected in Ageton's guide. See Bureau of Personnel Navy Department,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197.

[68]Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197 The only mention of these terms is in passing, in one paragraph in the surface officer section, see pg. 32.

[69] James F Calvert, VADM USN, "Thoughts Upon the Conclusion of a Four Year Tour," *Shipmate*, no. 4, April 1972, 9. Calvert explained that his efforts to revive this practice met with limited support. There is no record of later attempts to implement the common surface ship assignment after Calvert's failed attempt.

[70] Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197, pg. vii.

[71] Ibid., 8.

graduate education, the field of study was now restricted to technical fields! The Burke Scholarship, intended by its benefactor for study in technical or non-technical fields,[72] was reinterpreted to confine officers "...in a chosen scientific or engineering field."[73] Furthermore, navy-funded graduate study in English and history was now forbidden.[74] Education at the war colleges garnered minimal discussion: there was no mention of service school in the entire section for nuclear officers and only passing reference in the section for aviators and surface warfare officers. Most telling of the now low stature of progressive and integrative education, service school for aviators and surface officers was no longer described as a necessary or even desirable component in officer development. Rather, the service schools were just one option on a menu of hodge-podge items, apparently inter-changeable with any number of less career-enhancing assignments.[75] Future career guides well into the 1990s would follow the patterns established in the 1970s.[76]

The shift from generalist to Rickover's model of technical expert is reflected clearly in the changes of the *BUPERS Manual* of 1968 and the career guidance

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[72] David Alan Rosenberg, Interview with the Author, 15 June 2007.

[73] N.R. Thunman, RADM USN, "Commanding Officer's Addendum, Unrestricted Line Officer Career Guidebook", Naval Historical Center, general collections, Call Number VA 52. A63 NAVPERS 15197 Addendum c.2, dtd 6 March 1979, 18.

[74] Ibid., 20.

[75] Bureau of Personnel Navy Department,"Unrestricted Line Officer Career Planning Guidebook, NAVPERS 15197", Naval Historical Center, Washington, D.C., collections, VA 52.A63 15197, pages 32, 39. War College was just another option, the alternatives being listed included NROTC instructor, a training officer, staff duty, or recruiting.

[76] G.W. Emery, *The Naval Officer's Career Planning Guidebook, NAVPERS 15605* (Washington, D.C.: Government Printing Office, 1990). The technical-specialist pattern of officer education appears in BUPERS guides well into the 1990s. In the 1990 edition there is no mention of general "naval officer" qualifications of education. The 1990 guide book, by its organization and layout, represents a naval officer corps as a collection of specialists, with almost no common educational and or integrative experiences. Of the three career paths, only the surface navy makes mention of integrative education (pg 22) before the rank of 0-6. For the submarine officer (pg. 35) and the aviator (pg. 61), the only integrative military educational experience is optional, but comes only after the 20 year point in an officer's career.

documents of the 1970s. The leadership role of Rickover, his philosophy, and his nuclear officers is all but certain. The timing is consistent; the interventions are recorded. Navy policy changed as Rickover and his reactors ascended in power and influence. But the *BUPERS Manual* alone does not persuasively show which community of officers led the change. However, a synthesis of the *BUPERS Manual* changes with those recorded in *Naval Officer's Guide* shows clearly that the nuclear submarine path was the prototype for the changes that followed.[77]

The leadership role of the nuclear community is confirmed by a comparison of career development charts in the *Naval Officer's Guide*, eighth and ninth editions. In the 1970 eighth edition, the nuclear submarine officer career path is *for the first time* represented as distinct from diesel submarine officers.[78] While the diesel submarine career path still included the King phases of integrative education and development (fundamental, advanced, final), in the nuclear chart the development and educational phases are all but absent; the nuclear career sequence is defined by the requirements of the ship and its reactor. Whereas in the submarine officer charts prior to 1970 an officer's career progression included substantial educational and broadening assignments, the requirements of the machine (the nuclear propelled ship) took command of the career progression after 1970 and continued in later editions (see image A-3). The chart of the

[77] See Appendix, pp. A-1, A-2, A-3 for relevant chart reproductions.

[78] Arthur Ainsley Ageton, RADM, USN (ret) and William P. Mack, VADM, USN, *The Naval Officer's Guide*, 8th ed. (Annapolis, MD: US Naval Institute, 1970), 384. The battle for identity between diesel officers and nuclear submarine officers is in full display on these pages. The diesel officers on their career chart still claim the moniker 'submarine officer career path' (no reference to 'diesel'). The nuclear officer career chart is laid directly next to the 'submarine' chart, but the nuclear chart includes the adjective "nuclear" that precedes the word 'submarine'.

nuclear submarine career is thus the first community model to delete reference to "rounding out" an officer's career or educational experience.

The dominance of technology in the officer career path did not remain unique to nuclear submarine officers. The surface and aviation communities within a few years followed suit, evidenced in later editions of the *Naval Officer's Guide*: the surface and aviation career models eliminated any reference to 'rounding out' and instead adopted a career pattern strongly similar to the nuclear submarine depiction of 1970. Integrative education as represented by the King phases of development disappeared, replaced with an emphasis on technical training and sequential assignments focused almost exclusively on manning the platform.[79] Admiral Carney's 1954 concession to allow for temporary specialization in nuclear power had, by the early 1970s, become the *permanent* model for the entire navy 'line'.

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Failed Counter-Revolution:

Studying Engineering, Not War in the *War College*

The fleet-wide diffusion of Rickover's ideology of technical specialization did not proceed unopposed. While the personnel managers and many aspiring ship captains warmed to the relative simplicity of a specialist model of command--concentrate on one machine in order to maximize opportunity for command--a collection of senior officers

[79] The specialist career model, first pioneered by the nuclear submarine career, would prove to be a prototype that both the surface and aviation communities followed. See Naval *Officer's Guide*, 9th edition, images of surface and aviation career paths which strongly resemble the lay-out and structure of the 1970 submarine path. William P. Mack, VADM, USN and CAPTAIN Thomas L. Paulsen, USN, *The Naval Officer's Guide*, 9th ed. (Annapolis, MD: Naval Institute Press, 1983), 377-378.

opposed the new model. Admiral Bud Zumwalt was perhaps the most vociferous opponent of the Rickover view of the 'line', but he was not alone. Admirals Stansfield Turner and Harry Train, and Vice Admiral James Stockdale-- even some of the first generation of nuclear officers--recognized the dangers of a 'line' of specialists. Norman Friedman explained that Zumwalt's goal was to "… encourage American Naval officers to be patrons of a common mission and strategy rather than of discrete technologies..." [80] At varying times over a two decade period, Zumwalt and the other officers attempted to counter-act the effects of specialization in the 'line' and regain elements of integrative education and a common identity. That the counter-reform attempts failed is explained by the momentum and persuasive power associated with large socio-technological systems. The material of planes, reactors, and radars attracted the attention and time of the best officers who spent their sea duty on the platform and their shore-duty close to their parent community. This highly talented group of officers then became persuasive advocates for their community of fellow platform specialists. CNO messages and service college presidential speeches advocated that officers travel to Newport to study the 'art of war', fleet operations, and strategy. But such exhortations were, as Admiral Stirling had warned decades before, at a severe disadvantage to the material and thus went unheeded.

Turner and Stockdale, key figures in the counter-revolution, attempted from their position as presidents of the Naval War College to restore balance to the officer corps. Zumwalt, who feared an increasingly parochialism in the thinking of more junior officers,

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[80] Norman Friedman, "Elmo Russel Zumwalt, Jr., 1 July 1970 to 1 July 1974," in *The Chiefs of Naval Operations*, ed. Robert William Love, Jr., (Annapolis, MD: Naval Institute Press, 1980), 378.

sent Turner to Newport.[81] Turner is widely known as the officer who reinvigorated the Naval War College curriculum, raised faculty standards, and enhanced the profile of the institution among the world's military professions. Turner instituted these important reforms in an effort to compensate for what he described as the "…creeping intellectual devitalization..." at the Naval War College.[82] A wave of important conferences, publications, and war-game lessons emanated from the college while he served as president in the early 1970s. However, in perhaps his most important task—to draw the best officers to the Naval War College—Turner failed. He was unable to overcome the opposition of warfare community detailers and personnel officers who valued specialized community assignments over the integrative officer education which Newport offered. Turner reflected years later that he had made a mistake: he had wanted to reinvigorate the War College so that it would become a magnet for the best officers, who would then *voluntarily* seek assignment for a year of higher-level education. But the officers Turner sought did not respond voluntarily.[83] John Hattendorf, a leading scholar of the War College, noted the problem was that the "...NWC faced the ever increasing problem of obtaining appropriate students…"[84] Admiral Turner was more blunt in his assessment: "…the best did not come."[85]

What Turner had failed to overcome was the diffusion of the technical specialist identity in the minds of the officers of the 'line'. Officers were increasingly aware that,

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[81] Ibid., 370.
[82] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 283.
[83] Stansfield Turner, Admiral, USN (retired), Interview with the Author, 14 September 2005.
[84] John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 179.
[85] Stansfield Turner, Admiral, USN (retired), Interview with the Author, 14 September 2005. See also, Frederick H. Hartmann, *Naval Renaissance: the U.S. Navy in the 1980s* (Annapolis, Md.: Naval Institute Press, 1990), 172.

as VADM Semmes had revealed with his fleet-wide message in 1966, the Navy no longer enforced nor supported the integrative and non-technical education of 'line' officers. There was no quantifiable link between a war college education and assignment to specific billets, so war college education was seen as increasingly superfluous. Moreover, unlike the pattern that sustained from 1920 to 1966, promotion boards were discounting the value of integrative war college education when compared with more time spent with the parent community. Time away from a community, even if it helped the officer gain a broader picture of the Navy and of integrative and joint warfare, was viewed as a ‘black mark’. The likelihood of promotion was fast becoming inversely proportional to time spent in either graduate school or the war college.[86]

Stockdale, too, believed in the importance of integrative education provided by the War College and tirelessly promoted the institution. Stockdale, a decorated combat veteran and survivor of years in a North Vietnamese prison camp, urged the Navy to reemphasize advanced education that pushed officers beyond narrow technical specialization and the management of machine systems. Stockdale feared that, even among line officers, the “... manager came, almost consciously to eclipse the warrior…”[87] But Stockdale’s exhortations failed to stem the slow decline in ‘line’ officer attendance at the war college. Rather than attract more officers to its non-technical curriculum, Stockdale may have served only to prompt an unprecedented intervention in the war college curriculum by leading nuclear-trained admirals.

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[86] Roy Johnson, ADM USN,"Ltr to Chief of Naval Personnel, dtd 17 March 1966", NWC archives, RG 27, PME policy 1964-1966, Johnson ltr 17 March 1966 to CNP; Linda C. Cavalluzzo,"Navy Line Officer Advanced Education Requirements for 21st Century", Center for Naval Analyses Report, 1998; Linda C. Cavalluzzo, *A Bottom-up Assessment of Navy Flagship Schools* (Alexandria, Va.: Center for Naval Analyses, 1998).

[87] Stockdale as quoted in Michael Vlahos, *The Blue Sword: The Naval War College and the American Mission, 1919-1941* (Newport: Naval War College Press, 1980), 158.

Stockdale's successor was confronted with aggressive interventions by the first wave of Rickover's technical protégés who were now reaching senior flag rank. In one case illustrative of the rising power of technocratic thinking, VADM James D. Watkins, the nuclear-trained personnel chief, proposed in 1975 a fundamental redirection of the Naval War College. He suggested the War College move away from the study of strategy and policy and move toward the study of the technical aspects of current operations.[88] A detailed discussion of the issues and debate are beyond the scope of this paper, but a few points are worthy of note. Stockdale's successor, VADM LeBourgeosie, had worked to build on Turner's and Stockdale's efforts, to raise the educational and academic profile of the college. But Watkins' proposals would, in the words of the Chief of Naval Education and Training, VADM James B. Wilson, shift the curriculum to one that promoted the study of "…enemy threat parameters, missile radar frequencies, and the like—all subjects better taught at the Surface Warfare School, Submarine School, Readiness Squadrons..."[89] Such a redirection, Wilson further warned, would transform the war college into more of a "trade-school" and less of an educational institution. In the end, the dispute of conflicting visions of the war college was resolved by the CNO, Admiral Holloway. He upheld VADM Watkins' recommendation to expand the technical content of the curriculum.[90] This decision to lean toward the technical over the strategic is all the more remarkable given the then recent Office of Secretary Defense directive of 5 June 1975 to the Service Secretaries. In this directive the civilian leadership urged the Service

[88] James D. Watkins, VADM USN," Ltr from VADM James D. Watkins, Chief of Bureaus of Personnel to Chief of Naval Operations, dtd 13 April 1977", NWC Archives, RG 27, File "PME Policy 1974-1977".
[89] James B. Wilson, VADM USN (CNET),"Ltr from Chief of Naval Education and Training to Vice Chief of Naval Operations, dtd 17 June 1977", NWC Archives, RG 27, File "PME Policy 1974-1977", 1.
[90] James L. Holloway, III ADM, USN,"CNO Decision Memorandum to PNWC, CNET, CNP of 11 July 1977", NWC Archives, RG 27, File "PME Policy 1974-1977".

Secretaries to *broaden* officer education beyond the traditional specialties.[91] This example serves as yet one more signpost on the road to a techno-centric mode of training, education, and even thinking that was coming to dominate the values of the uniform officers.

While rear-guard actions against techno-centrism were failing at the War College, some senior civilians attempted to undo some of the Rickover reforms at Annapolis. In the mid-1970s, the Deputy Secretary of Defense, William Clement, chaired what became known as the Clement Committee. The committee sought to deemphasize technical specialties in favor of general education and encouraged the adoption of a more joint and integrated common core. The board recommended Annapolis re-emphasize the military aspects of the program by increasing the share of officer instructors relative to civilians. It further recommended strict limits to civilian tenure to "...that percentage of faculty members needed to maintain institutional memory..." [92] The Naval Academy, under the leadership of Vice Admiral Mack and later Vice Admiral Kinnaird McKee, a nuclear trained officer, resisted the Clement committee recommendations.[93] The identity of the Naval Academy as an engineering college that served as the primary source of nuclear officers continued to solidify in the 1970s. By 1979 the influence of the nuclear program was so powerful, and the idea of a naval officer as a technical expert so engrained, that engineering training became the highest priority of the naval officer corps. In late 1979, as the military confronted in Iran global Islamic terrorism, the momentum of Rickover's

[91] Author has copy, which is also retained at the Naval War College, NWC Archives, RG 27, File "PME Policy 1974-1977".

[92] W.P. Clement, Deputy Secretary of Defense,"DOD Committee on Excellence in Education: The Service Academies: Conclusions and Initiatives (The Clement Report) dtd 28 April 1975", NARA RG 405 USNA Special Collections, Studies and Reports, Curriculum 1970-75, Box 5.

[93] Jack Sweetman, *The U. S. Naval Academy: an Illustrated History* (Annapolis, Md.: Naval Institute Press, 1979), 236-238. See discussion of VADM Mack's tenure, which included the issues of the Clement Committee.

program remained unabated. In that year the Navy again drafted midshipmen involuntarily into the nuclear engineering program.

Other training and educational initiatives serve as further evidence of the diffusion of Rickover's technocratic ideas to the larger fleet. The Navy witnessed perhaps the ultimate manifestation of the technocratic idea of command in the deserts of Idaho: senior commanders, captains, and even admirals in large numbers were diverted from the study of tactics and operations and required instead to study engineering systems. The Rickover policy of mandatory, in-depth engineering education as a prerequisite for nuclear command became in the mid 1970s a fleet-wide, compulsory policy for all commanding officers. Prior to taking command of any conventionally-powered surface ship or group of ships, the putative commander was required to complete Rickover's course in engineering. Rather than study operations, strategy, and war at a *war college*, senior officers en masse now went to nuclear prototype facilities to complete a course of study known best by its acronym: SOSMRC, Senior Officer's Ship's Material and Readiness Course.

The SOSMRC material course and its influence on officer assignment arose out of a crisis in the fleet readiness of surface ship propulsion systems. By the middle 1970s, the surface fleet of ships was in poor condition. Driven hard by the Vietnam War and starved of maintenance funds by higher priority programs, the propulsion plants of surface ships were increasingly unreliable. Justifiably concerned by the deteriorating condition of the surface fleet, Admiral Holloway, the Chief of Naval Operations, turned to Admiral Rickover for advice. In consultation with VADM James Watkins, the nuclear trained personnel chief, Holloway asked Rickover to assume control of the commanding officer engineering training. Under the new system, all commanding officers (including many admirals) would be required to complete an intensive, nuclear-style engineering course of instruction prior to assuming command of the Navy's surface ships and surface groups.

Admiral Holloway saw in SOSMRC something more than just a remedial program, however. He envisioned SOSMRC as a tool to effect a long overdue shift of officer attention away from the study of tactics and weapons to the study of engineering fundamentals.[94] Holloway believed that the concentration on command and control and weapons had come at the expense of propulsion engineering. Holloway saw an urgent need to restore the professionalism and pride of ships engineers: "It didn't take me long to identify the root cause of the problem. The entire professional area of naval engineering had been neglected since WWII. Command and control and weapons were the glamorous assignments in the surface ships. If a line officer hoped to get ahead in the Navy, engineering duty was to be avoided at all costs." Admiral Holloway explained the inspiration for his program was Rickover's philosophy of engineering education and assignment policy: "Rickover's example of deep immersion of prospective commanding officers in engineering had impressed me."[95] Holloway adopted as his own Rickover's deeply held conviction, justified by the Act of 1899, that 'line' officers must be engineers.

Holloway planned to go yet further in his effort to make 'line' commanders into engineers. He planned to require all prospective commanding officers to serve first in the

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[94] James L. Holloway, III, ADM USN (CNO), *Aircraft Carriers at War: A Personal Retrospective of Korea, Vietnam, and the Soviet Confrontation* (Annapolis: US Naval Institute 2006), 355.
[95] Ibid., 355, 356-362. For discussion of the need to shift emphasis to engineering, see pg 355; for the powerful influence of Rickover over his thinking, see pp. 356-62.

engineering department of a sea-going ship.[96] As this assignment requirement proved logistically difficult to impose, he relented and required only that commanders attend SOSMRC, as discussed previously. Attendance at SOSMRC was vigorously enforced such that some officers who were not inclined to the study of engineering were weeded out of the officer ranks. Holloway noted that some officers refused to attend the engineering course as a matter of principle, in which case they were removed from the command list. But according to Holloway, "...the quality of the cadre of commanding officers was not diminished by the removal of these officers..." [97] What is further remarkable is that this major change in officer assignment policy was developed and implemented without consultation with the surface leadership, but was the policy decision of Holloway, Rickover, and Watkins. With SOSMRC, Rickover's ideas diffused through the fleet and were communicated to every commanding officer, the group from which all future senior leaders would be chosen. A large number of ship captains, numbering near a thousand, would ultimately pass through this intensive engineering training school.[98]

The diffusion effect of Rickover's program was unprecedented both in the number of captains it involved, but also in the number of senior policy-makers it reached. Rickover was able through this program to re-educate a large number of flag officers to focus first on the material, on engineering, and second on operations and integration.[99] Even Secretary of the Navy Middendorf was persuaded to devote a substantial share of

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[96] Ibid., 355-56.
[97] Ibid., 359.
[98] Thomas B. Buell, "The Education of a Warrior," *US Naval Institute Proceedings,* 107, no. 1, January 1981, 41-45. Within three years of the start of the program, already several hundred ship captains had attended the course. The program continued until the 1990s and thus, at 50 captains a year, well over a thousand would have been trained by the end of the program.
[99] Ibid. Within the first three years already two dozen flag officers had attended SOSMRC.

his time to engineering training and inspection issues. The CNO asked the Secretary to visit as many ship engine rooms as possible. The CNO explained to the Secretary: "After just a couple visits, I told him, you will know what to look for—in the bilges and firesides, for example—and will be able to speak knowledgeably about what you see." Holloway summarized the effect on the Secretary: "The final upshot was that Secretary of the Navy made more than 350 ship visits in the fleet, for the express purpose of inspecting the engineering spaces and visiting the engineers, in nearly every case climbing into a boiler opened for cleaning."[100] One is left to wonder how much time remained, after several hundred boiler inspections, for the Secretary to do much of anything else.

The nuclear model of the 'line'—of technical specialist and the engineer--remained ascendant, and if measured by promotions to high rank, the nuclear officers came to dominate the Navy by the early 1980s. All new submarines and all aircraft carriers under construction were nuclear. As late as the mid 1970s, all future large surface ships were, by Navy plans, to be nuclear powered. With SOSMRC an important change had been effected in the qualification for command of any and all surface ships, non-nuclear included. Threatened with a nuclear-takeover of the Navy through training initiatives like SOSMRC and by the construction of nuclear cruisers and carriers, the conventional surface officers and aviators took action to defend their community of officers. The non-nuclear aviator and surface officers embraced deeper specialization as a defensive bulwark against Rickover.

[100] James L. Holloway, III, ADM USN (CNO), *Aircraft Carriers at War: A Personal Retrospective of Korea, Vietnam, and the Soviet Confrontation* (Annapolis: US Naval Institute 2006), 361.

Part of the reason non-nuclear officers adopted the Rickover model of technical expertise and specialization was that it brought substantial bureaucratic advantages, especially those of defensive protection. Rickover's parochial model engendered in the broader Navy what could be called a "defensive technicalization", a tactic of bureaucratic competition.[101] Non-nuclear surface and aviation officers came to fear the rise of nuclear power, but so persuasively did the idea of technical specialization appeal that in their efforts to assert their independence they adopted similarly specialized and technically narrow programs and strategies. In the surface navy, the most successful bureaucratic defense against the nuclear ideology of engineering specialization was not breadth and integration, but the creation of the specialist community of "surface warfare". The creation of a specialized surface warfare identity marked an important shift from a 'generalist' identity to one of the 'specialist'.[102] The shift toward a specialist identity became particularly evident as the most successful surface officers embraced a radar

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[101] Jon Tetsuro Sumida, "Forging the Trident: British Naval Industrial Logistics, 1914-1918," in *Feeding Mars: Logistics in Western Warfare from the Middle Ages to the Present*, ed. John A. Lynn (Oxford: Westview Press, Inc. , 1993), 234. Sumida postulates that the dramatic expansion of Royal Navy bureaucracy in the First World War was a complex phenomenon. The expansion cannot be fully explained by the increased output in war material or even planning, or by the direct administrative needs of the war effort. Rather, the expansion was in part a result of bureaucratic competition between departments of the Royal Navy. In a similar way, the personnel innovations and rise of highly specialized groups in the surface and aviation communities of the US Navy may have been in part driven by 'defensive' strategies of the groups. Such a claim is in part substantiated by the observations of a mid-grade author writing in the 1980s about the relative isolation of the nuclear community from the other communities. See Albert H. Konetzni, Jr., CDR USN, "Comment," *US Naval Institute Proceedings*, 107, no. 2, February 1981: "The forced lateral transfer draft of qualified warfare specialists in to the submarine forces in the early 1960s further polarized the two groups—nuclear submariners and all others—and resulted in a situation in which the submarine community was forced to solve its manning problem alone. "

[102] Robert B. Pirie, VADM USN (ret), "1958: The Transition Year," in *Into the Jet Age: Conflict and Change in Naval Aviation, 1945-1975*, ed. E.T. Wooldridge, Captain, USN (ret) (Annapolis, MD: Naval Institute Press, 1995), 70. Pirie noted that he, among others, had pressured the Chief of Naval Personnel to compel surface officers in the early 1960s to adopt a shore-based technical training system akin to aviators and submariners, but that the surface officers had resisted. The surface navy may have ignored Pirie, but in the face of the expanding nuclear fleet, by the mid 1970s adopted the nuclear priority on platform centric, technical training in place of broader and integrative education.

system as a symbol of a new surface warfare officer specialist. The AEGIS[103] community created by RADM Wayne Meyer, an engineering duty officer like Rickover, helped blunt the nuclear drive to take over the surface fleet. But AEGIS could blunt Rickover's efforts only by replacing one technical specialty with another. In time, officers not so fortunate to be assigned to an AEGIS ship were threatened with marginalization and would complain that the AEGIS specialists were dominating the surface navy. [104]

In an effort to protect the socio-technical group of aviation from the power of Naval Reactors, aviators also embraced further specialization as a defensive tactic. Secretary Lehman feared the winnowing effect the nuclear engineering selection process would exert in the aviation community. Unless the policy was changed, when all aircraft carriers became nuclear only nuclear-trained officers would promote to flag rank.[105] In an effort to provide an alternative career path for aviators who were not particularly adept at engineering, the community embraced a model of narrow specialization known as commander of the carrier air group (CAG). But CAG as a path to flag was itself a solution based upon further specialization: an aviator rising to flag could indeed avoid the study of nuclear physics, but he was no longer broadened by command of a surface ship. One could argue that the CAG officers were more narrowly specialized than the early generation of aviator leaders, and perhaps even more narrowly experienced than the

[103] AEGIS is the name given to a highly sophisticated radar fielded in the late 1970s. Cruiser platforms later became defined by the radar and were known, in contrast to 'nuclear' cruisers, as 'aegis' cruisers.
[104] Wayne Meyer, RADM, USN (ret), Interview with the Author, 23 March 2007. RADM Meyer, an EDO specializing in ordnance systems, explained that he patterned much of his program, to include officer training, after Rickover’s system.
[105] James L. Holloway, III, ADM USN (CNO), Interview with the Author, April 26, 2007.

nuclear-trained aviators, all of whom were required to command a surface ship before taking command of the aircraft carriers.[106]

The machine had become by the 1980s so influential in the career of an officer that many feared that the first assignment in a long career could become determinative. If the first assignment, even as an ensign, were to the 'wrong' type of ship or aircraft, an officer's career path to higher command might be seriously compromised. If an officer was assigned as an ensign to an amphibious ship, he might henceforth be considered an 'amphibious sailor', and his prospects to be a future CNO would be almost zero. An ensign chosen to fly helicopters or anti-submarine aircraft was confronted with a 'glass ceiling' in his climb to four stars, a ceiling that had not existed in the time of the 'generalist' officer. By the 1970s, luck in aircraft or ship assignment combined with superior performance with a singular platform-- not integrative knowledge of the Navy or wide experience-- became the preferred path to high rank and command.

When the surface and aviation communities embraced more narrow specialization, King's idea of a unified and integrated 'line' was lost. In the place of a unified line emerged three de-facto independent professions organized and trained predominantly on their respective machines. By 1970, organizational charts of the CNO's office reflected the division of advisors along three platforms, a distinction which

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[106] Illustrative of this narrowing of focus is the experience of an aviator CNO in the later 20th century who had served as a CAG, not as a nuclear carrier captain. Though his detailed service record is not available for review, it is commonly believed that Admiral Jay Johnson, CNO 1996-2000, never served as a member of ship's company on any commissioned ship during his career. The contrast of Johnson's career with the prior generation of aviators is striking. For example, a collection of leading aviation admirals from the 1940s to 1970s, who contributed to the book chapters for *Into the Jet Age*, was widely experienced as members of ship's company in addition to their time in the cockpit. Of the twelve aviator flag officers who contributed to the book, ten of twelve had been surface ship officers prior to reporting to flight school, and then in almost every case followed with command of one or more surface ships. See E.T. Wooldridge, Captain, USN (ret), *Into the Jet Age: Conflict and Change in Naval Aviation, 1945-1975* (Annapolis, MD: Naval Institute Press, 1995).

was absent in the organizational charts of 1962.[107] In parallel, attendance of the best officers at integrative institutions or assignments—the Naval War College and joint war colleges—fell out of favor. The technology had now assumed a dominant role in making and choosing the admirals and commanders of the future.

By the early 1980s, the larger naval officer corps was beginning to express a growing unease with how the education of naval officers had changed. The Navy's leading professional publication, the Naval Institute *Proceedings*, carried almost a half dozen articles that debated the relative merits of the technically specialized officer versus what had been known as the generalist (though this term had fallen out of favor).[108] Retired admirals joined in the public discourse, and one, a former supporter of Rickover, criticized the admiral's technical ethos which was spreading through the officer corps' education and career development practices.[109] While the admirals pointed to Rickover as 'the problem', they failed to appreciate that many of their own organizations had

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[107] Frederick H. Hartmann, *Naval Renaissance: the U.S. Navy in the 1980s* (Annapolis, Md.: Naval Institute Press, 1990), 54.

[108] Thomas B. Buell, "The Education of a Warrior," *US Naval Institute Proceedings*, 107, no. 1, January 1981; Alan T. Isaacson, Captain USN, "Comment and Discussion," *US Naval Institute Proceedings*, 107, no. 7, July 1981; R. A. Dun, LCDR USN (CEC), "Comment and Discussion," *US Naval Institute Proceedings*, 107, no. 1, February 1981; Charles C. Holcomb, CAPT USN (Deputy Commandant of Midshipmen, USNA), "Comment and Discussion on Buell and Golightly Articles," *US Naval Institute Proceedings,* 107, no. 8, August 1981.

[109] John T. Hayward, VADM, USN (ret), "Comment," *US Naval Institute Proceedings,* 107, no. 4, April 1981, 21-22. Hayward levied a spirited attack on Rickover and his legacy: "As an engineer, he (Rick) has few superiors. As a man to fight a war or to prepare a Navy to fight a war, he has much too narrow a vision. No one has been killed by a propulsion plant, nor have many ships been sunk by one. A surface ship or a submarine is nothing but a vehicle to bring weapons into a position where they can be employed effectively. He (Rickover) is right where he belongs, running a complex technical program and doing it well. However, few in the Navy hierarchy have challenged his forays in fields where he lacks the competence to make valid judgments. ...Events have overtaken him. The educational requirements of a modern professional naval officer have little relationship to his idea of what a 'nuke spook' should be. " Hayward went on to ask: "Where are the Mitschers, Halseys, and Spruances of today? Are they....maintenance people?" Hayward concluded: "Admiral H.G. Rickover, one of our admirals least acquainted with war, is one of the Naval War Colleges severest critics. The height of Adm Rickover's foolishness about preparing a Navy for war is the Senior Officers Ship Material Readiness course. Let no one doubt that it was his drive that brought in into being."

adopted a new philosophy of specialization. Technical specialization, as opposed to integration, was becoming deeply embedded in the ‘line’ profession’s role models, curriculum, career paths, books, and publications. Getting Rickover to retire was no longer a solution to redirecting the officer corps, as subsequent events would show.

Several senior officers, including successive war college presidents and leaders of the Navy, perceived what they considered a disturbing shift in the ‘line’ to ever more narrowly technical and specialist orientation. A handful of senior officers in a sign of unity removed their platform-warfare devices or pins, but at least one four star admiral was quietly chided by the CNO and ordered to resume wearing his specialist pin.[110] Others pointed to the war colleges and argued that, though the seats might be filled, the best officers still did not come. But it was too early to say with certainty if the Navy's future leaders were being broadened or narrowed in their education and assignments. The ultimate evidence of the Navy's command culture would be the type of officer who rose to high command. What type of officer was rising to command: the integrative officer or the technical expert and specialist? With time the statistical analyses of the changing ranks of senior commanders did indeed show a shift in the model of those who rose to command. Rickover's technical expert model of command gradually came to define the highest ranks of the surface, submarine, and aviation admirals.

[110] Harry Depue Train, ADM USN, Interview with the Author, 2 November 2007. Admiral Train explained that while he served as Commander, Atlantic Fleet, he removed his warfare device in a show of solidarity with the ‘general line’. He was however ordered by the CNO, Admiral Thomas Hayward, to resume wearing the device.

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Taking Stock: The Promotion of Technical Experts to High Command

The changing qualifications and education of those who rose to high command showed a change in model: the generalist was replaced by the technical expert in command. The King system of officer development as measured by its product, senior officers, had been eclipsed. Despite the efforts of numerous admirals and even some political leaders, the techno-centric and platform-centric die that had been cast in the early 1960s determined the type of flag officer who rose to the highest ranks two decades later. As Admiral Pride and his board of admirals observed in 1963, the creation of senior leaders takes a generation and "...as for potential flag officers....the education and training die was cast in the relatively distant past, more on the basis of the needs of the Navy at that point in time..." [111]

The first signs of change in output in the production of specialist commanders were detected in a study conducted in the 1970s by the Bureau of Personnel. The study analyzed promotion patterns and determined that by 1973 a discernible pattern had emerged wherein the traditional general line officer (distinguished by multiple platform experience and broad assignment variety) was being replaced in *lower* level decision-making positions by those identified through education and practice as specialists.[112]

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[111] Alfred W. Pride, ADM USN (Ret),"Criteria for Selection to Flag Rank in the USN, Report of Board 20 February 1963", NARA RG 24-470-54-25 Box 6 part 3, pg 2.

[112] Richard Webster Hunter, "Developing the new decision-makers: a qualitative analysis of the Navy subspecialty system" (Thesis Ph D --American University, 1973), 220-221. Hunter concluded that by 1973 "specialists" had risen to the lowest rung of 'decision makers' in the Navy. Decision makers had not yet risen to flag rank, but they represented a shift in the model from generalist to specialist. The trend in 'promotion marks' indicated the traditional general line officer (those officers who served on multiple platforms and had a broad range of experience) were being replaced by those identified by education and

The study was, however, conducted too soon after the change in model to discern the down-stream implications at the higher ranks of three and four star flag rank.

An analysis of longer term trends was possible by 1990, and the evidence of a shift in senior officer models is persuasive. The educational credentials of 'line' officers rising to high command (three and four star rank) reflect a shift in beliefs about how an officer should be educated and professionalized. The shift had its origin in officer career decisions made in the second half of the 1960s and early 1970s. The metric used to measure the shift was the propensity of elite officers (those who would rise to the top leadership ranks) to broaden their education and development beyond their specialty and beyond the Navy. An indicator of shifting attitudes is the change in propensity of elite officers to choose to be educated at a non-technical, non-navy institution. Attendance at the National War College was chosen as the metric: the college was a non-technical, non-navy educational institution, most strongly associated with broad, general knowledge of warfare, yet advanced enough on the progressive educational sequence that an officer could not casually seek assignment to the year long course.[113]

From the period 1948 to 1966, the Navy sent a steady stream of its best officers to the National War College as evidenced by two decades of prolific flag promotions

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practice as specialists. But interesting, the specialist education was in most cases NOT utilized in the specialist's field. Only 36% of officers used their education subspecialty in the related field. Instead, the majority of the 'specialties' were attained by training or experience, a model very much in line with Rickover's approach which placed emphasis on technical training and certification through technical examinations (e.g. the engineers exam), a process that did not require graduate education, but in fact, came to displace graduate education for many officers.

[113] National War College was chosen over the Industrial College of the Armed Forces in part because the latter college attracted more staff and supply corps officers which would possibly detract from the focus on unrestricted line officers. The Naval War College experienced a similar decline in both quality and quantity, the percentage of naval officers attending Newport falling to an all-time low in the classes of the later 1960s. See John T. Hayward, VADM, NWC President,"Subj: "Quality of Officers for NWC", letter to Chief of Naval Personnel dtd 12 April 1966", NWC Archives, RG 17, Staff Studies, Box 3, JT Hayward documents.

from these classes.[114] The pattern changed dramatically somewhere between 1967 and 1970: the classes after 1967 produced a minimal number of senior flags. In the first two decades following the Second World War, the period from 1948-1966, the National War College produced 21 four star admirals; the next two decades, 1967-1987, the college produced only 3 four star admirals. If measured over only a decade, the decline in integrative senior flag officers was still dramatic: from 1957-1967, National War College produced nine admirals of four star rank; between 1968- 1978, the college produced only two full admirals. The change in three star admirals evidences a similar shift in values: from 1947 to 1966, only four classes produced *less than two* VADMs; after 1966, 17 of the next twenty years produced *one or no* vice admirals.

Stated another way, 77 VADMs were promoted from the National War College classes between 1947-1966; in the next twenty years after 1966, only 17 VADMs would be produced from this same college. In the decade from 1956-1966, 24 VADMs hailed from National; in the decade from 1967 to 1976, only 9 VADMs did. If the three and four star promotion patterns are viewed together, it is apparent that, prior to 1970, almost every class produced two or three senior officers (either admirals or vice admirals). For two decades after 1970, only a handful of senior officers would rise to senior rank out of combined output of twenty classes.[115] (See Figure 7-1) This data indicates that the shift in beliefs concerning an officer's career came in the middle to late 1960s. The best officers no longer sought to 'round out' their education at a joint war college. What is especially significant is that the 'best' officers began to shun war college *before* the

[114] *Directory of National War College Graduates*, (Washington, D.C: The National War College Alumni Association, 2003) Data compiled from year groups from 1947 to 1992.
[115] Ibid.

Vietnam War, and when hostilities ceased they never did return to attendance and promotion patterns characteristic of the 1950s and early 1960s. The effect was generational.

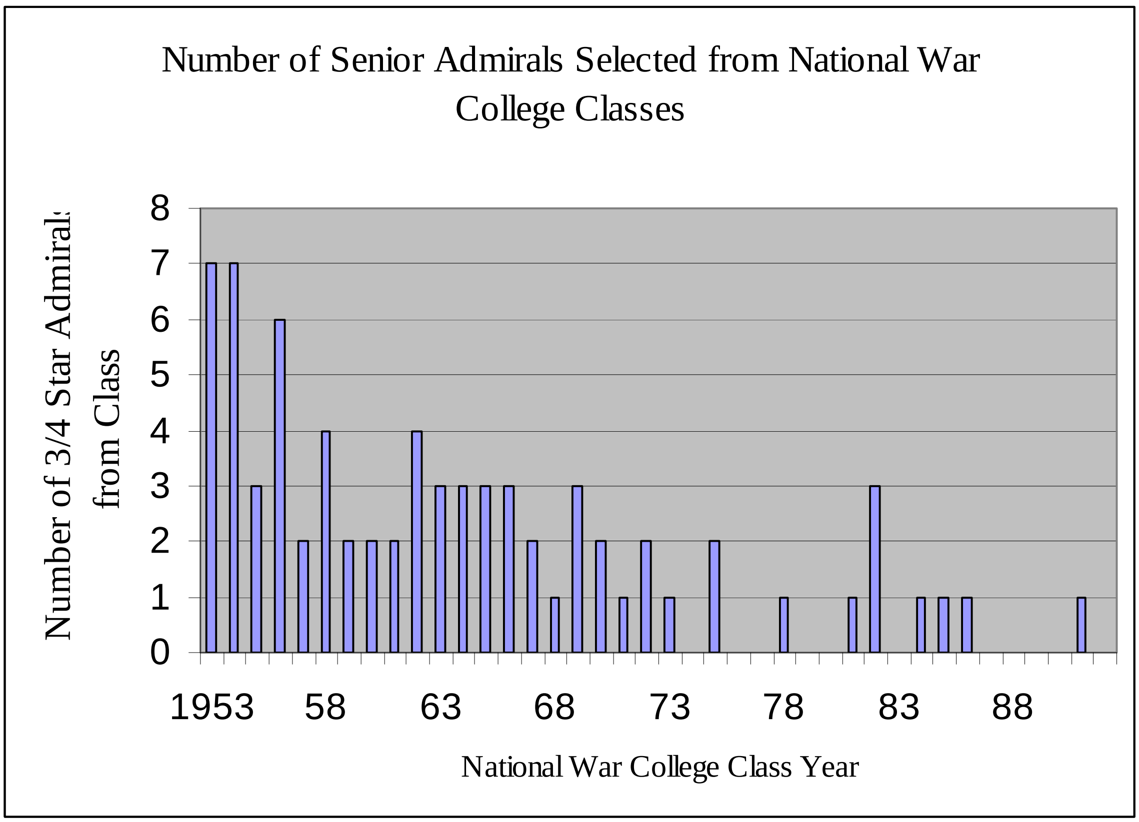

Figure 7-1: Number of Senior Admirals Selected from National War College Classes. Data drawn from 2003 National War College Alumni Directory.

One possible explanation of the dramatic decline in education at the most senior joint war college may have been due to a change in attitudes toward that one particular institution. To control for this possibility, an examination of the educational and career patterns of all URL flag officers aggregated from all colleges was examined. For the ranks of 0-7 to 0-10 combined, the attendance drop-off starting after 1966 is marked and clear. In 1966, 88% of all URL flags were graduates of at least one of the war colleges. The percentage fell more or less steadily for the next quarter century: 1978 only 50% URL flags were graduates of any war college; 1984 only 39%, 1990 only 33% of URL flags were graduates of ANY war college.[116] (See Figure 7-2) For the most senior officers —predominantly four star admirals—the data show a strikingly similar trend if not a more dramatic collapse in matriculation rates. As late as the middle 1970s, the vast majority of navy four star admirals had followed a rough approximation of the King pattern of progressive education (9 of 10 had attended either the Naval War College or one of the joint war colleges). However, this type of career education and development rapidly fell out of favor for officers commissioned in the middle 1950s who would reach their first junior command and eligibility for war college in the 1960s. For the most successful officers of these later year groups, those who promoted to four stars, few if any officers had attended any war college. In 1990, the last year of the Cold War, *only one of ten navy four-star admirals had attended any senior war college.*[117]

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[116] Linda C. Cavalluzzo, *A Bottom-up Assessment of Navy Flagship Schools* (Alexandria, Va.: Center for Naval Analyses, 1998), 86. For 1966 figures, see B.J. Jr. Semmes, VADM USN,"Memorandum Chief of Naval Personnel to Secretary of the Navy, Subject: Retention, dtd 30 March 1965", Naval Historical Center, Operational Archives, 00 Files, 1965, box 29

[117] This data is assembled from a search of biographies of the officers listed as four star admirals in the Navy Register. Data of war college attendance is printed in the register up to 1970, and thereafter must be assembled by the cross check of data in alumni association magazines, academy registers, and war college publications. The author has assembled data on four star admirals for all year groups up to 1970, and thereafter for 1976, 1978, 1982, 1986, and the final year, 1990. In the later years of the century, a CNA study has compiled data on flag officer joint qualifications. See Linda C. Cavalluzzo,"Navy Line Officer Advanced Education Requirements for 21st Century", Center for Naval Analyses Report, 1998.

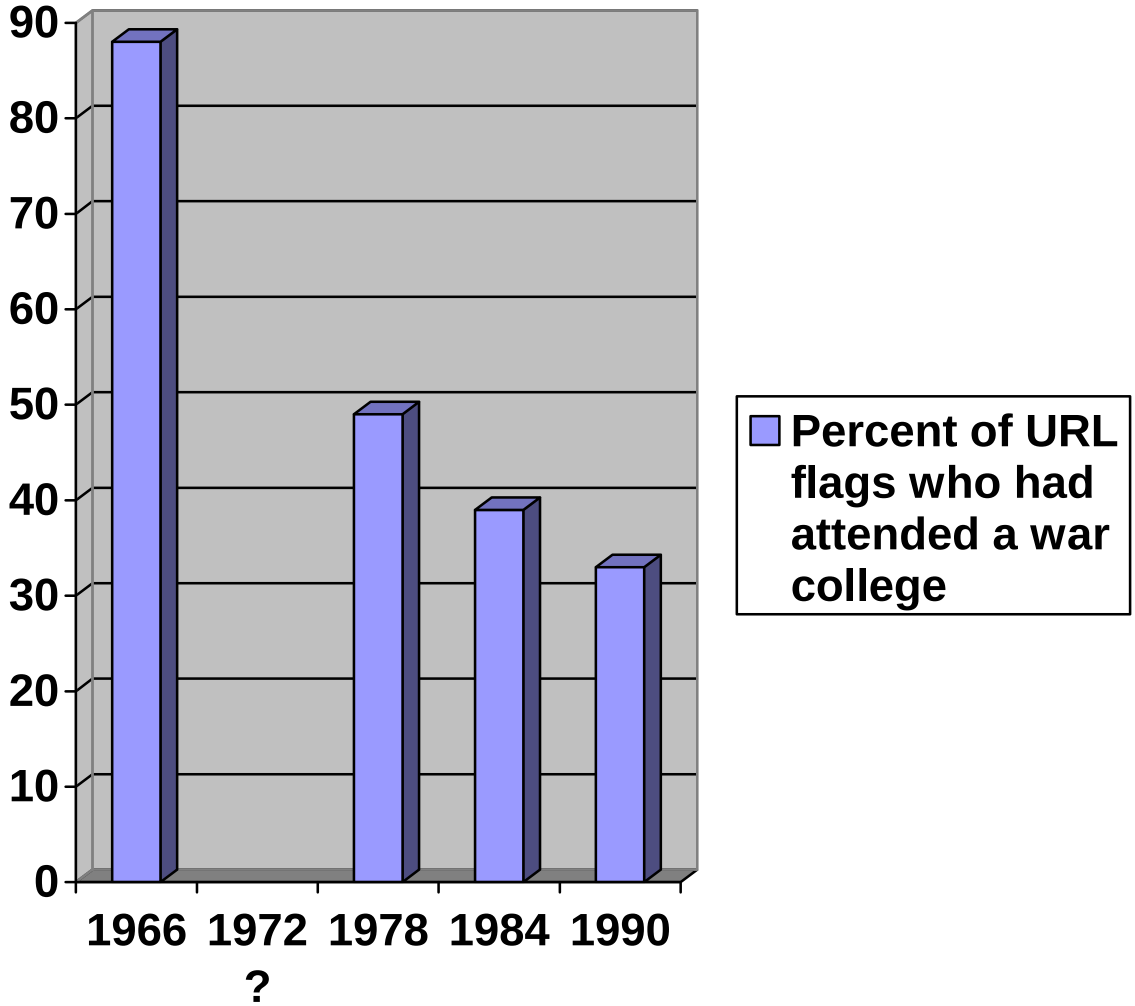

Figure 7-2: Percentage of all Unrestricted Line Flag officers who attended a war college. (Data for 1972 not available)[118]

The transformation of the 'line' was by 1990 complete: naval command conformed to Rickover's ideal of the technical expert and specialist. The 'line' had experienced an almost *complete inversion of the pattern that defined high naval command from the 1930s to the 1970s.* By the last decade of the 1990s, progressive and

[118] Data for 1972 not available. Data for 1978, 1984, 1990 drawn from Linda C. Cavalluzzo, *A Bottom-up Assessment of Navy Flagship Schools* (Alexandria, Va.: Center for Naval Analyses, 1998), 86. For 1966 figures, see B.J. Semmes, Jr., VADM USN,"Policy on Education for Unrestricted Line Officers, Memo from Chief of Naval Personnel, dtd 9 Feb 1966, to all Unrestricted Line Flag Officers," Naval War College Archives, RG 27, Box 1966, folder "Educational Policy".

integrative education was no longer common in the professional experience of those who rose to the highest rank. Those who would command in 1990 were by and large a ‘line’ of technical and platform specialists in the mold first articulated by Rickover in 1953. The “Rickover Effect" had perpetuated a technical specialized officer corps that survived the Cold War and continued to mold leaders well into the post-Cold War period, an environment far different than that of 1963 when THRESHER sank. The philosophy that informed the Rickover model was a philosophy of technocracy, in which technology drove history, in which man had to conform to the dictates of the machine. By 1990, the Navy had entrusted its future to a belief in a new determinism, that of technology. Modern admiralship had been re-made by the 'discipline of technology', which required the man to adapt to and be measured by his machine.

Conclusion:
The Question of Technocracy in Command

"Your profession is the art of war..."
Rear Admiral Stephen B. Luce, USN (retired), 1911[1]

"The man of the future on whom we shall depend more and more is the technical expert..."
Vice Admiral Hyman G. Rickover, USN, 1959[2]

"As for potential flag officers...the education and training die was cast in the relatively distant past, more on the basis of the needs of the Navy at that point in time..."
Admiral Alfred W. Pride, USN (retired), Board Chairman, "Criteria for Selection to Flag Rank in the United States Navy," Report of Board, 20 February 1963[3]

Almost exactly one generation--thirty years-- after the first nuclear reactor went to sea, the Cold War ended and Admiral Rickover died. However, the Cold War, nuclear reactors, and Rickover left a powerful legacy that persists to this day: a changed officer corps and a changed way of thinking about commanding men and machines.

By the late 1980s, the fruits of a changed system of officer development had risen to dominate the naval high command. Naval command had been profoundly transformed: a technical expert and techno-centric model of command had displaced King's favored generalist model.

Such a transformation, however, was not fated or required by the dictates of science and technology. Through a remarkable and highly contingent sequence of events

[1] Stephen B. Luce, RADM, USN (retired), "On the Relations between the U.S. Naval War College and the Line Officers of the U.S. Navy," *US Naval Institute Proceedings*, 37, no. 3, September 1911, 796.
[2] Hyman G. Rickover, *Education and Freedom* (New York: E.P. Dutton, 1959), 19
[3] Alfred W. Pride, ADM USN (Ret),"Criteria for Selection to Flag Rank in the USN, Report of Board 20 February 1963", NARA RG 24-470-54-25 Box 6 part 3, pg 2.

and political interventions, Hyman Rickover had gained de-facto control of the Navy's system of officer education and professional development. From this position, he was able to remake the 'line' in accord with an elite technocratic philosophy. Using a strategy of personal interviews, demanding schools, and purposeful personnel shortages to eliminate a rival culture, Rickover transformed the submarine navy into a technical vanguard. In need of young officers with which to man a rapidly expanding POLARIS fleet, he reconstituted the cradle of 'line' officer education at Annapolis into an elite polytechnic college. More by momentum than design, the Navy's transformation was complete when Rickover's surface ship exemplars transferred technocratic norms and values to the larger, non-nuclear fleet.

The cumulative effect of Rickover's unprecedented bureaucratic victories was the inversion of 'line' officer policy and priorities that had stood for half a century: technical knowledge became more valued than integrated operational knowledge and non-technical knowledge. By the time senior leaders realized what was happening and acted to stop Rickover, it was too late. The die had been cast for a generation of senior officers who would command the men and machines of the U.S. Navy in the 20th century and beyond.

Important organizational pre-conditions established years earlier helped make possible Rickover’s transformation of the officer corps.   Before Rickover had gained senior flag rank and powerful political allies, he invoked navy history to justify his use of 'line' officers (not EDOs) in the engine rooms of his nuclear ships. The historical precedent he invoked was the 1899 engineer-'line' merger that had been predicated on the conviction of "every line officer is to be an engineer". In the merged naval profession that resulted —the commander who was both ‘line’ officer and an increasingly scientific engineer-- there was inserted a bias toward the material. The precedent of 1899 would be used more than once to justify expanded technical education of the 'line' at the cost of time spent on the study of tactics, strategy, culture, and language.

The tendency for the 'line' officer to identify his profession with engineering and machinery was reinforced by the rise of two new machines of war: the submarine and the airplane. The machines began to draw to their periscopes and airframes the inquiring minds of young officers and thereby posed a threat to professional unity. The promotion reforms of 1916, by empowering different social groups to replicate themselves through the promotion system, further inclined the profession toward fragmentation. Remarkably, unlike the Army and the Air Force, the Navy did not split by technological affiliation. This outcome was not a matter of chance. Naval leaders had anticipated the tendency of officers to become techno-centric and platform-centric and had taken action to forestall it.

In the years immediately after the First World War, navy leaders acted to counterbalance the appeal of machine platforms. The Navy adopted a system of education, assignment, and promotion that encouraged officers to adopt values of integration over specialization: a generalist model of command. The plan, pioneered by Ernest J. King in 1919, had as its primary objective the development of officers of breadth, capable of integrated judgment in matters of operations and strategy. A secondary, though important, objective was the ability of a ‘line’ officer to maintain and manage the technologies of war. King's system was dominant for almost a half century and helped produce the enlightened leadership of the inter-war era, whose virtues were confirmed by the experience of the Second World War.

The validation of the 'generalist' model between 1941 and 1945 and the persistence of this model well into the Cold War is a finding that fills a void in recent scholarship on the officer corps. In his study of the naval warfare in the 20th century, *At War At Sea*, Ron Spector devotes considerable attention to the rise of naval aviation and the cultural challenge it posed to the traditional navy and its concept of the general line officer. However, Spector's treatment of the cultural challenge posed by nuclear power is less rigorous. To be sure, Spector acknowledges that nuclear technology was a critically important innovation in the second half of the century and brought with it a renewed priority on engineering knowledge. However, Spector devotes only a few pages to an examination of the significance of the reactor and Rickover as a force for change in the non-nuclear officer corps.[4] Without a detailed discussion of Rickover's program, one is left to conclude that the shift from generalist to specialist model in the officer corps was in place by the end of the Second World War and was mostly the product of the rise of naval aviation and naval aviators. The conclusion of this research is that aviators endorsed a modified form of the 'generalist' officer and that it was the actions of Rickover and the nuclear engineers in the 1960s that replaced the old model with a more techno-centric alternative.

Scholars who attempted synthetic inter-service studies have also tended to overemphasize the culturally transformative power of the Second World War and the technological and organizational changes associated with that conflict. These scholars have also tended to minimize service differences as they strive to reach universal conclusions about the military profession. Janowitz in his classic *The Professional*

[4] Ronald H. Spector, *At War, at Sea: Sailors and Naval Warfare in the Twentieth Century* (New York, N.Y.: Viking, 2001), 331-340.

Soldier appears to have underestimated the degree to which the Navy's professional and sociological evolution was unique among the military services.[5] In the face of considerable pressure to conform to Air Force and civilian models of executive development, the Navy doggedly retained a unique system of officer development. Janowitz' argument that the military profession in the 1940s-50s was aligning more closely with civilian professional specialties underemphasized a critically important counter-current: the navy high command remained committed to the old 'generalist' model well into the 1960s. Moreover, an explanation of how and why leaders changed the Navy could not be extrapolated from other service or civilian experiences. The Navy's model changed as a consequence of events unique to the internal social structure of the navy officer corps, the result of aggressive group action by identifiable persons motivated by a set of unique concerns and beliefs. These findings remind the scholar that each military service is culturally unique and is the product of a unique history. Consequently, each service should be studied closely before inter-service generalizations can be made with confidence.

Instead of changing as a result of the Second World War, the King model of 'line' officer would survive until the 1960s. In that decade the pillars of the integrative approach-- general education at Annapolis, assignment variation on multiple platforms, attendance at a war college, and common promotion exams-- would be supplanted by a model which emphasized in-depth technical training on a single platform. The technically trained URL officers would also be expected to replace large numbers of RL

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[5] Morris Janowitz, *The Professional Soldier: a Social and Political Portrait* (Glencoe, Ill.,: Free Press, 1960). See also revised edition, 1971.

technical experts in their technical assignments ashore.[6] The 'line' had indeed become a technical elite. The single person most responsible for this transformation was Hyman G. Rickover.

Rickover believed that advanced technical systems required more specially trained technicians. His beliefs were consonant with the values and norms found in the civilian field of scientific engineering. Modern engineering and advanced technology required intense study and a greater degree of specialization. In the field of nuclear plant operations, Rickover's system has proven remarkably reliable, and his form of technical supervision remains the model for most civilian nuclear power plants. However, where Rickover parted company with other advocates of technical specialization was his insistence that the top-level leaders--the combat leaders of the 'line'-- should also be engineers and technical experts. Rickover's advocacy for a techno-centric type of leader derived not from his naval education or combat experience. Rather, Rickover was most likely inspired by an aggressive variant of the activist engineering ideologies in the 1920s, that of the Technocracy Movement. Rickover had been a graduate student in the cradle of the Technocracy Movement, and it appears that he took for his own the values of the movement. One of the most important values he carried back to the Navy, and which informed many of his reforms, was the belief that man must be conformed to the needs of technology.

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[6] The alternative to a more technically specialized 'line' could have been an expanded EDO corps. But it remains a mystery why Rickover and Navy line officers did not expand the Navy's EDO corps to provide for the Navy's perceived needs of more technical expertise. There is in the late 1950s evidence of renewed 'line' hostility to the EDO community. Some line officers (VADM Semmes) would claim that the need for a 'wet and dry' Navy had been solved by URL officers who could shoulder both technical and operational duties once they had acquired a technical 'subspecialty' after approximately two years of study, thus obviating the need for more EDOs. The policies concerning EDO officers in the early 1960s deserve a dedicated study, which due to limitations of time and space was not possible in this work.

Rickover was convinced that the modern, 'artificial age' required the technical expert and specialist to command at the highest levels. Rickover believed technology would drive history; men had to adapt to the technology, not technology to the man. It followed that the technical expert and technical specialists should command at sea and in battle. The technical expert earned this right to command because of his detailed technical knowledge of a single machine. To Rickover, command in the field of battle that heretofore belonged to the tactical and operational officer was one "tradition that had to be broken". However, for much of his career Rickover did not have the political power to mold the Navy to this belief system.

In the early years of the nuclear navy, Rickover had been willing to compromise with the King model of integrative officer development. Consequently, the first generation of nuclear officers was the most broadly educated, integrative commanders to rise through the ranks of the Navy. However, with the sinking of USS THRESHER and Rickover's bureaucratic victories that followed, he became an extremist in his advocacy for a deeper transformation of the navy officer corps. His interpretation of THRESHER was that a naval officer, starting with his nuclear officers, was to be first and last a technical expert. After THRESHER, Rickover insisted that the less scientifically capable officers, which included the mass of diesel submarine officers, be barred from nuclear training and command. Rickover sustained such a policy only with the aid of a massive transfusion into the nuclear submarine force of scientifically minded surface and aviation officers, most of whom possessed no tactical or operational experience in submarines.

Rickover's technical expert model of command diffused through the larger Navy aboard a fleet of nuclear-propelled surface ships and aircraft carriers. In the 1970s, senior navy educators and combat veterans who had experienced defeat in Vietnam opposed the techno-centric model of command. But the physical presence and promotional advantages of machine systems proved more persuasive in the minds of young officers than arguments of combat veterans. Even in the face of a counter-revolution by admirals Zumwalt, Stockdale, and Turner, the technocratic metamorphosis of 'command' continued. The power of the technocratic idea grew so ascendant that by the late 1970s all commanding officers of ships, as well as many admirals, were required to study engineering systems at a nuclear installation in the Idaho desert. Instead of studying war in the war colleges, senior leaders of the Navy studied the technical requirements of complex machines. This policy of mandatory technical training for senior officers would become a fixture in the officer development system for almost two decades.

The surface and aviation communities were troubled by the growing power of Naval Reactors to influence the selection and advancement of future 'line' commanders (the ship captains). Both communities realized that Rickover's organization might marginalize those of their officers who did not become nuclear trained. So persuasively did the idea of technical specialization appeal to these non-nuclear communities that, in their efforts to assert their independence, they adopted similarly specialized and technically narrow officer programs and strategies. In essence, the community leaders declined to join Rickover's opponents who had advocated a return to the generalist, more unified model (e.g., Zumwalt, Turner, Stockdale), and instead embraced Rickover's model of deeper specialization. Rickover's form of technical specialization of the 'line' became a model for social group action that brought with it substantial bureaucratic advantages, especially those of defensive protection. Rickover's model, and his parochial attitudes, engendered in the broader Navy what could be called a "defensive technicalization" of officer personnel, a tactic of bureaucratic competition.[7]

To defend itself against an expanding nuclear organization, the surface navy abandoned its long cherished identity of 'generalist' and replaced it with the identity of technical expert. The heretofore generalist officer became a 'surface warfare' officer and in 1975 began to wear the insignia of a specialist. Moreover, it was RADM Wayne Meyer, the EDO specialist who built AEGIS radars and the AEGIS community of officers, who did more to preserve the surface navy's independence than did Zumwalt. In an effort to insulate aviation from Naval Reactors, aviators also embraced further specialization in their model of command. To provide an alternative career path for aviators, the community created a model of narrow specialization known as commander of the carrier air group (CAG). However, CAG as a path to flag was itself a solution based upon further specialization: an aviator rising to flag through this system avoided the study of nuclear physics, but the officer was no longer broadened by command of a surface ship.

But Rickover's legacy was not confined to the nuclear fleet and the platform captains. In response to the urgent manning requirements of POLARIS, exacerbated by the collapse of engineering recruiting on civilian college campuses in the later 1960s, Rickover relied on the Naval Academy to be his primary source of nuclear officers. The midshipmen curriculum was, however, insufficiently technical, and Rickover remade Annapolis into an elite polytechnic. His reforms became deeply institutionalized in core

[7] Jon Tetsuro Sumida, "Forging the Trident: British Naval Industrial Logistics, 1914-1918," in *Feeding Mars: Logistics in Western Warfare from the Middle Ages to the Present*, ed. John A. Lynn (Oxford: Westview Press, Inc. , 1993), 234.

curriculum, quotas on academic majors, and even admissions metrics. At a tender age of eighteen, the midshipmen were selected out, conditioned to think of themselves as technical specialists and experts, and then encouraged to become engineers. The technocratic identity he stamped on the academy in the 1960s took on a unique permanence that persists a half-century later, after having resisted multiple attempts to rescind it.

The continuation of the technocratic model in the Annapolis *undergraduate* program is not the result of the demands of the national security environment--the Cold War ended almost two decades ago-- but is an educational example of socio-technical momentum. Two forces sustained the momentum of the academy's technical curriculum: an elite engineering faculty ranked as one of the nation's best, and the half-century longevity of the industrial technology of the pressurized water reactor. Efforts to move the academy in the direction of a stronger program of social sciences and expanded language failed due to vigorous resistance by powerful technical organizations, in particular Naval Reactors, and the elite technical faculty.[8] Efforts to place social scientists in the Dean's office and to rebalance admission's metrics to ameliorate the bias against verbal and linguistic candidates proved short-lived.[9] Evidence of this persistent technical momentum that drives the academy is the simple fact that engineers have dominated the dean's office, with only one relatively brief exception, since the position became civilianized almost a half-century ago. The dominance of engineers in the dean's

[8] Kinnaird R. Mckee, Admiral, USN, Interview with the Author, 18 September 2006.
[9] Frederick H. Hartmann, *Naval Renaissance: the U.S. Navy in the 1980s* (Annapolis, Md.: Naval Institute Press, 1990), 77. See also Naval Reactors Office, "Nuclear Power Accessions briefing, dtd 22 August 1990", Office of Institutional Research, Ward Hall, US Naval Academy, Folder: 1991 Nuclear Accessions. When the academy temporarily adjusted the admissions metrics to be more neutral--removed the bias that favored the technical candidates-- the graduates of the associated classes pursued fewer technical degrees. The technical bias in admissions was however reinstated and remains in place in the early 21st century.

office stands in stark contrast to the myriad of 'line' officers--technical and non-technical-- who had served in an equivalent position prior to Rickover's intervention.

The shift of 'line' officer *graduate* education toward the technical and away from the non-technical also coincided with the rise to prominence of Rickover's technocratic model of command. A vivid example of this shift was manifest in the evolution of the high-profile scholarship program, the Burke Scholar program designed for both Navy and Marine Corps officers. Originally intended for the study of either social sciences or technical subjects, navy administrators sometime in the later 1960s or early 1970s re-interpreted the purpose of the scholarship. The vast majority of Burke Scholars were no longer allowed to study social sciences, liberal arts, or language. This distortion of the scholarship's original purpose provoked protest from the benefactor, a retired CNO, Admiral Burke, who complained that there "... was to be no restriction to education only in the hard sciences."[10] As a consequence of this distortion of Burke's original purposes, many of the Navy's brightest officers for a generation were steered away from the study of language and culture.

Admiral Burke was not alone in questioning why 'line' officers were being channeled to technical education and away from the social sciences and liberal arts. However, Burke and other like-minded officers were poorly equipped to reverse the techno-centric educational tide that was washing over the Navy. The shift to more technical 'line' officer education was justified by the 'requirements' of the machine platforms. The 'requirements' were, in turn, justified by highly detailed, statistically

[10] Arleigh Burke, as quoted in Seth Powell, "Train for the Known, Educate for the Unknown: The Navy's Struggle for Clarity with Graduate Education in the Humanities, from Holloway to Rickover," (Annapolis, MD: US Naval Academy, 2004). Source of quote is letter from Arleigh Burke, Bethesda, MD, to Captain Anthony Maness, Executive Assistant to the Chief of the Bureau of Personnel, 2 June 1983, Arleigh Burke Papers, Box 107, Naval Historical Center, Washington D.C.

impressive lists of qualification codes offered as evidence of the link between technical 'line' officers and machine-related billets.

While a *specialized* system of technical qualifications, training, and billets lent itself to quantification, the intuitive need for *integrative* and non-technical education defied easy quantification. In the face of seeming persuasive statistical arguments for technical specialization, the advocates for social sciences, language, and general education had to resort to making historical arguments. They invoked the wisdom of combat-tested commanders and pointed to the pre-1963 Annapolis traditions of universal language education. They reminded audiences that the future was uncertain, that technological prowess and machines might not always be decisive in war. As late as 1960 a leading publication on officer development would assert, but could not statistically 'prove', that an over-reliance on specialization was dangerous and would "... stereotype the thinking faculties of a professional..."[11] But the defenders of the integrative officer could not quantify their claims, and such arguments disappeared from later editions of the publication.

In the intervening decades since 1963, the value of integrative education at war colleges had become tainted in the minds of young and mid-grade officers. By the 1980s-1990s, almost no policy, short of compulsion, could improve the quality of officers who would attend. In 1982, Admiral James Watkins began to distance himself from Rickover's specialist philosophy and expressed concern that ‘line’ officers were

[11] BUPERS-Navy edition of "Armed Forces Officer", NARA RG 24-470-54-25-6 Box 5. See also Department of Defense United States, *Armed Forces Officer*, 2nd ed. (Washington, D.C.: Government Printing Office, 1960), 36-37.

becoming too narrow in their experience and education.[12] Like CNO Thomas Hayward before him, Watkins supported new initiatives to encourage officers to attend the Naval War College. Watkins put the usually persuasive power of the CNO's office behind the reforms and even reduced staffing at training schools to free up additional billets to increase attendance at the Naval War College.[13] However, Watkins' efforts to enhance the stature of the War College fell short as the 'best' officers continued to stay close to their specialized platform communities.[14] Admiral Trost, Watkin's successor, found the aversion to the war colleges so strong that he personally intervened in captain detailing to ensure some of the rising stars had a year in Newport.[15]

Admirals Watkins and Trost failed in their attempts to broaden the 'line' not because they did not try, but because young officers had prioritized platform values and needs over those of the larger Navy. By the 1980s the 'line' came to possess a deeply engrained culture of technical specialization and platform-centrism that would not yield

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[12] By the late 1970s, when serving as BUPERS, Watkins expressed concern for the narrowing of submarine officers. In the early 1980s as CNO, he was concerned about the fleet-wide phenomenon of narrow officer experience. For his concerns about submarine officers see Senate Armed Services Committee, Subcommittee on Manpower and Personnel, Statement of VADM James D. Watkins, USN, Chief of Naval Personnel H.R. 10451, a Bill to Amend Title 37, United States Code, Relating to Special Pay for Nuclear Qualified Officers., 94th Cong., 2nd sess., 3 June 1976, 12. Watkins wrote: "The increased sea duty resulting from inadequate officer inventories is causing a spiraling retention decline. Our officers are not receiving the educational and broadening staff assignments which are desirable for future leaders of the nuclear Navy."

[13] Frederick H. Hartmann, *Naval Renaissance: the U.S. Navy in the 1980s* (Annapolis, Md.: Naval Institute Press, 1990), 63. In Admiral James D. Watkins' "Ninety Day Message of October 1982", the CNO set as a goal to "…revitalize the Naval War College as the crucible for strategic and tactical thinking. In the near term, rotate selected post-command COs through the senior course (or a portion of it) en route to subsequent assignments..." See Appendix E.

[14] Admiral Watkins, upon his promotion to CNO, perceived the narrowing of the officer corps and called for a 500% increase in NWC attendance by post-command officers. See John Hattendorf, *Sailors and Scholars: The Centennial History of the Naval War College* (Newport, RI: Naval War College Press, 1984), 318. However, the best officers continued to hesitate to attend the NWC as evidenced in promotion statistics. See Linda C. Cavalluzzo,"Navy Line Officer Advanced Education Requirements for 21st Century", Center for Naval Analyses Report, 1998. See also charts pg. 12.

[15] C.A.H Trost, ADM USN, Interview with the Author, 3 November 2007, 18 December 2007. Trost explained that he personally directed at least one future four star be assigned to the CNO's Strategic Studies Group, a group that was associated with the Naval War College and provided some modicum of broadening for an officers who were likely to promote to flag rank.

to exhortations from the highest rank admirals. All three types of 'line' officers--surface, submarine, and aviator-- had been socialized to see themselves as specialists, not generalists or integrators. As officer assignments became the exclusive purview of platform community managers, the best officers were quietly steered to the 'best' community assignments, which were typically those specialized by platform. The needs of the larger organization--in this case, to have more war college graduates-- were discounted.

The platform-centric model of 'line' officer grew so persuasive that the value of war college education had even taken on a negative connotation. The generation-old Navy educational values were inverted: what once had been 'good' was considered 'bad' for a career. Whereas in the early 1960s attendance at the war college could still be the deciding factor for promotion to flag,[16] in later decades the bias was reversed: attendance at a war college could *hazard* an officer's promotion. The group of officers who became the Navy's most senior admirals in 1990, if compared by war college attendance with the senior flags from 1938 to the 1970s, represented an almost complete inversion in officer models. Furthermore, the new generation of flag officers was arguably less 'jointly' educated than the generation that had preceded them.

The larger field of history and sociology of technology may have something to learn from this navy case study. This navy case study explains in detail how a technology and a subordinate technological organization--the Naval Reactors office, whose personnel once numbered in the single digits--inverted the values of the naval

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[16] Carl Lavo, *Slade Cutter: Submarine Warrior* (Annapolis: Naval Institute Press, 2003), 234. Slade Cutter, a highly decorated submarine veteran, recounts that Admiral James S. Russell revealed the flag board deliberations to Cutter. Russel said that Cutter's failure to attend a war college had been a determinative factor in his failure to promote.

profession whose members numbered in the tens of thousands. What does this inversion tell us about the capacity of technologies and technological organizations to repeat this feat, perhaps in other contexts?

This inversion of values--where organizational values were radically modified through close association with technology-- provides an example of a phenomenon Siegfried Gideon, *Mechanization Takes Command*, and Langdon Winner, *Autonomous Technology*, observed decades ago.[17] Winner wrote of the apparent capacity of technological systems to redefine, to "reverse adapt", the values of the human organization, where the "...artificial slave (machine) gradually subverts the rule of its (human) master."[18] The detailed Navy study here shows that indeed technological innovation can be associated with an inversion of human-organizational values. However, the cause of the inversion was not, by any means, a "technology out of control." Nor did the machine effect the inversion by some artificial means. On the contrary, the inversion was the result of more *human* agency, not less. Out of fear of the machine (the reactor) and in an attempt to more closely control technology--to prevent it from getting 'out of control'-- the technologists gained near complete control of the human operator's training, education, assignment, and promotion prospects. Once in control, the technologists remade the operator’s values through these instruments of the personnel-education system and thereby produced an inversion in human values.

In the Navy, a small group of technologists invoked the fear for 'reactor safety' as a not unreasonable justification to gain control over thousands of machine operators.

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[17] Siegfried Giedion, *Mechanization Takes Command: a Contribution to Anonymous History* (New York: Oxford Univ. Press, 1948); Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge, Mass.: MIT Press, 1977), 226-251.
[18] Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge, Mass.: MIT Press, 1977), 227.

Though vigorously opposed, Rickover ultimately won the bureaucratic battle for the control of 'line' officer education, assignment, and promotions and was able to inculcate a philosophy of the technocracy throughout the officer corps. His ideology of technocracy inverted the old value system that had been in place for a half century. The subtle yet profoundly important changes to the education, assignment, and promotion system produced a 'technical specialist' mindset wherein officers valued technical solutions over the non-technical, wherein officers' loyalty was first to the platform or technical community, secondly to the Navy.

As platform and technical communities carved up the Navy's officer corps, the larger organizational values and needs were gradually discounted. As community detailers became the supreme controllers of personnel assignments, those important Navy billets that were too far removed from the platform community tended to be filled by lower quality officers. Moreover, young officers mindful that community officers controlled their careers became increasingly hesitant to criticize their platform community because they had no other community or refuge to which they could turn for support. They certainly could not rely on the larger Navy to protect or promote them, for the larger navy no longer had the means to protect or promote personnel who had lost community support. Such a condition was new for the Navy. In the old generalist system, the 'Young Turks' had been able to criticize a dominant platform community and yet survive (as did submarine pioneers Nimitz, Stirling, Lockwood, and Rickover; aviation pioneers Reeves, Yarnell, Moffett, and Towers). To be able to criticize a parent community and survive was significantly more difficult in the platform-centric officer corps of the later 20th century.

Officer cohorts socialized according to platform-centric norms and values eventually rose to high command and brought with them their trust in technology and their deeply engrained loyalties to their platform. This cycle of techno-centric and platform-centric training and culling continued for a generation and produced officers increasingly loyal to the platform technology at the expense of the larger organization. This inversion of loyalties--platform and technology first, Navy second-- produced the impression that "technology was out of control." This inversion was what Admiral Train observed: officers became "captive" of a particular technology.

It is clear from this study that such an inversion of values did not happen quickly and did not happen automatically, but was the cumulative result of years of educational, assignment, and promotion changes. The techno-centric and platform-centric identity of naval command was thus not fated nor required by the dictates of technology. Rather, the Navy's current model of command is a product of unique historical conditions, sustained by the momentum of a socio-technical system and its associated ideology.

A system of leader development sustained by technical and ideological momentum, however, may be particularly resistant to changing environmental conditions. If the personnel system successfully resists change for too long, evidence of declining officer performance may eventually emerge. Critics of the officer corps have made such charges (as was discussed in the introduction). However, a brief review of some examples of the costs of techno-centrism and platform-centrism may help illustrate the importance of understanding how officers are prepared to command. While a techno-centric and platform-centric model of 'line' command may be highly effective for managing complex machine systems, it appears to carry costs that only in the later 20th century are becoming apparent.

As noted previously, the Navy's senior leadership by 1990 was dominated by technical experts who were more platform-centric than they were integrative generalists. The technical expert commanders had risen to high command and brought with them the mindset of the specialist rather than the generalist. Gone were the 'generalist' type of officers, the type of officer who in the inter-war period (1919-1941) built the carrier fleets that eventually displaced the battleship. Gone were the generalist types-- e.g. Admirals Carney and Burke-- who would in the 1950s champion radical new innovations of nuclear power, data links, and POLARIS even though the innovations threatened some established officer groups. Whereas a 'generalist' CNO in the 1930s and 1950s could advocate the development of a new technology that eventually threatened the socio-technical status of any number of officer communities, a platform-specialist CNO in the later 20th century faced greater difficulty in making such radical recommendations. Moreover, since the changed navy culture had come to value the specialist over the generalist, only highly specialized officers *were recognized* as qualified to make decisions that might compromise or infringe on a technological system or platform. Thus, a proverbial "Catch 22" resulted: only a platform expert (surface, aviation, or submarine) had the knowledge and authority to make the 'hard decisions' about a platform, but these very experts were the least likely to be objective enough to make such decisions. A respected 'generalist', loyal to the larger navy but conversant in a specialized technology, would have been an ideal type of officer to make the hard choices required to keep an organization from becoming beholden to its constituent parts. However, by the later 20th century, the generalists had been retired from the Navy.

The shift in officer models--the decline of the generalist and the rise of the specialist-- may thus help explain the difficulty the Navy has confronted when trying to adapt to radical innovations and changed political-military conditions in the later 20th and early 21st century. It is perhaps no coincidence that, after the more specialized officers rose to high command, the building and construction programs of the three platform communities have taken on the appearance of what Thomas Hughes called 'technological momentum'.[19] After the specialist model became prominent at high levels of command, alternative technologies and programs which threatened to detract from the favored platforms-- such as unmanned aerial vehicles, cruise missiles, mine warfare, computer networks, smaller ships-- often survived only with outside support or when disguised in platform-centric rhetoric.[20]

The shift to a specialist model of commander may also help explain some high profile operational and integration problems the Navy experienced in the last decades of the 20th century. When compared to Navy leaders' stunning success in joint operations in the Second World War, the ability of commanders to understand and operate jointly with the other services had atrophied by the later 20th century. Senior navy officers would

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[19] Thomas Parke Hughes, *Networks of Power: Electrification in Western society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983); Thomas Parke Hughes, *American Genesis : a Century of Invention and Technological Enthusiasm, 1870-1970* (New York, N.Y.: Viking, 1989).

[20] Terry C. Pierce, *Warfighting and Disruptive Technologies: Disguising Innovation* (London; New York: Frank Cass, 2004). Pierce enjoyed unique access to several studies of innovation. Though he does not make an explicit link between the rising difficulty of innovating in the USN and the decline of the generalist, the two events may be connected. In discussions with VADM Jerry O. Tuttle, one the pioneers of advanced communication systems, the admiral admitted to the author that he had to keep his knowledge and interest in communications system a secret during the early years of his career. He feared that if it were known that he had interests outside aviation, his promotion prospects might be in jeopardy. J. O. Tuttle, VADM USN (retired), Interview with the Author, October 2005.

admit that in the 1991 Iraq War U.S. Navy commanders could have been better prepared and more knowledgeable concerning other services and joint plans and procedures. At least one navy flag veteran of the first Iraq War in 1991 would attribute this deficiency in command to the rise of technical parochialism and narrowness in the officer development system.[21]

In the first years of the 21st century, there is some evidence that the effects of a techno-centric system of officer development were beginning to be manifest at the highest ranks of Joint command, not just in the navy. Some of the nation's highest joint commanders had come to define conflict in almost exclusively machine terms and placed what now appears in hindsight to be *misplaced* confidence in the power of their machines to win wars and protect the country. An example of this techno-centric thinking is found in the writings of a naval officer who promoted to four stars and served as the Vice Chairman of the Joint Chiefs of Staff. In his capacity as the VCJCS, he led a forward-looking body of officers--known as the JROC-- that was charged with anticipating future needs of national defense. This senior admiral placed such a great degree of trust in technology that he predicted technology was on the verge of invalidating 200 hundred year-old Clausewitzian maxims. Just months before the most successful surprise attack ever launched against the United States in 2001, this four-star admiral would speculate that technology was on the verge of "Lifting the Fog of War."[22] The existence in the American high command of such a misplaced confidence in the efficacy of technology to

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[21] Ray Taylor, RADM USN (a senior Joint Component Commander during the 1991 Gulf War), Interview with the Author, 21 April 2007.
[22] William A. Owens and Edward Offley, *Lifting the Fog of War*, 1st ed. (New York: Farrar Straus and Giroux, 2000).

win wars may help explain some of the faulty decisions and resultant difficulties later encountered in the second Iraq conflict.

As today's leaders attempt to design the officer model of the future, the historical record provided by this study may be of use. Rickover's arguments for advanced technical education were in some cases compelling. It was true that officers charged with the design and maintenance of technical systems could no longer be a 'jack of all trades'. Rickover's emphasis on technical and platform expertise was in many ways an appropriate model for the Cold War, when large, isolated, strategic missile submarines held the fate of the world in their tubes. As noted, he may well be remembered as the most important naval leader in modern times, especially if the world comes to rely increasingly on nuclear technology to meet human energy needs. However, Rickover's model of the combat commander may have gone too far in the direction of the technical expert.

When he was a senior admiral, Rickover faced the twin demands of the THRESHER disaster and the accelerated POLARIS construction program. In the pressure of the moment, he rejected forty years of navy wisdom as to how to develop leaders and embraced instead the technical elitism of the Technocracy Movement. The unique large machines Rickover built and the deep cultural change he wrought combined to impart a momentum to leadership models that persist to this day. VADM Calvert and Secretary Long warned that some day the Navy and nation might need a new model of officer. Leading thinkers of military organizational change postulated as early as 2000 that such a time has arrived: the world environment of the 21st century requires a different type of ‘post-modern' officer.[23] The reality of a four dimensional battlefield (to include cyber-space), joint, interagency, and coalition warfare and counter-terrorism demand something different from Rickover's model of 1963.

One could argue that a return to the King model may be in order. King had encouraged 'line' officers, sixty years ago, to pursue an integrated understanding of navy capabilities, joint matters, and the larger socio-political-strategic environment. However, King's model had a problem: he attempted to include in his model a 'line' officer who could *also* be part-time engineer or technical expert. In hindsight, it is clear that King underestimated the educational demands scientific engineering and advanced weapons systems would place on the officer corps in the later 20th century.

The operational commander in the 21st century is taxed by increasingly complex global operations. For the commander to be able to refocus on operations and the non-technical aspects of war may require, paradoxically, an increase in the number of restricted line, technically-expert officers who can assume greater responsibility for the machines of war. What seems a paradox--that increases in operational complexity may require more EDOs-- has historical precedent. The relationship between the line and the engineering specialists has been since 1899 symbiotic: the health of one group affects the other. When the EDO community has not been 'healthy', when the numbers and quality of engineers declined, the 'line' has been required to compensate and thereby distract its attention from tactical and operational needs.

It is beyond the scope of this study to suggest how to create a system wherein a corps of technical experts can free the operational 'line' from specialized technical duties,

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[23] Charles C. Moskos, John Allen Williams, David R. Segal, ed., *The Postmodern Military: Armed Forces after the Cold War* (New York: Oxford University Press, 2000).

but history offers a cautionary note. 'Line' officers should substitute for the technical experts only in extraordinary circumstances, and then only with the support and cooperation of the EDO leaders. When the 'line' officers displace EDOs, especially in technical leadership positions, the morale and professional security of the engineers may be damaged, the repair and healing of which may take decades. In the interim, increasing numbers of 'line' officers are required to shoulder specialized technical duties. Such an intervention occurred in the late 1950s when the Franke Board slated engineer specialists for possible elimination, their billets to be filled by URL officers with technical sub-specialties. Some engineers believe their community has yet to regain the levels of professional pride and performance that characterized EDOs before the disruption of the Franke Board. Contrary to the assertion of VADM Semmes (an assertion made when EDOs were slated for large reductions) that the URL sub-specialist concept had "solved the problem of the wet and dry navy", the history since Semmes' pronouncement is less sanguine. It is not altogether clear that URL officers holding technical sub-specialties have been able to adequately substitute for an expanded community of experienced technical experts.

This history may also prompt some to re-think the Annapolis curriculum. The history shows that the curriculum reforms of 1960-70s were a unique product of history. Rickover's policy was inspired by the old philosophy of the Technocracy Movement and only gained access to the naval officer corps because of the contingent events of POLARIS and Vietnam-era recruiting problems. The persistence of a large technological system combined with the power of faculty tenure has imparted a certain momentum to a Cold War-vintage midshipmen curriculum. Knowledge of the highly contingent origins of the Annapolis program should encourage leaders to be imaginative as they consider rebalancing curricular priorities. As the events of the 1960s recede into memory, it may be time to reconsider the wisdom of a generation and evaluate the merits of reinstating the curricular program that existed prior to Rickover's intervention, one with a stronger component of general education, language, and non-technical education.

END

Appendix:
Changing Images of the *Naval Officer's Guide*

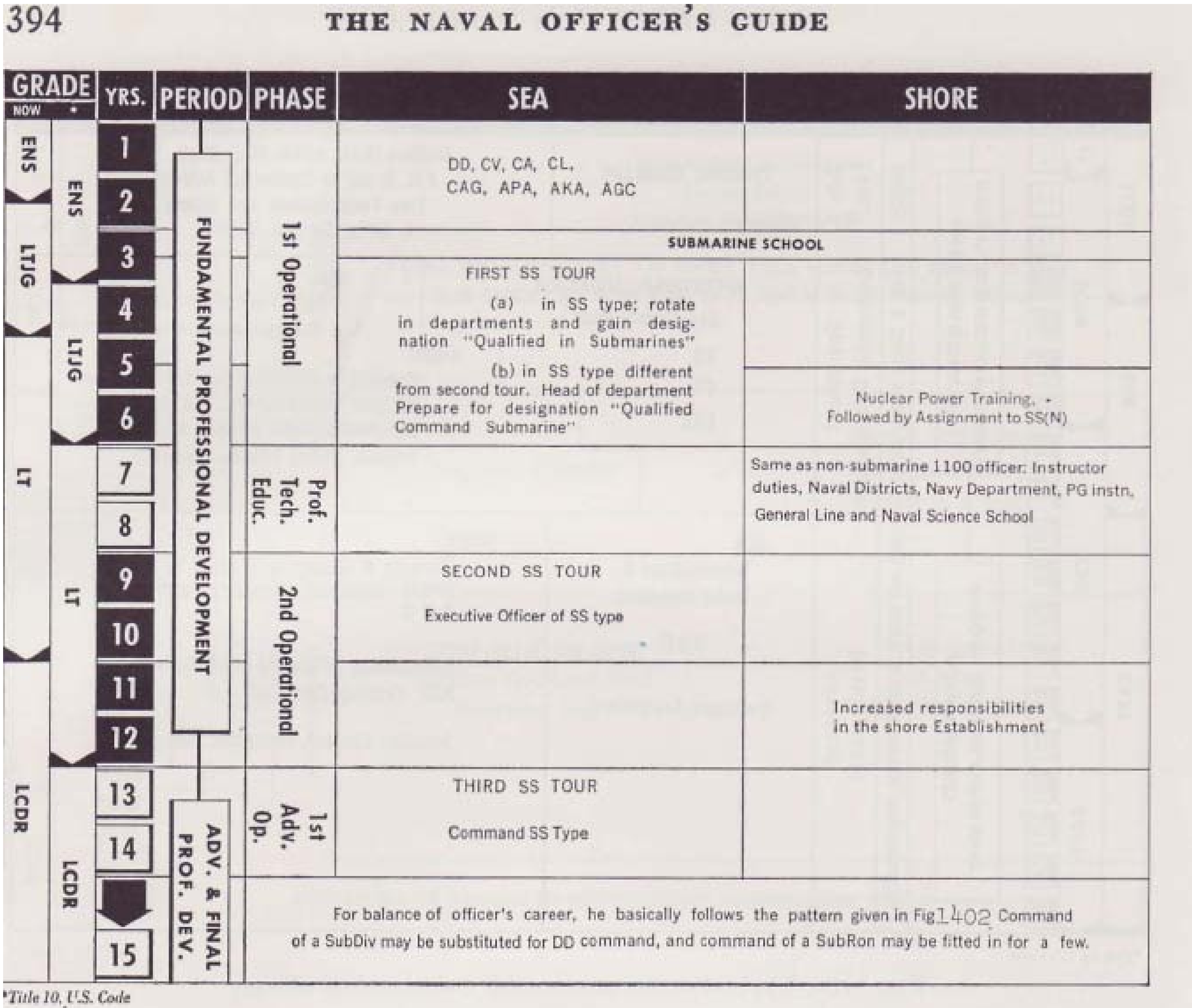
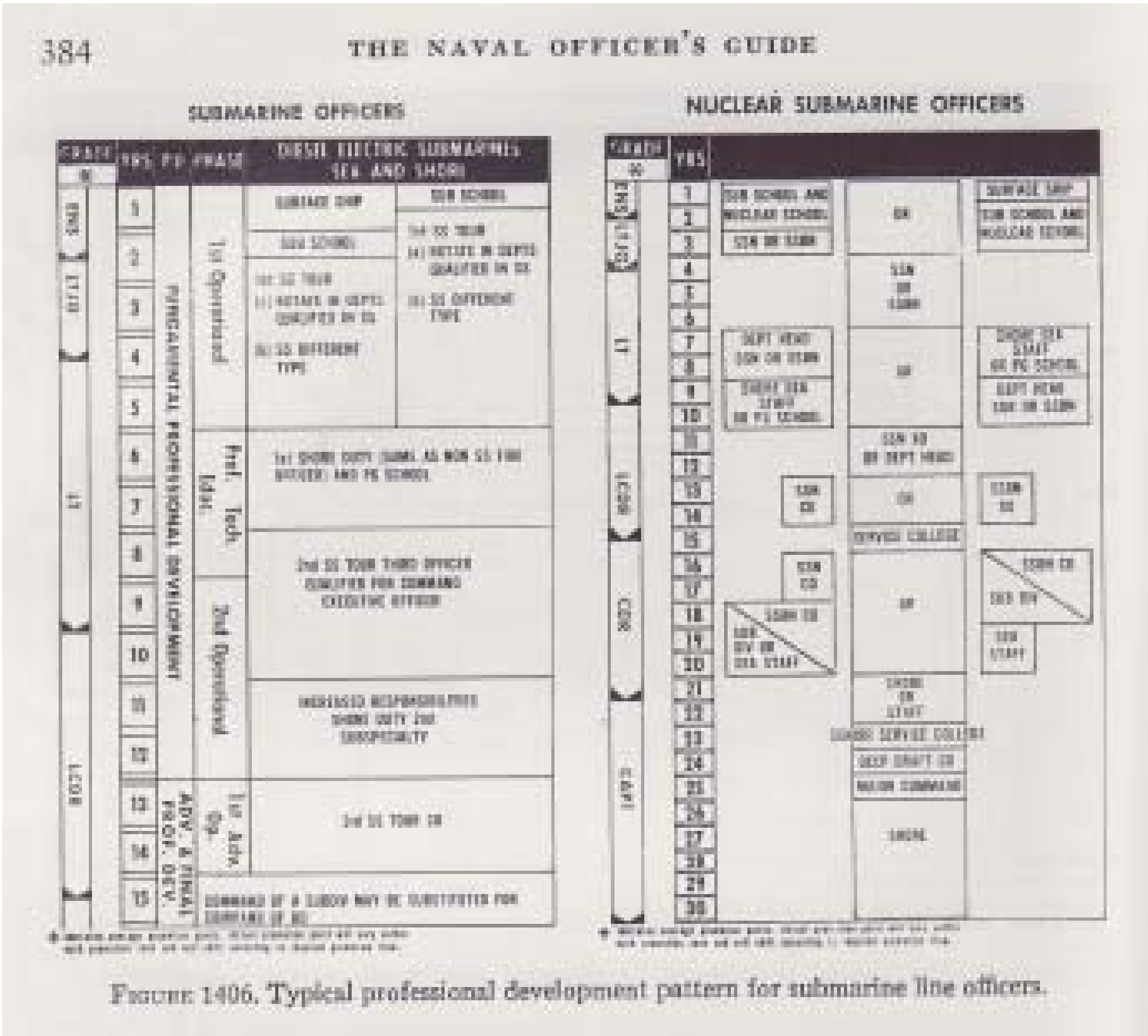


FIG. 1405. Typical career pattern for submarine line officer.

A-1: Career Pattern for submarine line officer in 1967. Note commonality with surface officers before submarine training, and again after year 15. Note also the chart's consistency with the King phases of officer development that is displayed under the column "Period".



A-2: Career Pattern for two types of submarine line officer in 1970: *submarine* and *nuclear submariner* line officers. Note that the top heading for traditional submarine officers is NOT identified by their engine type, whereas nuclear submarine officers are in fact define by their propulsion system. Note also that the nuclear officers dispense with King's phases of development, and no longer admit to any commonality with the surface officers. In contrast, the traditional submarine officer still adheres the King's phases of development.

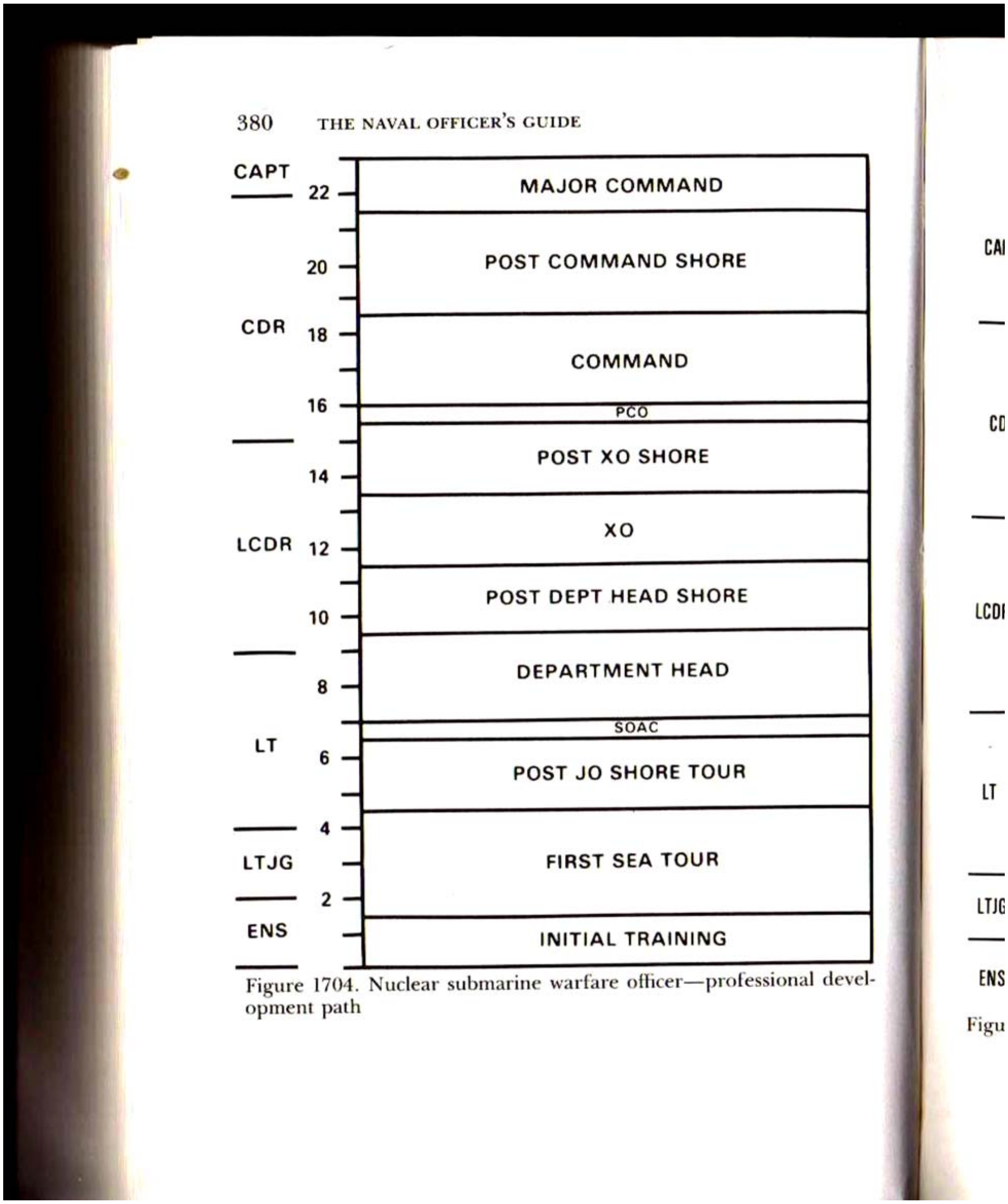

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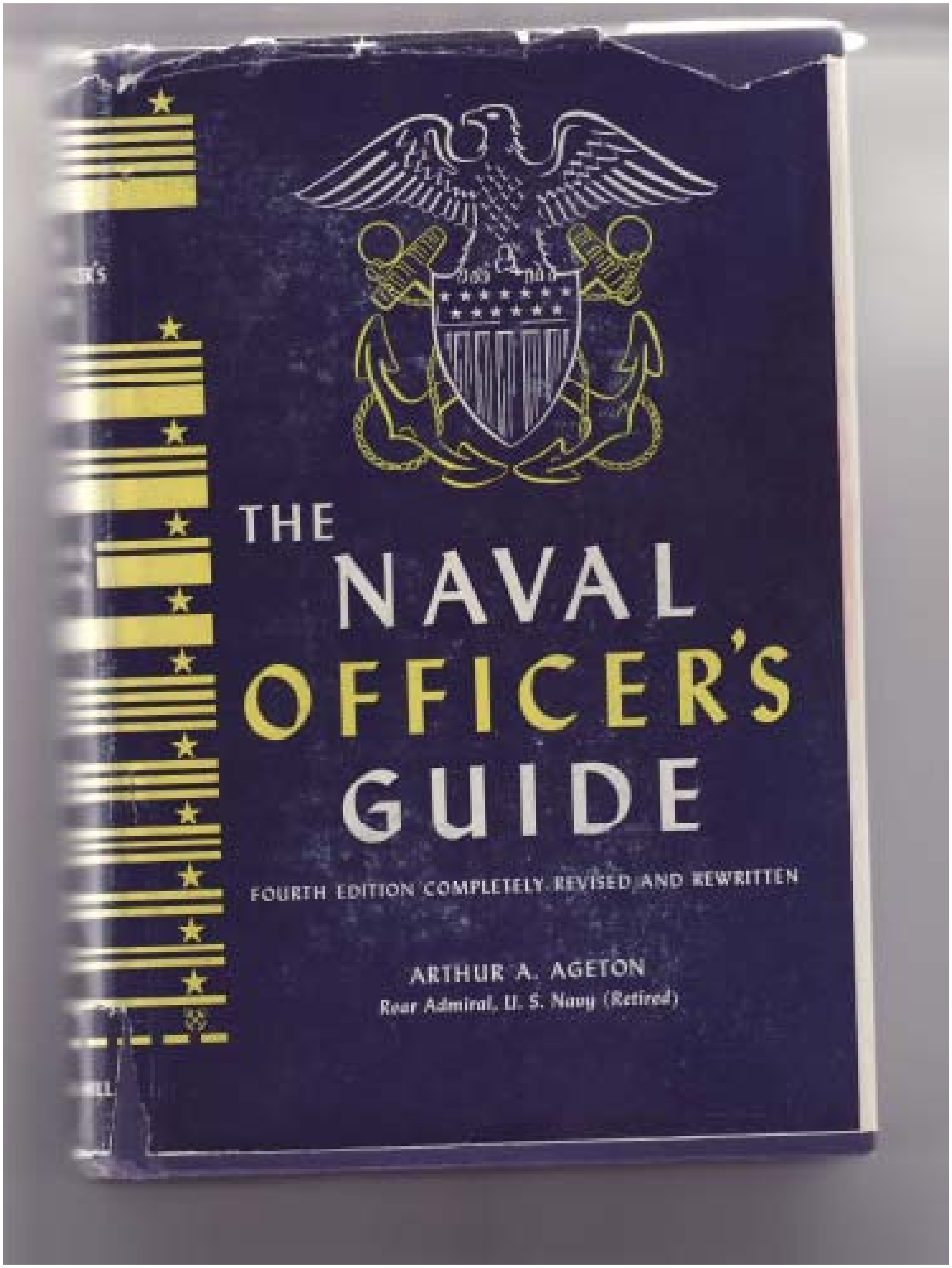
Figure 1704. Nuclear submarine warfare officer—professional development path

A-3: Career Pattern for nuclear submarine officer in 1983 (9th edition). In this next version that followed the key change of 1970, the officer career path had become entirely defined by the machine. No vestiges of King's system remain.



A-4: *Naval Officer's Guide* 1951 cover before the rise of the specialist identity. The symbol shown is that of the 'line' officer, with a career progression defined by the rank structure on the left margin. Images or markings that emphasize a specialty are entirely lacking.

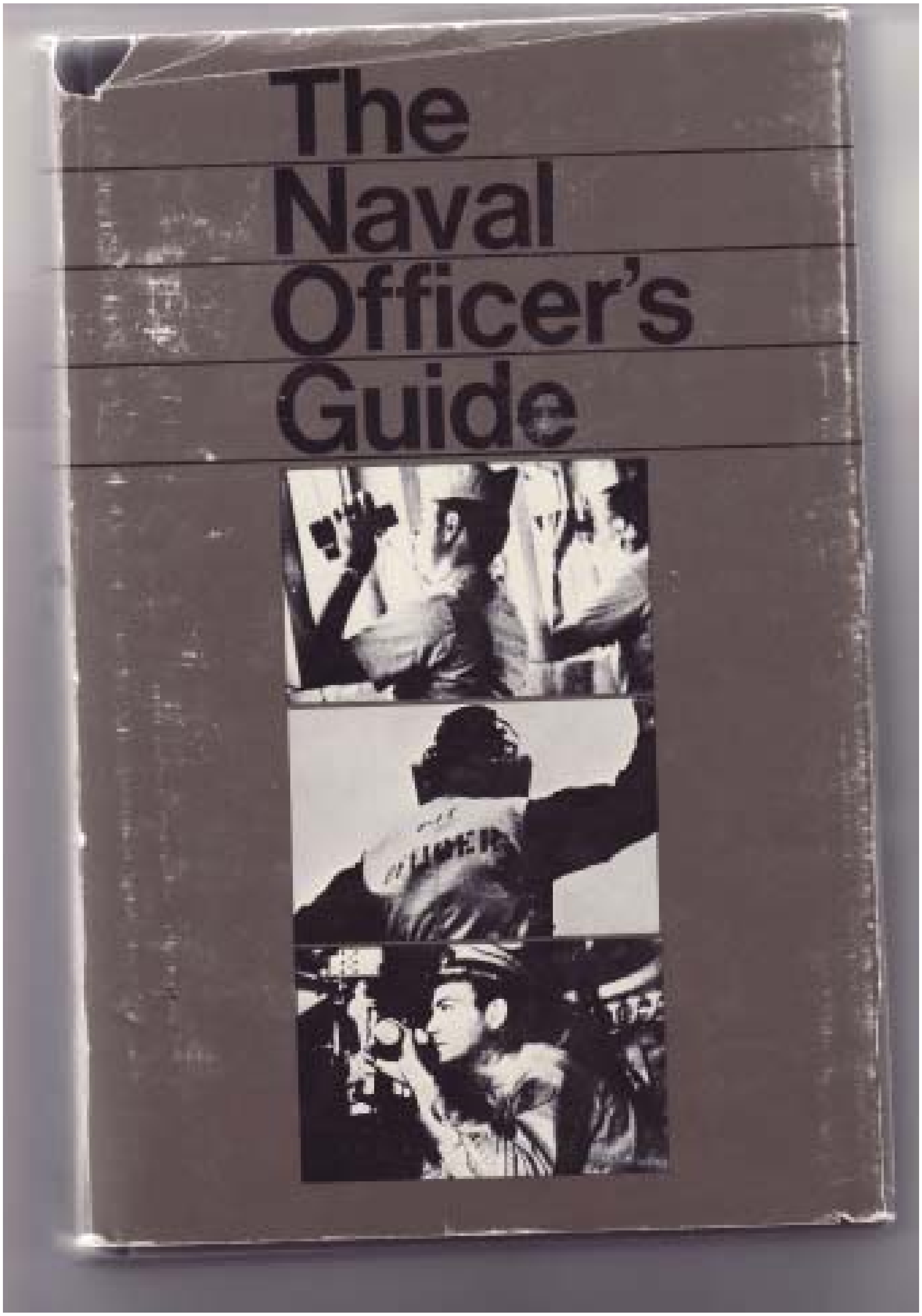


Figure A-5: Cover of the 1970 *Guide.* The ascendancy of the technical specialist identity complete: the officer corps is represented by three specialties as defined by their technological platform. The surface specialist, aviator, and submariner are independent.

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