Japan's "Carrier Revolution" in the Interwar Period

A Thesis

Presented to the Faculty

of

The Fletcher School of Law and Diplomacy

by

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In partial fulfillment of the requirements for the

Degree of Doctor of Philosophy

February 2016

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Abstract

Carrier aviation has been considered as one of the most successful cases of revolutions in military affairs (RMA) in the period between the Frist and Second World Wars. During those two decades, only three navies, Japan, the United States, and Great Britain, successfully built and operationalized large fleet carriers. However, compared with the U.S. and British cases, the Japanese case has been understudied in the literature of RMA. In order to fill this void, this dissertation considers two related research questions. First, what factors made the "carrier revolution" possible for the Japanese Navy, and second, to what extent do the different approaches account for their relative degrees of strategic success achieved by aircraft carriers?

This study argues that, while technological opportunities and the external environment provided an initial push for the "carrier revolution," organizational innovation is a critical intervening variable in accelerating the process of RMA. Given the lack of civilian control over the military and the relative autonomy enjoyed by the Japanese Navy during the interwar period, senior officers in the Japanese Navy recognized a structural change in the security environment, invented a "new theory of victory" and adapted their organization by their own initiative. The Japanese Navy underwent a process of innovation by expanding its officer corps through creating a new career path and establishing their organizational base, the Naval Aviation Department. A distinctive organizational culture developed within naval aviation encouraged vigorous training and experimentation, which drove military innovation more profoundly than in any other branches of the Japanese Navy.

However, the specific ways the organizational innovations were implemented critically affected the degree to which the Japanese Navy achieved the RMA during the Pacific War. In particular, the Japanese Navy's practice of funding personnel only after its procurement budget was approved and the commitment to ensuring the promotion of Naval Academy graduates up to the rank of Captain contributed to limiting the organizational representation of aviators within the navy, which, in turn, had serious adverse implications for the development of carrier aviation.

To Yuri and Naoya,

for their unconditional support and incredible patience

Acknowledgements

This dissertation could not have been completed without support from a number of mentors, friends, and colleagues. I first came to the Fletcher School in September 1999 as a MALD student, and I have gone back and forth between Japan and the United States since then. My long academic journey gave me many chances to interact with them, which I appreciate greatly.

I would like to thank the entire Fletcher community for giving me a chance to pursue a Ph.D. degree. First and foremost, I truly appreciate my committee members, Profs. Toshi Yoshihara, Robert F. Pfaltzgraff, Jr., and Stephen Peter Rosen for their kind assistance and advice. Their guidance helped me to focus on the most important issues. My special thanks go to Profs. Alan Wachman and William Martel, who allowed me to start this endeavor. Without their encouragement, I could not have even dreamed of applying to the Ph.D. program. Their premature passing was a huge loss to the Fletcher community, and I miss them a lot for their warm hearts and great insights. I also thank Jenifer Burckett-Picker for her indispensable support to continue my study. Her timely and candid advice helped me to overcome a number of challenges in the course of my long journey.

I have been very fortunate to have come across with great classmates since 1999. A few of those are Kevin Newman, Toru Matsushita, Tomoko Kyogoku, and Kei Koga. I am particularly indebted to Tim Wilkie and Jim Platte for their comments and edits on my draft dissertation. Their suggestions greatly improved my erroneous English into a readable text. However, I should note that all the flows and errors contained in this dissertation are entirely my own.

Outside of the Fletcher School, I would like to thank my colleagues at the National Institute for Defense Studies (NIDS) and the Ministry of Defense for their support. In particular, my special thanks go to my colleagues at NIDS, Masafumi Iida, Masami Nishino, and Hikaru Yamashita for their advice. My former colleagues, Jun Tsunekawa, Hideki Tsuchimoto and Hitoshi Kawamura played an indispensable role to allow me to continue my study while working full-time at the institute. My thanks also go to my colleagues at the Ministry of Defense, Atsushi Endo, Daiki Iwashita, Koji Kano, Akihito Fukui, Yoshihiko Tsuchida, Kentaro Suzuki, Yoshinobu Hosokawa, and Jikichiro Matsubara for their help and encouragement.

My job at NIDS gave me precious opportunities to interact with top-notch experts in my field. Those include such prominent scholars as Eliot Cohen, Andrew Krepinevich, Edward Luttwak, Thomas Mahnken, Mark Mandeles, Williamson Murray, Geoffrey Till, and Barry Watts. In particular, I was extremely fortunate to meet Mr. Andrew Marshall in person through my work. His great insight inspired me to look into the Japanese case, and I would not have done so without his pointed suggestion.

And last, but not least, I would like to express my foremost appreciation to my family. My parents, Kazuhiko and Toshiko Tsukamoto, always understood my desire to study in the United States and provided support throughout my academic endeavor. I would also thank my mother-in-law, Mineko Ikenaga for her warm support to my entire family. My sincere appreciation goes to my wife, Yuri, and my son, Naoya, for their support and patience. They are my source of motivation and inspiration. To them, I dedicate this dissertation.

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Meguro, Tokyo

April, 2016

Contents

Introduction

On December 7, 1941, the Japanese Navy attacked Pearl Harbor in Hawaii with 350 aircraft launched from six aircraft carriers.[1] The air raid disabled most of the battleships of the U.S. Pacific Fleet. While, before the attack, all the major powers considered battleships to be the core of naval power, after Pearl Harbor aircraft carriers became the central component of the U.S., British and Japanese navies.[2] This dissertation seeks to address such questions as: What factors were behind the development of these new naval powerhouses? What accounts for the differences between these three navies in terms of their success, or lack thereof, in developing and utilizing this new approach to naval warfare? What lessons could be drawn from this history to ease future military innovation?

Naval operations after the Pacific Harbor attack differed completely from what the leaders of the three navies had expected before the war.[3] Few large fleet actions pitting battleships against other battleships, which they had envisaged and prepared for, took place during the war. Instead, battleships played a merely supporting role in naval operations by providing protection for carrier task forces and shelling fortified positions prior to amphibious operations. Thus, the concept

[1] Boeicho, Boei Kenshusho, Senshishitsu [Office of Military History, National Institute for Defense Studies, Japan Defense Agency] (hereafter NIDS), *Senshisosho: Kaigun koku gaishi* [War history series: A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 222.
[2] Emily O. Goldman, "Receptivity to Revolution: Carrier Air Power in Peace and War," in *The Diffusion of Military Technology and Ideas*, ed. Emily O. Goldman and Leslie C. Eliason (Stanford: Stanford University Press, 2003), 267 and Clark G. Reynolds, *The Fast Carriers: The Forging of an Air Navy* (Annapolis: Naval Institute Press, 1968), 22.
[3] Masataka Chihaya, *Rengo kantai koboki, jo* [The rise and fall of the Combined Fleet], vol. 1, (Tokyo: Chuokoronsha, 1996), 9.

of a fleet organized around the battleship "…became obsolete without ever having been used in battle."[4]

This radical change in naval warfare was not brought about by chance, but was the result of a generational change between the First World War and the Second World War.[5] Along with the development of aircraft carriers, other profound changes in warfare took place during the same period. In particular, Germany created the Blitzkrieg concept and the United States and Britain developed the strategic bombing doctrine, both of which changed the course of the Second World War.[6]

In history, there have been times when military organizations have undergone a radical change and have realized a dramatic increase in military effectiveness as a result, which are often referred to as revolutions in military affairs (RMA).[7] Numerous definitions of the RMA have been produced to this day, but little consensus exists among relevant literature. The well-cited definition of such radical changes is the one created by Andrew Krepinevich. He used the phrase "military revolution" to describe the phenomenon and defined it as follows:

> It is what occurs when the application of new technologies into a significant number of military systems combines with innovative operational concepts and organizational adaptation in a way that fundamentally alters the character and conduct of conflict. It

[4] George W. Baer, *One Hundred Years of Sea Power: The U.S. Navy, 1890-1990* (Stanford: Stanford University Press: 1993), 213.
[5] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), 105.
[6] On this point, Williamson Murray, "Armored Warfare: The British, French, and German Experiences," in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996); James S. Corum, *Roots of Blitzkrieg: Hans Von Seeckt and the German Military Reform* (Lawrence: University Press of Kansas, 1992); Robert M. Citino, *Path to Blitzkrieg: Doctrine and Training in the German Army, 1920-39* (Mechanicsburg: Stackpole Books, 2008).
[7] Michael Roberts first identified the rapid military change that occurred during the 15th century as a primary driver of state formation and conceptualized the phenomenon as "military revolution." There has been a debate among historians on the significance of military revolution since the early 1950s. On this point, see, Clifford J. Rogers, ed., *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder: Westview Press, 1995).

> does so by producing a dramatic increase in the combat potential and military effectiveness of armed forces.[8]

Krepinevich identifies ten historical RMA and includes carrier aviation as one of the "Interwar Revolutions in Mechanization, Aviation and Information" which had changed the nature of war dramatically.[9]

Focusing on a different aspect, Stephen Peter Rosen, in his landmark study on military innovation, defines the RMA as "…a change in one of the primary combat arms of a service in the way it fights or alternatively, as the creation of a new combat arm."[10] Rosen also includes the development of carrier aviation as one such innovation during the interwar period. Given the change in the nature of naval warfare that took place during the Pacific War and the advent of a new combat arm within the navy, Japan's carrier development fits both definitions and has been considered as one of the major successful cases of RMA in the interwar period.[11]

Historically, the RMA allows a state to demonstrate a clear military superiority over another without it. In the world of balance of power, "internal" balancing based on each country's own military capabilities is more reliable and precise than "external" balancing with the capabilities of allies.[12] For this reason, the RMA that drastically increases military power by changing the way of warfare is worthy of scholarly attention. However, military organizations with their rigid hierarchical order are highly bureaucratic and resistant to change. As Rosen points out, military organizations are especially resistant to change and

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[8] Andrew Krepinevich, "Cavalry to Computer: The Pattern of Military Revolution," *National Interest*, no. 37 (Fall 1994): 30.
[9] Ibid., 36.
[10] Rosen, *Winning the Next War*, 7.
[11] Thomas C. Hone, Norman Friedman, and Mark D. Mandeles, *American and British Aircraft Carrier Development, 1919-1941* (Annapolis: Naval Institute Press, 1999), 201 and Barry Watts and Williamson Murray, "Military Innovation in Peacetime," in Murray and Millett, 384.
[12] Kenneth N. Waltz, *Theory of International Politics* (Boston: McGraw-Hill, 1979), 168.

the absence of innovation is "the rule, the natural state."[13]

For this reason, studies on the sources and processes of past RMA have garnered great interest from not only scholars but also practitioners as a means of understanding how to innovate effectively.[14] Andrew Marshall, former Director of the Office of Net Assessment in the U.S. Department of Defense, who has a keen interest in the interwar RMA, drew an analogy between the situation after the Cold War and the interwar period as part of efforts to encourage studies to identify the driving forces behind successful military innovations.[15] One such study, carried out by Thomas Hone, Norman Friedman, and Mark Mandeles, investigated how the U.S. and British Navies confronted the emergence of aircraft carriers, which they regarded as the "landmark innovation" culminating in the RMA in naval warfare.[16]

With the help of these commissioned studies, Marshall developed the concept of RMA further and promoted innovation centered on information technology and precision-guided munitions within the U.S. military in the 1990s.[17] The RMA still has significant policy relevance even for today's security environment, particularly in Asia. China is developing its military capability rapidly, which seems to trigger arms competition among the neighboring countries. The RMA would give any country in the competition a significant military edge against the others, thus understanding the past cases of RMA may offer critical insights about the future strategic interactions in the region.

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[13] Rosen, *Winning the Next War*, 5.
[14] Emily O. Goldman and Richard B. Andres, "Systemic Effects of Military Innovation and Diffusion," *Security Studies* 8, no. 4 (Summer 1999): 98.
[15] Barry Watts and Williamson Murray, "Military Innovation in Peacetime," in Murray and Millett, 377. According to the acknowledgments of the book, this influential research project itself is "…most indebted to Dr. Andrew Marshall of the Office of Net Assessment for his interested and enthusiastic support."
[16] Hone, Friedman, and Mandeles, *American and British Aircraft Carrier Development*, 1.
[17] On the role of Marshall and the Office of Net Assessment in conceptualizing the RMA, see Stephen Peter Rosen, "The Impact of the Office of Net Assessment on the American Military in the Matter of the Revolution in Military Affairs," *Journal of Strategic Studies* 33 (August 2010): 469-482.

The problem, however, is that most previous studies on the development of aircraft carriers focused on the U.S. and British cases in large measure because the Japanese case is poorly documented, at least in English. Even the research on this subject that has focused on case studies of the Japanese, U.S., and British Navies has given insufficient treatment to the Japanese case, often due to the lack of materials available in English.[18]

Only after David Evans and Mark Peattie published their comprehensive research on the Japanese Navy, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941,* did a credible source of research on Japanese carrier development become available in English.[19] However, this study devotes only one chapter to naval aviation and does not provide detailed information or analyses of the subject. On the other hand, Peattie published a book entitled *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941*.[20] He explored Japanese sources extensively and gave well-balanced explanations of the development of Japanese naval aviation, but did not base his argument on the concept of RMA because the book was written primarily for the purpose of describing the comprehensive history of Japanese naval aviation. Furthermore, Peattie relied mostly on Japanese secondary sources and did not conduct in-depth archival research. Accordingly, there has been no equivalent study focusing on Japanese naval aviation to those on the British and U.S. cases with detailed analysis employing a wide range of materials including archival sources.

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[18] For major comparative studies including the Japanese case, see James H. Belote and William M. Belote, *Titans of the Seas: The Development and Operations of Japanese and American Carrier Task Forces during World War II* (New York: Harper & Row, 1975); Norman Friedman, *Carrier Airpower* (Annapolis: Naval Institute Press, 1981); Geoffrey Till, "Adopting the Aircraft Carrier: The British, American, and Japanese Case Studies," in Murray and Millett; John Buckley, "Maritime Air Power and the Second World War: Britain, the USA, and Japan," in *Airpower History: Turning Points from Kitty Hawk to Kosovo*, ed. Sebastian Cox and Peter Gray (London: Frank Cass, 2002); Goldman, "Receptivity to Revolution."

[19] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics and Technology in the Imperial Japanese Navy 1887-1941* (Annapolis: Naval Institute Press, 1997).

[20] Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2002).

With these major deficiencies in the scholarship on the revolution in military affairs in mind, this study seeks to fill a void in the studies on the RMA by shedding light on how the Japanese Navy achieved the "carrier revolution" and the nature and consequences of the differences that influenced the approach among the three navies on building technologically advanced carrier forces. In so doing, this study explores a wide range of materials in both English and Japanese. In terms of Japanese sources, most of the official documents were destroyed at the end of the Pacific War, therefore, in order to describe internal workings of the Japanese Navy, this study relies on such official and semi-official sources as the *Senshisosho* (War History Series) compiled by the National Institute for Defense Studies and the *Nihon Kaigun Kokushi* (The History of Japanese Naval Aviation), authored by former naval aviators. Also, articles and books including memoirs written by former naval officers are also employed to fill the gap caused by the lack of official documents. However, despite the wholesale destruction of official documents, a small number of credible documents are left intact, which have not been fully employed in the existing literature, particularly in English. This study makes best use of those untapped documents wherever possible to elaborate the internal working of Japanese naval aviation.

In order to clarify the process of RMA, this study will consider two related research questions: first, what factors made the "carrier revolution" possible for the Japanese Navy, and second, to what extent do the different approaches taken by the three navies (Japan, the United States, Britain) in developing aircraft carriers in the interwar period account for their relative degrees of strategic success achieved by aircraft carriers?

To deal with these questions, this research will focus on the following research questions. What kind of internal and external factors drove the RMA? To what extent can the existing explanatory models explain the Japanese case? After the process of RMA had begun, how did the Japanese Navy deal with organizational innovation to drive the RMA? Relatedly, was there any significant difference in ways to deal with organizational innovation between Japan and other major powers, notably the United States and Britain? If so, to what extent did the difference affect the RMA achieved during the Pacific War? Did organizational culture, particularly within naval aviation, promote or slow the RMA? If so, how did the organizational culture influence the process of RMA?

In answering these questions, I argue that, while technological opportunities and the external environment provided an initial push for innovation, organizational innovation within the Japanese Navy is a critical intervening variable in accelerating the process of RMA. Given the lack of civilian control over the military and the relative autonomy enjoyed by the Japanese Navy during the interwar period, senior officers in the Japanese Navy recognized a structural change in the security environment, invented a "new theory of victory" and adapted their organization by their own initiative. The Japanese Navy underwent a process of innovation by expanding its officer corps through creating a new career path and establishing a new institution. A distinctive organizational culture developed within naval aviation encouraged vigorous training and experimentation, which drove military innovation more profoundly than in any other branches of the Japanese Navy. However, the specific ways the organizational innovations were implemented critically affected the degree to which the Japanese Navy achieved the RMA during the Pacific War. Specifically, the Japanese Navy's practice of funding personnel only after its

procurement budget was approved and the commitment to ensuring the promotion of Naval Academy graduates up to the rank of Captain contributed to limiting the organizational representation of aviators within the navy, which, in turn, had serious adverse implications for the development of carrier aviation.

This dissertation will fill a void in the studies on the nature of RMA by providing a detailed case study on the Japanese Navy. In particular, it focuses on organizational factors to understand that even technologically backward countries, such as prewar Japan, could achieve a significant degree of military innovation by effectively employing factors other than technology, notably including organizational processes and approaches. At the same time, this study will demonstrate that different organizational paths produced quite different strategic outcomes, which contributed to the initial success as well as the final defeat of the Japanese Navy. These findings will help illuminate more completely the forces that help military organizations undertake more effective transformations in the future.

The next chapter will survey the existing literature on the RMA and discuss as to which models can be best employed to explain the development of carrier aviation by the Japanese Navy. In the scholarship of the RMA, technology has been considered as the primary driver, however there are some cases where technology did not play a dominant role in the process of innovation and the Japanese case is one of them. A competitive strategic environment also gives states a strong motivation for innovation, but such drive does not automatically translate into the RMA. Accordingly, there are four major models focusing on different sources of innovation: civilian intervention, interservice rivalry, intraservice politics and organizational culture. This chapter discusses the

applicability of each model to the Japanese case and concludes that the intraservice politics model and organizational culture have greater explanatory power in explaining the rise and fall of Japanese naval aviation.

The second chapter analyzes the strategic thinking of the Japanese Navy which triggered military innovation. The international context after the First World War drove the Japanese Navy to identify issues to be addressed by the RMA. In this case, the Japanese Navy recognized a significant change in the security environment caused by the Washington Naval Limitation Treaty and took steps to counter the perceived strategic inferiority in its naval power.

The third chapter will identify key visionary leaders who developed a new theory of victory to address the strategic problem. As the intraservice politics model predicts, the presence of reformers was critical in developing a new theory of war. There were several key figures including Admiral Isoroku Yamamto who promoted the novel idea and helped develop carrier aviation. Their initiative to diffuse the new theory within the navy will also be examined.

The next two chapters will look at the intraservice interactions within the navy. The fourth chapter first examines the parallel developments took place within the U.S. and Japanese navies. Specifically, the chapter describes how the visionary leaders institutionalized the new theory of victory by focusing on the establishment of the Naval Aviation Department and its effect on the course of development of naval aviation. The creation of the Department provided an institutional home for carrier aviation, and thus promoted further organizational developments and enhanced aviators' standing inside the Japanese Navy.

Conversely, the fifth chapter focuses on the different pathway to organizational developments peculiar to the Japanese Navy. The roles of carrier forces gradually shifted from spotting and scouting for battleships to independent offensive strikes, keeping pace with the technological development of aircraft. In so doing, naval aviation expanded rapidly in terms of resources and personnel throughout the interwar period. This chapter examines how the navy integrated its new combat arm into its existing organization and dealt with organizational challenges posed by this shift by looking closely at internal workings, particularly its personnel and promotion policies. The chapter will demonstrate that the different pathway to innovation affected the ability to sustain innovation in the development of carrier aviation.

The sixth chapter discusses how organizational culture affected the process of military innovation. This chapter looks at how the unique organizational culture developed within naval aviation drove the aircraft carrier revolution. In particular, it demonstrates a plausible explanation as to why carrier aviation was developed more successfully than other platforms which developed around the same time during the interwar period.

The concluding chapter will look at the similarities and differences in the factors across the strategic, organizational and cultural levels and discuss how the different path to innovation taken by the Japanese Navy affected the degree to which it achieved the RMA.

Chapter 1

Competing Theories of Innovation

Introduction

As revolutions in military affairs (RMA) attract increasing attention in both academic and policy fields, practitioners and scholars alike have made efforts to clarify what drives innovation, primarily through exploring past cases of RMA. In so doing, a consensus has been formed around two factors, competitive strategic environment and technology, as central to promoting innovation. While these factors are certainly critical to achieving RMA, there are a number of cases where states failed to innovate despite fierce competition among states and sufficient technological maturity. Thus, these two factors may be a necessary condition but not sufficient conditions for RMA. These observations stimulated further studies to seek another set of variables to determine the course of innovation. In particular, four major schools of thought focusing on different sources of innovation have been developed to bridge the gap between the two primary drivers and RMA. Given the accumulation of studies on military affairs in the West, these models predominantly derived from the case studies mainly on European states and the United States. Against this backdrop, this chapter will discuss whether these models can be applied to explain the Japanese case. In so doing, this chapter compares the strengths and weaknesses of existing explanatory models and concludes that the intraservice politics model and organizational culture best explain the Japanese case.

Strategic Environment

In the literature of international relations, the realist and neorealist theorists assume that states eventually emulate an RMA for their survival. As Kenneth Waltz argues, "Contending states imitate the military innovations contrived by the country of greatest capability and ingenuity. The weapons of the major contenders, even their military strategies, thus begin to look much the same all over the world."[21] According to realist and neorealist theory, states under the strategic pressure of anarchy would respond to the RMA uniformly.

Eliot Cohen concurs with the neorealist argument by saying that technology, organization and operational concepts are formed around "…assumptions about what war is, how it can and should be waged, by whom and against whom it will be conducted."[22] However, at the same time, Cohen argues different countries face very different security environments, thus the concepts of RMA would vary by country and take very different forms. In illustrating this point, he also goes on to say that "Japan and the US pushed carrier aviation because they anticipated war with one another in the Pacific."[23]

While scholars agree that strategic context clearly provides an initial push for the RMA, neorealist theory does not fully explain differences in the timing and ways in which innovations take place across different countries. For example, Germany, France and Britain, under the similar strategic environment with comparable industrial and technological bases, adopted armored warfare

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[21] Kenneth N. Waltz, *Theory of International Politics* (Boston: McGraw-Hill, 1979), 127. Theo Farrell and Terry Terriff concur that the most obvious source of innovation is a changing threat to national security. Theo Farrell and Terry Terriff, "The Sources of Military Change," in *The Sources of Military Change: Culture, Politics, Technology*, ed. Theo Farrell and Terry Terriff (Boulder: Lynne Rienner, 2002), 10.
[22] Eliot A. Cohen, "Change and Transformation in Military Affairs," *Journal of Strategic Studies* 27, no. 3 (September 2004): 396.
[23] Ibid., 397.

differently.[24] Therefore, the study of RMA requires another set of theories to explain these differences.

Technology

Andrew Krepinevich argues that four elements constitute the necessary, but not sufficient conditions for the RMA. They are technological change, systems development, operational innovation, and organizational adaptation.[25] In particular, technology has been seen as a primary driving force for the RMA. Military innovation driven by information technologies attracted much attention after the spectacular victory of the coalition forces in the Gulf War of 1991. In that war, many advanced weapons systems, such as stealth fighters, long-range precision guided munitions, sophisticated sensors, and the Global Positioning System played a critical role in the victory.[26] Admiral Bill Owens (Ret.), one of the most influential advocates of RMA after the Gulf War, argues that the RMA "…seeks to use new technology to transform the way in which military units can wage war."[27]

However, technology alone cannot create or stimulate an RMA, which is why the literature on military innovation focused on the various reasons why military organizations fail to accept and integrate technological innovation into their organizations, tactics, and operations.[28] In order to translate technological

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[24] On this point, see Williamson Murray, "Armored Warfare: The British, French, and German Experiences," in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996).
[25] Andrew Krepinevich, "Cavalry to Computer: The Pattern of Military Revolution," *National Interest*, no. 37 (Fall 1994): 30.
[26] Thomas A. Keany and Elliot A. Cohen, *Revolution in Warfare? Airpower in the Persian Gulf War* (Annapolis: Naval Institute Press, 1995).
[27] Bill Owens with Ed Offley, *Lifting the Fog of War* (New York: Farrar, Straus and Giroux, 2000), 10.
[28] See John Ellis, *The Social History of the Machine Gun* (Baltimore: Johns Hopkins University Press, 1975) and Edward N. Luttwak, *Strategy: The Logic of War and Peace*, revised ed. (Cambridge: Harvard University Press, 2001), 100-101.

innovation into military effectiveness, military organizations must adopt new technologies organizationally by establishing new institutions, creating new doctrines for training their troops and educating their officers to take full advantage of their full potential.[29]

Other studies also underscore this point. Based on nine case studies on military change, Theo Farrel and Terry Terrif conclude that "technology is not deterministic" in causing a radical change. Rather, military change including the RMA is "…more complex, one that requires the analyst to go within state, indeed within military organizations themselves, to account also for the role of culture, politics and technology."[30] In one of the major comparative case studies on the RMA in the interwar period, Williamson Murray and Barry Watts acknowledge that "…technological developments played an enabling or facilitating role in precipitating fundamentally new and more effective way of fighting."[31] However, they also point out that the underlying technologies and the new military systems formed only a part of RMA.

Therefore, while technology is widely considered as a necessary condition for the RMA, a growing consensus that technology alone could not account for when and how it occurs has been formed. Accordingly, the recent scholarship turns to other factors to explain the process of RMA. Adam Grissom identifies four major schools of thought in this field. These schools focus on civil-military relations, interservice politics, intraservice politics, and organizational culture.[32] Using Grissom's categorization, the next section will review each explanatory model of RMA and discuss which model can best explain the Japanese case.

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[29] Keaney and Cohen, *Revolution in Warfare?*, 201-202 and Mark D. Mandeles, *The Future of War: Organizations as Weapons* (Washington: Potomac Books, 2005), 33.
[30] Farrell and Terriff, "The Sources of Military Change," 16.
[31] Watts and Murray, "Military Innovation in Peacetime," in Murray and Millett, 371-372.
[32] Adam Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5 (October 2006): 908-919. Pierce also employed the same categorization. Terry C. Pierce, *Warfighting and Disruptive Technologies: Disguising Innovation* (London: Frank Cass, 2004), 4-8.

Civil-Military Relations

Domestic political system, particularly the mechanism of civilian control, has been considered as a necessary condition in making military organizations adaptive to innovation. There are some cases where civilian intervention seems critical to drive the RMA. For example, in his case study on the introduction of continuous-aim firing in the U.S. Navy, Elting Morison found that the navy initially resisted the new invention proposed by then junior officer William Sims. However, after Sims wrote President Theodore Roosevelt about his proposal, he was assigned as Inspector of Target Practice, and continuous-aim firing was successfully installed into the fleet. Upon this observation, Morison, quoting Alfred Mahan, concludes that "…no military service should or can undertake to reform itself;" therefore, it "…must seek assistance from outside."[33]

Barry Posen echoed Morrison's arguments by stating that military organizations seldom innovate if left alone. He points out three primary reasons for this.[34] First, military organizations, same as other bureaucratic organizations, try to minimize uncertainties, therefore tend to avoid creating uncertainties by changing the traditional way of business. Second, military organizations are usually highly hierarchical, which prevents a bottom-up flow of information conducive to innovation. Third, senior military officers achieved their ranks through mastering traditional ways of warfare and have less incentive to change. Based on these observations, Posen concludes that military innovation "…should

[33] Elting E. Morison, *Men, Machines, and Modern Times* (Cambridge: MIT Press, 1966), 67.
[34] Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca: Cornell University Press, 1984), ch. 2.

occur mainly when the organization registers a large failure, or when civilians with legitimate authority intervene to promote innovation."[35]

Deborah Avant concurs that Posen is successful in explaining the relationships between civilian leaders and military organizations and considers civilian intervention as a source of military innovation. However, in order for better understanding of the civil-military dynamics, Avant introduced institutional theory and focused on domestic institutions to explain different success in responding counterinsurgency between the United States and Britain. The structure of domestic political institutions, she argues, "…affects the bias of military organizations and indicates the type of civilian intervention which will be most likely to prompt military change."[36]

Robert Art and Stephen Ockenden also argue that high-level political intervention was necessary to drive innovation. They took the case of development of cruise missiles by the U.S. Air Force, Navy and Army in the 1970s and early 1980s. They point out that none of the services wanted to develop cruise missiles at first since the platform threatened each service's dominant missions and/or consumed their budgets. Only political pressures from high-level political figures started or sustained the cruise missile programs. Thus, they conclude that military organizations are "…highly resistant to radical change," and therefore, "…political intervention from the outside is necessary if radical change is to occur."[37]

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[35] Ibid., 224.
[36] Deborah. D. Avant, *Political Institutions and Military Change* (Ithaca: Cornell University Press, 1994), 130.
[37] Robert J. Art and Stephen E. Ockenden, "The Domestic Politics of Cruise Missile Development, 1970-1980," in *Cruise Missiles: Technology, Strategy and Politics*, ed. Richard K. Betts (Washington: Brookings Institution Press, 1981), 406.

Given its focus on civilian influence over the military, this school of thought provides a plausible explanation about military innovations in democratic countries, particularly the United States and Britain. Also, as Posen shows, it can also explain the case of Nazi Germany, where the civilian dictator prompted the Blitzkrieg doctrine.

However, it seems difficult to explain the Japanese case for three reasons. First, there was no effective civilian control or even oversight from the executive branch or the Diet on detailed military matters.[38] The Meiji Constitution granted each minister of state, including the army and navy ministers, the right of direct access to the emperor. This constitutional provision separated both the administrative and operational functions of the Army and Navy from civil cabinet controls.[39] Also, both the Ministers of Navy and Army were chosen from the pool of active uniformed officers who were put in reserve right after the appointments.

There was a theoretical possibility that civilians might be appointed as Army or Navy Ministers since the Meiji Constitution did not stipulate that the Army and Navy Ministers be active duty officers. However, the Imperial Ordinances of May 1900 specified that they were to be held only by senior officials above the rank of lieutenant general or vice admiral. In addition, in 1937, it was stipulated that active uniformed officers be appointed as the Ministers of Navy and Army, which required the Prime Minister to secure consensus first from the military services to form the cabinets. Under this system, the Japanese

[38] Traditionally, the Japanese armed services "enjoyed legal independence and the ability to coerce cabinets." Carl Boyd, "Japanese Military Effectiveness: The Interwar Period," in *Military Effectiveness, vol. 2, The Interwar Period*, new ed., ed. Allan R. Millett and Williamson Murray (Cambridge: Cambridge University Press, 2010), 132.
[39] Leonard A. Humphreys, *The Way of the Heavenly Sword: The Japanese Army in the 1920s* (Stanford: Stanford University Press, 1995), 8.

military services even had "the ability to make or break governments by a 'majority of one' in cabinets" in this period.[40]

Second, there was no substantial civilian presence within the Japanese Navy. Civilian bureaucrats, very selective cadre of elites, were known to be very powerful political force within the Japanese executive branch. However, they operated under the principles of the Meiji Constitution which preserve the independence of command and did not see the rise of military services as a threat to the principle of civilian control. Also, except for engineers or workers hired by the navy (some of them were incorporated as uniformed officers), there was no civilian official within the Navy Ministry. Conversely, military officers were appointed to senior posts in civilian agencies, particularly those created within the Cabinet. Therefore,

Finally, neither civilian leaders nor the Diet had any control on promotion policies of the military services. According to Avant, in order for civilian leaders to make military organizations adaptive to innovation, civilian political institutions need to be united and to be designed so as to allow civilian leaders to change military leadership without significant political costs. She argues that, under this political arrangement, civilian leaders can effectively employ promotion policies to induce a particular perspective among military leaders.[41] However, in the Japanese case, neither the cabinet nor the Diet had this power to approve or change senior military leaders. Even the most senior posts, such as the chief of naval operations and vice administrative minister of the Navy Ministry did not require approval from the cabinet or diet. The

[40] Alvin D. Coox, "The Effectiveness of the Japanese Military Establishment in the Second World War," in *Military Effectiveness*, vol. 3*, The Second World War*, new ed., ed. Allan R. Millett and Williamson Murray (Cambridge: Cambridge University Press, 2010), 3.
[41] Ibid., 17.

personnel management policy was totally under the control of the Bureau of Personnel within the Navy Ministry.[42]

As Leonard Humphrey rightly pointed out, this political system created by the turn of the twentieth century prevented civilian interference with the military.[43] While civilian intervention is deemed critical in terms of military innovations in other countries, this model is not expected to have much explanatory power for the presented case.

Interservice Politics

This school of thought focuses on the relationship between the military services within a state. The core tenet of this school is that competition between the services over scarce resources is a primary driver for innovation. The military services, just as other bureaucratic institutions, seek greater budgets and more personnel for their survival, and thus compete in new critical mission areas. Specifically, this model holds that interservice competition over novel, but similar weapons systems accelerates technological development, which eventually results in the RMA.

Vincent Davis observed that the interservice competition created an atmosphere which made the armed services receptive to innovation.[44] In illustrating this point, Davis took the case of the development of a nuclear strike

[42] Teiji Nakamura, *Nichibei ryokaigun no teitoku ni manabu: Dainiji sekai taisen ni okeru tosotsu no kyokun* [Learning from U.S. and Japanese admirals: Lessons of leadership from the Second World War] (Tokyo: Heijutsu Dokokai, 1988), 6-7.
[43] Humphreys, *The Way of the Heavenly Sword*, 8.
[44] Vincent Davis, *The Politics of Innovation: Patterns in Navy Cases*, Monograph Series in World Affairs 4, no. 3 (Denver: University of Denver, 1967).

capability by the U.S. Navy in the late 1940s. Immediately after the Second World War, nuclear weapons had increasingly been considered as the dominant weapon of the future and it was believed that the U.S. Air Force was the ideal military service to deliver the weapon. The U.S. Navy felt its continued existence threatened by the Air Force and became receptive to innovative ideas for survival. In this case, the U.S. Navy accepted an idea to equip carrier-borne aircraft with nuclear weapons, a policy suggested by junior officers, and eventually developed the capability. Davis concludes that the interservice rivalry "…produced a steadily improving climate for innovations within the Navy."[45]

Michael Armacost focused on the case of the Thor-Jupiter controversy between the Air Force and the Army in the 1950s and demonstrated that the development of the missiles was influenced by the character of the political process. In particular, Armacost saw the military services as "…lobbying groups jealous of and aggressively defending their institutional interests," and both the Air Force and Army tried to secure budgetary and operational control over the functional area over which neither service had clear jurisdiction. As a result of the competition for survival, the development of the novel weapon system was promoted rather than protracted.[46]

Harvey Sapolsky also argues that interservice competition spurs innovation. In particular, in cases where there is an expectation of significant reward or loss, the military services offer new ideas and ways to improve military capabilities.[47] Sapolsky demonstrated that the U.S. Navy's fear of losing the nuclear deterrent mission to the Air Force in the early Cold War era had

[45] Ibid., 41.
[46] Michael H. Armacost, *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia University Press, 1969).
[47] Harvey M. Sapolsky, "The Interservice Competition Solution," *Breakthroughs* 5, no. 1 (Spring 1996): 1.

prompted the development of Polaris submarine-launched ballistic missile, which became a less vulnerable and more cost-effective nuclear deterrent.[48]

In the Japanese case, there existed a severe interservice rivalry between the army and the navy throughout the interwar period. However, the interservice politics model has limited explanatory power on this case for two reasons. First, as the cases above show, in order for interservice rivalry to turn into competition conducive to innovation, there needs to be contested critical mission areas; however, there was little duplication in this regard between the two services. This is primarily because of the difference in their main theaters of operations — while the Army had focused exclusively on land warfare on the continent, the navy concentrated on naval operations in the Pacific.[49] Naval aircraft thus required longer ranges to operate in the vast areas across the Pacific Ocean and specialized airplanes, such as seaplanes and flying boats, and equipment, such as torpedoes and armor piercing bombs, were needed for naval engagements.[50] Accordingly, at least in the development of combat aircraft, the Japanese Navy cared less about the possible overlaps of missions and capabilities vis-à-vis the Army.

Second, given the lack of effective civilian control to manage the rivalry, the Japanese Navy and Army arranged a certain kind of "negotiated environment," where a military budget was divided equally, each service prepared for its own preferred war, and forces did not cooperate effectively.[51] Under this political circumstance, both services acknowledged a certain

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[48] Harvey M. Sapolsky, *The Polaris System Development: Bureaucratic and Programmatic Success in Government* (Cambridge: Harvard University Press, 1972).
[49] Boeicho, Boei Kenshusho, Senshishitsu [Office of Military History, National Institute for Defense Studies, Japan Defense Agency] (hereafter NIDS), *Senshisosho: Kaigun koku gaishi* [War history series: A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 73.
[50] Ibid., 1-5, 25-29, 73-80.
[51] Posen, *The Sources of Military Doctrine*, 54.

autonomy to avoid direct confrontation in weapons developments. Hone, Friedman, and Mandeles notes that the Japanese Navy was "…free to pursue its own aviation programs without severe competition or criticism from the Japanese army."[52] Peattie describes the situation of aircraft development as follows: "Both services carried out aviation design and production research and development in their arsenals and depots, but neither shared the results with each other. Each service saw to it that particular aircraft were designed and produced only for that service." [53] This description underscores the fact that the presence of a negotiated environment was evident even in terms of combat aircraft development as well. For these reasons, the interservice politics model seems not to offer strong explanatory power for the presented case.[54]

Intraservice Politics

This school of thought treats military organizations as complex political communities comprising different branches and departments, each with its own culture or rules, and considers the organizational level of analysis as critical in explaining the RMA. It holds that although military organizations are as difficult to change as other bureaucratic institutions, they do innovate from time to time in the absence of external forces such as civilian intervention and interservice rivalry.

Stephen Rosen examined twenty-one cases of innovation from the U.S. and British military services and pointed out that the RMA has both intellectual

[52] Hone, Friedman, and Mandeles, *American and British Aircraft Carrier Development*, 204.
[53] Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2002), 100.
[54] Peattie indicated that the interservice rivalry generally "hampered" rather than promoted the development of combat aircraft throughout the interwar period (even during the war). Ibid., 100-101.

and organizational components. Specifically, he argues that the RMA requires the following four themes. First, it requires an ideological struggle centered on "a new theory of victory, an explanation of what the next war will look like and how officers must fight if it is to be won."[55] Second, this new theory has to be translated into new concrete and critical tasks against which performance can be measured. Third, this intellectual struggle must lead to control over the promotion of officers, which is the source of power within military organizations. Finally, RMA requires the creation of a new promotion pathway to the senior officer level so that talented junior officers advance, resulting in a generational change of the military. This pathway, Rosen notes, could only be created by senior officers with the power to do so.

Based on this intraservice model, Rosen argues that the success of U.S. carrier aviation could be attributed to Rear Admiral William Moffett, who was the first chief of the Bureau of Aeronautics, and his innovation strategy. Moffett took the lead in creating an attractive and rewarding career path for naval aviators, which contributed to an increase in the number and influence of naval aviators inside the U.S. Navy.[56] Barry Watts and Williamson Murray echo Rosen's argument and maintain that intraservice politics are critical in explaining the American RMA. They maintain that American success in building aircraft carriers was "…contingent on organizational interactions and processes through which the naval aviation community reached technological decisions about the kinds of carriers and carrier aircraft it would need."[57]

Compared with the first two explanatory models, this intraservice model has greater promise in tracing the process of Japan's carrier aviation

[55] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), 20.
[56] Ibid., 76-80.
[57] Watts and Murray, "Military Innovation in Peacetime," 384.

development. Evidence suggests that there was a parallel to the development path laid out by Rosen inside the Japanese Navy. In the following section, some evidence demonstrating the presence of visionary leaders, the establishment of a new institution, and the creation of new career path will be reviewed.

In military institutions, with their rigid hierarchical order, the role of senior officers is critical in formulating any policy. Individual leadership, particularly the senior officers' influence, plays a critical role in the development of an RMA. As for the case of the Japanese Navy, the role of senior officers in driving the RMA has also been emphasized. In particular, Admiral Isoroku Yamamoto has been considered "Japan's greatest naval strategist and commander" for his "great contribution to naval strategy [which] was in his ability early on to recognize the importance of air power and the development of long-range aircraft."[58] Yamamoto was also the mastermind of the Pearl Harbor attack, which John Potter described as "...Yamamoto's daring, magnificently planned and executed attack – the greatest air operation ever seen up to this time."[59] In this sense, Yamamoto was one of the senior officers who developed a "new theory of victory" within the Japanese Navy.

Creating a new department is critical in expanding the political clout of new combat arms. In this regard, the establishment of the Naval Aviation Department in April 1927 had significant impacts on the development of carrier-borne aircraft. As Admiral Shigeyoshi Inoue, an air-minded admiral, later pointed out, it was the establishment of the aviation department that brought about the success of naval aviation in the Second Sino-Japanese War and the

[58] Yamamoto's role in naval aviation, see Hiroyuki Agawa, *The Reluctant Admiral: Yamamoto and the Imperial Navy* (Tokyo: Kodansha International, 2000); Nakamura, *Nichibei ryokaigun no teitoku ni manabu*, 225-231.
[59] John Dean Potter, *Yamamoto: The Man Who Menaced America* (New York: Viking, 1965), 120.

early stages in the Pacific War.[60] Geoffrey Till reached the same conclusion: "the revolution in naval administration which began in 1927 explains the impressive surge in the development of Japanese naval aviation from the mid-1930s."[61] This development in the Japanese Navy paralleled the creation of the Bureau of Aeronautics in the U.S. Navy in 1921, which was the primary agency for U.S. carrier development.[62] Conversely, the British Navy did not create a separate department and its carrier aviation was integrated into the Air Force in 1918, which had significant negative impacts on the organizational development of naval aviation.[63]

This new Japanese department, which exercised significant administrative control over all weapons and facilities related to naval aviation, consisted of three sections: administration, technology, and education and training.[64] What set it apart from its surface ship counterpart in terms of an innovative culture was that the department contained its own education and training section, in addition to a powerful administration section. The primary reason why the aviation department dealt with educational and training matters was that the navy leadership believed it critical to coordinate technology, equipment, and operations in the rapidly developing field of naval aviation.[65] With these two sections, the department exercised near total administrative control over almost all areas of naval aviation except operational matters, and did so in an organization which values rigid hierarchical control.

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[60] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi* [The history of Japanese naval aviation], vol. 3 (Tokyo: Jiji Tsushinsha, 1969), 44.
[61] Geoffrey Till, "Adopting the Aircraft Carrier: The British, American, and Japanese Case Studies," in Murray and Millett, 213.
[62] Ibid., 210.
[63] Geoffrey Till, *Air Power and the Royal Navy, 1914-1945: A Historical Survey* (London: Jane's Publishing, 1979), and Rosen, *Winning the Next War*, 99-100.
[64] NIDS, *Kaigun koku gaishi*, 7.
[65] Ibid, 8.

Although all three navies took similar paths in pursuing a carrier revolution in other areas, a central argument in this research is that the Japanese case likely demonstrates that there are significant differences in the ways each navy adopted aircraft carriers and that these differing approaches had direct and immediate consequences for their operational effectiveness in war and ability to promote and sustain innovation in the development of technologies and operations. The case in point is aviator recruitment. When the Pacific War broke out in 1941, approximately ninety percent of Japanese naval aviators were noncommissioned officers. By contrast, the U.S. Navy maintained an officer pilot corps which consisted of more than seventy percent commissioned officers.

This decision had a critical effect on the development of Japanese naval aviation, since there were fewer officers to go on to positions of influence in the navy. Since senior leaders, able to exercise influence and authority over all significant changes in policy in the navy, did not recognize the value of and encourage the potential of naval aviation, it was up to the junior officers to change the existing organization.[66] Not only did this impede the organizational innovation, but the comparatively small number of commissioned officers in the Japanese case also were largely unable to expand the influence of naval aviation within the navy in contrast with their American counterparts.[67]

Furthermore, the shortage of commanding officers who were trained as pilots exercised a significant degree of influence on the development of aircraft carriers: for senior officers to command aircraft carriers effectively, it was essential for them to have first-hand experience operating aircraft. However, in the Japanese Navy, commanders of aircraft carriers were surface ship officers,

[66] For this point, see Rosen, *Winning the Next War*, 76-80.
[67] Ibid., 78-79 and Watts and Murray, "Military Innovation in Peacetime," 396.

and insufficient efforts were made to educate commanders in naval aviation. Even though the navy transferred many talented commanders from other areas into naval aviation command billets, they had no experience as naval aviators.

In contrast, the U.S. Navy took a different approach to personnel policy for developing aircraft carrier commanders. In the mid-1920s, the Morrow Board decreed that commanders of air stations and aircraft carriers had to be aviation officers, which in effect created an attractive career path for them both in terms of assignments and the potential for promotion.[68] Similar to the Japanese Navy, the U.S. Navy transferred senior officers from other areas to fill the increasing number of posts in naval aviation. However, in so doing, the U.S. Navy created a training course for naval aviation observers, which trained selected senior officers in the art and science of aviation.[69] For example, Joseph Reeves, who was one of the senior officers who took the training course, made a significant contribution to the development of carrier operations as commander of *USS Langley*, which was the first aircraft carrier in the U.S. Navy.[70]

The Japanese Navy tried to maintain a percentage of commissioned officers of at least fifteen percent in naval aviation, but it failed even to maintain this level, which sometimes fell to as low as ten percent.[71] This resulted in a shortage of commissioned officers produced as a consequence a relatively low overall number of pilots. According to one estimate, the Japanese Navy had less than 3,500 operational pilots at the opening of the Pacific War, while there were

[68] Rosen, *Winning the Next War*, 77-80.
[69] Ibid., 77 and Watts and Murray, "Military Innovation in Peacetime," 401.
[70] Thomas Wildenberg, *All the Factors of Victory: Adm. Joseph Mason Reeves and the Origins of Carrier Airpower* (Washington: Brassey's, 2003), 120-135.
[71] Vice Admiral Tasuku Nakazawa, director of the department of personnel management, later wrote that the actual ratio of officer pilots was from 6 to 8 percent. Nakazawa Tasuku Kankokai, ed., *Kaigun chujo Nakazawa Tasuku: Sakusenbucho, jinjikyoucho no kaiso* [Vice Admiral Nakazawa Tasuku: Memoir of the Chief of Naval Operations and the Director of Personnel Management] (Tokyo: Hara Shobo, 1979), 216.

8,000 active duty pilots in the U.S. Navy and Marine Corps.[72] Even though the Japanese Navy suffered from a shortage of officer pilots in the interwar period, it did not take the issue as seriously it should have.[73] Instead, it chose to create a small but highly trained elite cadre of pilots. At the time of the Pearl Harbor attack, the navy maintained approximately 600 carrier aircraft pilots with an average experience of 800 flying hours. By that standard, they were the best-trained pilots in the world at that point.[74]

However, this small number of officer pilots had negative effects on naval aviation during the Pacific War. Even when the navy realized that air war would require many more pilots than anticipated, it could not rapidly expand its pilot corps, because there were not enough experienced pilots who were available as training instructors. In this sense, the Japanese Navy succeeded in creating enough elite carrier pilots to carry out the initial offensive operations, including the Pearl Harbor attack, but failed to prepare for the protracted period of attritional air warfare with the United States in the Pacific Theater of Operations.[75]

Since previously overlooked organizational factors may shed light on why military innovation in Japan differed from in the U.S. and British navies and its effects on the war, the focus of this dissertation is to understand the organizational arrangements inside the Japanese Navy, particularly how and why it chose to create such a skewed aviator corps, through the intraservice explanatory model.

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[72] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics and Technology in the Imperial Japanese Navy 1887-1941* (Annapolis: Naval Institute Press, 1997), 583.
[73] NIDS, *Kaigun koku gaishi*, 466-467.
[74] On this point, Peattie pointed out: "By 1941, in training and experience the navy's fighter pilots as a whole were among the best in the world, and its carrier pilots were probably the best among the world's three leading carrier forces." Peattie, *Sunburst*, 134.
[75] NIDS, *Kaigun koku gaishi*, 212-213.

Organizational Culture

Cognitive-cultural theories have attracted increasing attention in the international relations literature.[76] Accordingly, this cultural school of thought has gained more influence in the recent study of military innovation by offering a plausible explanation as to how cultural factors influence the way military organizations adopt the RMA. Specifically, this explanatory model focuses on cultural factors as an intervening variable in the causal relationship between technology and military organizations.

Every organization has a culture which is sometimes referred to as "organizational culture." James Wilson defines organizational culture as "a persistent, patterned way of thinking about the central tasks of human relationships within an organization."[77] According to Wilson, "procedural" organizations, whose outputs can be observed but outcomes cannot, tend to have strong organizational cultures and military organization is one of them.[78] Organizational culture has attracted increasing attention since it causes different responses to the same stimuli in different ways, which explains why some organizations, faced with changed environments, stick to traditional ways of behaving and others will adopt new ways.

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[76] For this point, see the debates on strategic culture, in particular between Colin S. Gray and Alastair Ian Johnston. Alastair Iain Johnston, "Thinking about Strategic Culture," *International Security* 19, no. 4 (Spring 1995); Colin S. Gray, "Strategic Culture as Context: The First Generation of Theory Strikes Back," *Review of International Studies* 25, no. 1 (January 1999); Alastair Iain Johnston, "Strategic Cultures Revisited: A Reply to Colin Gray," *Review of International Studies* 25, no. 3 (July 1999).

[77] James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York: Basic Books, 1989), 91.

[78] Daniel W. Drezner, "Ideas, Bureaucratic Politics, and the Crafting of Foreign Policy," *American Journal of Political Science* 44, no. 4 (October 2000): 736.

For example, Elizabeth Kier argues that organizational culture can explain how certain doctrines were chosen by militaries. Kier defined organizational culture as "…the set of basic assumptions, values, norms, beliefs, and formal knowledge that shape collective understandings" and stated that "[i]t is not surprising that military organizations, with long-term membership and powerful assimilation mechanisms, develop strong cultures."[79] According to Kier, France chose defensive doctrines in the interwar period because of organizational culture within the French Army. After the First World War, civilian leaders decided to shorten the term of military service to one year despite opposition from the military. The French Army believed that short-term conscripted soldiers were less trained than professional ones, thus could not take offensive operations which required sophisticated skills and high morale. However, the fact that the Germany Army conducted offensive operations in Europe in the Second World War with largely short-term conscripted soldiers disproved this belief. Therefore, Kier concludes that organizational culture within the French Army foreclosed French strategic options other than defensive doctrines. Otherwise it could have chosen offensive doctrines it had employed during the First World War and tested in the interwar period.

Organizational culture is also considered to be a driving force of RMA.[80] Williamson Murray describes organizational culture peculiar to military organizations as "military culture" and defines it as "…the ethos and professional attributes, both in terms of experience and intellectual study that contribute to a common core understanding of the nature of war within military

[79] Elizabeth Kier, *Imagining War: French and British Military Doctrine between the Wars* (Princeton: Princeton University Press, 1997), 28.
[80] See Risa A. Brooks, "Making Military Might: Why Do States Fail and Succeed?" *International Security* 28, no. 2 (Fall 2003); Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis*, a RAND research study (Baltimore: Johns Hopkins, 1989); Kier, *Imagining War*; Douglas Porch, "Military 'Culture' and the Fall of France in 1940: A Review Essay," *International Security* 24, no. 4 (Spring 2000).

organizations."[81] He argues that military culture may be the most important enabling factor — and perhaps more important and decisive than technology alone. Murray also considers military culture as an essential element in successful innovation and attributes military culture to the success in developing U.S. carrier aviation in that it "created a realistic relationship between yearly exercises, planning for those exercises, and education and war gaming that occurred at the Naval War College."[82] Therefore, organizational culture matters when it creates an atmosphere conducive to an RMA within the military organizations.

In his recent study, Dima Adamsky examines Russian, U.S., and Israeli strategic cultures and demonstrates how the variations in strategic cultures account for the various ways in which military innovations, based on similar technologies, develop in different ways.[83] On the one hand, the United States and Israel developed precision guided munitions, sensors, and information technologies and actually used them effectively in battle, however both countries failed to recognize the revolutionary change those technologies brought about. It took the United States and Israel more than a decade to fully embrace the concept of RMA. On the other hand, although the Soviet Union did not have any of them, the Soviet Army, particularly its General Staff, was able to observe the revolutionary change and conceptualize the RMA in the 1980s. In addressing this puzzle, Adamsky argues that cultural factors intervened in the causal relationship between technology and innovation and conditioned the intellectual paths toward the RMA. He also argues that cultural factors help explain "why,

[81] Williamson Murray, "Does Military Culture Matter? The Future of American Military Culture," *Orbis* 43, no. 1 (Winter 1999): 27.
[82] Williamson Murray, "Innovation: Past and Future," in Murray and Millett, 316-317.
[83] Dima Adamsky, *The Culture of Military Innovation: The Impact of Cultural Factors on the Revolution in Military Affairs in Russia, the US, and Israel* (Stanford: Stanford University Press, 2010).

once a new technology is available, certain states translate it into an RMA while others do not, or do it in a different style."[84]

Even within a single military organization, several sub-cultures coexist across different branches. Wilson indicates that there are several cultures within the U.S. Navy. He points out that "[t]he culture of the U.S. Navy is very different depending on whether you are assigned to submarines, aircraft carriers, or battleships."[85] Kier also pointed out that, within the British Army, there existed different organizational cultures among infantry and cavalry regiments which were traditional military branches on one hand, and technical branches on the other hand.[86]

Although the existence of unique organizational culture alone does not explain the entire process of the RMA in the Japanese Navy, it contributes to some understanding of why naval aviation developed a more innovative culture in terms of technological receptivity and tactical developments than the other branches of the Japanese Navy during the same period and was more successful in avoiding the pitfalls of seniority rule, which had exercised a dominant influence in almost all other aspects of the Japanese military.[87] Furthermore, as the studies above show, most existing studies focused on organizational cultures in non-Asian military organizations, namely those of the United States and European countries. By closely looking at the case of the Japanese Navy, this study will expand the range of cases in the literature of RMA, which aids an

[84] Ibid., 11.
[85] Wilson, *Bureaucracy*, 92.
[86] Kier, *Imaging War*, 134.
[87] NIDS, *Senshi sosho: Daihonei kaigunbu, daitoa senso kaisen keii*, vol. 1 [Imperial General Headquarters, Naval Section: The process of the outbreak of the Greater East Asian War] (Tokyo: Asagumo Shimbunsha, 1979), 9-12 and Chie Nakane, *Japanese Society* (Berkeley: University of California Press, 1970).

understanding of how idiosyncratic organizational cultures influenced the process of RMA as an intervening variable between technology and innovation.

If we can identify the presence of unique organizational culture distinctive from other branches of the Japanese Navy and demonstrate the process in which technological and doctrinal development within the naval aviation was prompted by the cultural factors, this study might be able to provide a plausible explanation as to why the development of aircraft carriers was more successful than other naval platforms developed around the same timing and duration.

Conclusion

Both technology and strategic competition were important preconditions for the RMA, and they certainly gave an initial push to seek innovation for the Japanese Navy. However, the Japanese Navy had many other alternatives to address the same strategic issue, and they alone did not automatically lead it to focus exclusively on aircraft carriers. As the following chapter will demonstrate, the Japanese Navy actually invested in many different platforms to rectify the perceived strategic inferiority vis-à-vis the United States. In order to explain why the Japanese Navy was successful in building the carrier force to the extent that it could conduct the Pearl Harbor attack and following air campaigns, the intraservice politics model and organizational culture seem more promising than the civilian-control model and the interservice politics model, given the political environment surrounding the navy in the interwar period.

Upon these observations, the following chapters can potentially make two theoretical contributions to the existing literature. First, this study will give detailed analysis on the inner working of the Japanese Navy by employing extensive Japanese sources while making a comparison with the British and U.S. Navies. Since there are virtually no existing studies to elaborate the organizational and cultural aspects of the Japanese navy, particularly in English, this study can offer the first building block to enable further comparative studies for theory development. Second, this study also marks the first systematic effort to apply the interservice model and organizational culture to explain the Japanese case. In so doing, this study can help determine the range of applicability of these two models. These two contributions combined can improve the existing models and pave the way forward to develop new theories of innovation.

Chapter 2

The Japanese Navy's Strategic Thinking

Identifying a potential enemy and a possible battlefield helps military planners to prepare effectively for the next war. Military organizations need detailed war plans for their force requirements and weapons development and the Japanese Navy in the interwar period was no exception. It recognized the competitive strategic environment and devised a series of war plans on which their build-up plans were based. There were diverse weapon platforms developed by the navy during this period and one of them which commanded particular attention was the aircraft carrier, Did the competitive environment and its resulting war plans alone provide enough momentum for the Japanese Navy to develop aircraft carriers? To what extent did the external shocks explain the process of aircraft carrier development in comparison to other naval platforms developed during the same period?

Realist and neorealist theorists argue that external shocks trigger the RMA and states naturally emulate others' military innovation for survival." As a consequence, as Eliot Cohen noted, for most of the 20th century, "…the armed forces of the world shared similar weapons."[88] Stephen Rosen also considers a perceived change in the character of the security environment to be what provides an initial intellectual basis for the RMA. Rosen observes that the

[88] Eliot A. Cohen, "Technology and Warfare," in *Strategy in the Contemporary World: An Introduction to Strategic Studies*, 5th ed., ed. John Baylis, James J. Wirtz, and Colin S. Gray (Oxford: Oxford University Press, 2016), 129.

international security environment consists of factors outside the control of military organizations or the government of hostile powers, but which constrain or create opportunities for the military. For example, Rosen considers technological revolutions (the advent of aircraft) or major changes in the international role of a state (the U.S. emergence as a Pacific military power after the acquisition of the Philippines) as a trigger for RMAs.[89] Therefore, the competitive security environment after the First World War might have provided a sufficient incentive for the Japanese Navy to seek and emulate innovation centered on aircraft carriers.

However, external shocks do not automatically lead to a particular innovation. As diverse innovations across warring states during the Second World War show, there are a number of different paths and forms of innovation. In order to understand the Japanese Navy's efforts to build aircraft carriers, it is critical to recognize what kind of security environment it had to deal with and identify its strategy in the interwar period. For this purpose, this chapter focuses on Japanese naval strategy punctuated by two arms control treaties: the Washington Naval Treaty of 1922 and the London Naval Treaty of 1930. These two treaties directly challenged a Japanese naval strategy centered on battleships and drove the Japanese Navy to seek alternative platforms on which to base a naval strategy. Aircraft carriers were not the only potential alternative. During the First World War, there were a number of new naval platforms tested in actual combat. For example, the German Navy employed submarines extensively to intercept merchant shipping of the Allied countries and aircraft were also widely employed for both land and naval operations. This chapter

[89] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1994), 57.

demonstrates that aircraft carriers were one of these emerging platforms, but were not necessarily the exclusive focus of attention in Japan's war planning against the United States.

The Origin of the Imperial Defense Policy

After closing itself to the outside world for more than 200 years, Japan as an insular power started to emphasize naval strength. After the Meiji Restoration, Japan made great efforts to build a modern navy with the extensive assistance from the Western powers including France, Britain and the United States.[90] At around the turn of the 20th century, in a bid to expand its sphere of influence in Asia, Japan fought two major wars, one with China and another with Russia. Due to its geographical location, Japan depended on naval strength in exerting itself abroad, and therefore both wars inevitably involved great naval battles. In particular, on May 27-28 1905, the Japanese Combined Fleet defeated the Russian Baltic Fleet in the Battle of Tsushima, which was considered as "one of the few annihilating battles in naval history."[91]

The Russo-Japanese War and the Battle of Tsushima in particular left two long-lasting legacies on the evolution of Japanese naval doctrine and strategy. As David Evans pointed out, the Battle of Tsushima "…fixated Japanese naval doctrine on the concept of the decisive battle at sea whose

[90] On the British assistance, see John Curtis Perry, "Great Britain and the Emergence of Japan as a Naval Power,"*Monumenta Nipponica* 21 (1966): 305-21.
[91] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics and Technology in the Imperial Japanese Navy 1887-1941* (Annapolis: Naval Institute Press, 1997), 124.

outcome would be determined by big ships and big guns."[92] In terms of strategy, as the threat posed by Russia receded following the war other major powers, particularly the United States, came to be regarded as potential threats.

After the spectacular victory over the Russian Navy, the imminent threat from Russia could no longer be used as a rationale to maintain a large, powerful Japanese Navy. In 1907, the Japanese Navy and Army made efforts to make the case to maintain their inflated force level even after the war by creating a strategic guidance document called *Teikoku Kokubo Hoshin* (the Imperial Defense Policy). According to this Policy, Russia remained a primary threat, and Germany, France, and the United States emerged as secondary, or, more accurately, "hypothetical" threats.

The Imperial Defense Policy stipulated that Japan should have military capability sufficient to take offensive operations against Russia and the United States in East Asia. However, the Japanese Navy focused on the United States because only the U.S. Navy had the capability to threaten Japan's security after the defeat of the Russian Navy. Under the Policy, Japan's naval strategy was relatively simple; as in the Battle of Tsushima in 1905, the Japanese main fleet would intercept the U.S. fleet near Japan and seek a decisive battle with massed battleships.

The Policy estimated the force level required for national defense was a fleet comprised of eight battleships and eight armored cruisers, the so-called "eight-eight" fleet.[93] The navy distinguished between two categories of fleets: the first-line and reserve fleets. The first-line fleet consisted of ships less than eight

[92] David C. Evans, "Japanese Naval Construction, 1878-1918," in *Technology and Naval Combat in the Twentieth Century and Beyond*, ed. Phillips Payson O'Brien (London: Frank Cass, 2001), 28.
[93] Minoru Nomura, *Nihon kaigun no rekishi* [A history of the Japanese Navy] (Tokyo: Yoshikawa Kobunkan, 2002), 83-85.

years old and would make up the eight-eight fleet, while other ships were put in reserve and assigned for local defense and support for the first-line fleet. As David Evans and Mark Peattie pointed out, this eight-eight fleet plan became "an unquestioned article of faith" between 1907 and 1922.[94]

The Imperial Defense Policy was reported to the Emperor and approved by the Cabinet. However, the cabinet planned to build the fleet stipulated by the Policy incrementally in accordance with Japan's fiscal situation, to which both the army and the navy agreed.[95] As the cabinet's concern indicated, the eight-eight fleet plan was beyond Japan's fiscal and industrial capacity. Also, with the launch of Britain's *Dreadnought* in 1910, all existing battleships became instantly obsolete and an entirely new class of capital ships had to be built, at a drastically increased cost of construction. Against this backdrop, it was increasingly apparent even to the navy's senior leaders that it would take considerable time to build the eight-eight fleet.

However, the changes in warfare during the First World War pushed the navy to pursue a more aggressive building plan. In particular, the Battle of Jutland of 1916 between the German and British Navies demonstrated the effectiveness of capital ships and the navies of the major powers came to emphasize battleships and battle-cruisers with large hulls and big guns.[96] In 1917, as an interim plan toward the eight-eight fleet, the budget for building eight battleships and four battle-cruisers was approved by the Diet. Also, the following year, construction of additional two battle-cruisers was authorized.

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[94] Evans and Peattie, *Kaigun*, 150.
[95] Boeicho, Boei Kenshusho, Senshishitsu [Office of Military History, National Institute for Defense Studies, Japan Defense Agency] (hereafter NIDS), *Senshisosho: Daihoneikaigunbu, rengokantai 1 kaisen made* [War history series: Imperial General Headquarters, Navy Division, Combined Fleet, vol. 1, to the start of the Pacific War] (hereafter *DKRK*), vol. 1, (Tokyo: Asagumo Shimbunsha, 1975), 121-122.
[96] Saburo Toyama, *Nihon kaigunshi* [Japanese naval history] (Tokyo: Kyoikusha, 1980), 113.

These building programs were fiscally possible due to expanding national revenue from increased exports to warring European states.

Against this backdrop, the Imperial Defense Policy was revised for the first time since its formulation. As Germany and France lost their influence in Asia as a result of the war, China was added to the Policy as a potential threat to Japan. Russia remained as a primary threat, but more importantly, the United States became a more significant target for Japan's armament and budget.

In 1918, the United States announced its plan to build 16 battleships in order to achieve parity with Britain.[97] In response to this ambitious U.S. plan, the revised Imperial Defense Policy authorized an additional eight battleships or battle-cruisers, resulting in the eight-eight-eight fleet plan. Behind this decision was a strategic rationale stating that a defending fleet should have seventy percent strength against an attacking fleet, which had dominated Japanese naval strategy after the Russo-Japanese War.

It is unclear how this force ratio became an article of faith within the Japanese Navy, but Japan's official war history, *Senshisoho*, assumes two sources of origin of this thought. The first was Saneyuki Akiyama, who had been an operational staff officer to Admiral Togo Heihachiro during the Battle of Tsushima. Akiyama was known for his extensive knowledge of military history and, through a lengthy study of historical naval battles, came to the conclusion that it would be necessary for the Japanese Navy to maintain the seventy percent force ratio to win a decisive battle against the United States. Akiyama

[97] George E. Baer, *One Hundred Years of Sea Power: The U.S. Navy, 1890-1990* (Stanford: Stanford University Press, 1993), 83.

served as an instructor at the Naval Staff College once before the Russo-Japanese War and twice after the war.

The second presumed source was Captain Tetsutaro Sato. Sato, who had studied at the U.S. Naval Academy, was known as a strategist within the Japanese Navy. Unlike Akiyama, he was considered as more of a "scholar soldier" than a battle-seasoned naval officer. He served at the Naval Staff College as an instructor once before the Russo-Japanese War and three times after the war. In addition, he later became the principal of the college. Sato was said to have studied all the historical naval battles and concluded that an invading fleet needs more than fifty percent superiority over a defending fleet. As a result, he went on to argue that a successful defense requires the defending fleet to beat least seventy percent of the strength of the attacking fleet.

These two origins were so influential within the navy that it is hard to determine which left more lasting legacies. However, naval officers who graduated from the Naval Staff College were elites destined to occupy influential positions within the navy, whose thought formed the mainstream of the navy's strategic thinking. Therefore, Akiyama and Sato who had served relatively long tours at the college together cultivated a line of thought emphasizing that maintaining the 10:7 force ratio was a minimum necessary condition to counter the U.S. Fleet.

However, the Japanese government could not finance the naval build-up plan because of an economic recession and the plan was delayed considerably. When the eight-eight fleet plan was finally approved by the Diet in 1920, the budget for the navy in FY1920 was estimated at 29 percent of the entire national

budget.[98] In addition, the navy wanted to keep the first-line battleships up-to-date, by replacing every battleship after eight years of service. Therefore, the cost of sustaining the eight-eight fleet was a much more serious problem than the construction cost. The Navy Ministry estimated that the ordinary expenditure for the eight-eight fleet, if realized, would be about 600 million yen despite the fact that the total FY1920 national budget was only 1,360 million yen.[99] It was clear to the budget authority that the eight-eight fleet was not fiscally sustainable and even the Vice Minister of Finance came to warn the navy's top brass that Japan's fiscal future would depend critically on the navy's decision.[100] It was such a dire financial situation that the navy, sooner or later, was destined to reconcile its force requirements with the political reality.

The Navy's Early Interest in Aviation

Although the Japanese Navy had unquestionable faith in battleships, it had shown a keen interest in aviation from a relatively early point. After the first successful aircraft flight in 1903, the major powers have developed military aircraft rapidly. In keeping pace with these developments, the Japanese Navy recognized the potential military application of aircraft and set up the Kaigun Kokujutsu Kenkyu Iinkai (Committee for the Study of Naval Aeronautics) in 1910. The first flight test in Japan was successfully conducted in 1912 with

[98] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi* [Japanese naval history], vol. 3 (Tokyo: Daiichi Hoki Shuppan, 1995), 31.
[99] NIDS, *DKRK*, vol. 1, 182.
[100] Yamanashi Katsunoshin Sensei Kinen Shuppan Iinkai, ed., *Yamanashi Katsunoshin sensei ihoroku* [Memoirs of Katsunoshin Yamanashi] (Tokyo: Suikokai, 1968), 67.

foreign equipment and foreign-trained pilots. However, the budget for naval aviation was not authorized until 1914.

Full-scale development of Japan's naval aviation came after the outbreak of the First World War. In 1914, the budget for naval aviation was authorized for the first time due to the effectiveness of aircraft demonstrated during the war. From 1915 to 1920, the navy started to set up three air groups in Yokosuka. In 1919, the navy decided to add an additional five more air groups. However, later that year, stimulated by aircraft development in Europe, the navy decided to build seventeen air groups in total by 1922. These air groups were made up of seaplanes and land-based aircraft and were used primarily for air defense, anti-submarine warfare, and other supporting missions for fleets operating close to their bases. However, the navy's top priority was to build up the eight-eight fleet in this period, and naval aviation was expected to play a supporting role for the fleet.[101]

Immediately after the First World War, the Japanese Navy studied the roles of aircraft and revised its Kaisenyomurei (Naval Operations Manual) in 1920. It listed the roles of aircraft as follows: 1) reconnaissance, 2) attack against enemy's main fleets and aircraft carriers, 3) attack against enemy's airpower, 4) search for enemy's submarines, 5) surveillance of forward areas, torpedoes, and mines, 6) surveillance of enemy's maneuvers and cooperation to increase effectiveness of gunnery, and 7) cooperation with other branches.[102]

However, at that time, Japanese naval aviation and its missions were limited to reconnaissance, surveillance, and spotting. The offensive capability of

[101] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi* [The history of Japanese naval aviation], vol. 2 (Tokyo: Jiji Tsushinsha, 1969), 12.
[102] NIDS, *Kaigun kokugaishi* [A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 26.

aircraft was still limited and offensive missions against enemy fleets or aircraft were unrealistic when the Naval Operations Manual was revised. According to Kyoichi Tachikawa, military historian at the National Institute for Defense Studies, the navy did not consider those missions feasible at that time and instead listed hypothetical missions of aircraft in this manual for the sake of future research.[103]

The Japanese Navy was also interested in ship-borne aircraft almost at the same time they started to build up naval aviation. The navy operated seaplanes from the naval transport *Wakamiya* in the naval exercise of 1913, just one and a half years after the first flight. The exercise convinced the navy senior leaders that seaplanes could be operated from ships.

Japan's participation in the First World War also helped the navy to recognize the potential of ship-borne aircraft. Japan entered the war at the request of Britain and fought primarily against the Germans in China. The Japanese Navy used its aircraft in battle for the first time. Namely, the navy deployed *Wakamiya*, which was converted to a seaplane carrier, to attack the German military base in Tingtao. The four seaplanes on *Wakamiya* conducted aerial bombings and reconnaissance against German naval vessels and military installations. However, while they were effective for reconnaissance, they could not inflict significant damage on German naval vessels. Even though the results and scale of the operations were not impressive, the battle experience obtained from the operations made the Japanese navy appreciate the strategic value of aircraft.

[103] Kyoichi Tachikawa, "Kyunihon kaigun ni okeru kokusenryoku no yakuwari [The role of airpower in the Imperial Japanese Navy]," *Military History Studies Annual*, no. 7 (2004): 23-24.

In addition, the Japanese learned from other countries' air operations. During the First World War, the Japanese Navy sent a cadre of officers to the European theater to gather information regarding aircraft development. In particular, it was interested in ship-borne aircraft operated by HMS *Furious* of the British navy. The British success led the navy to build the first aircraft carrier soon after the war.[104] The navy also sent a delegation to Britain to observe air operations on *Furious* and invited British military advisers headed by former naval pilot William Sempill to Japan in 1920.

Based on the lessons from the First World War, the navy recognized the necessity of aircraft carriers and asked the Diet to increase the military's budget in order to start building one. The Diet finally approved the budget in 1918 and the navy started to build its first aircraft carrier, *Hosho,* which was completed in 1921. *Hosho* was the first operational aircraft carrier in the world that was planned as an aircraft carrier from the keel up, while most early carriers were converted from existing ships used for different purposes.

Most of the major navies believed that ship-borne aircraft would play a supporting role, particularly scouting, spotting, and reconnaissance for the fleets comprised of battleships. Therefore, when the *Hosho* was built, the navy planned to use its aircraft for scouting and reconnaissance. After being commissioned, the *Hosho* initially had only 10 aircraft used only for basic training in such areas as air cover of the main fleet, reconnaissance, deployment of smoke screen, and torpedoing and bombing.[105] After building the *Hosho*, the navy planned to build another carrier with a displacement of 13,500 tons. However, this program was

[104] Evans and Peattie, *Kaigun*, 180.
[105] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 195.

canceled since the Washington Naval Treaty forced the navy to review its force structure altogether.

The Washington Naval Treaty

At the request of President Warren Harding, the United States, Britain, France, Italy and Japan gathered in Washington to discuss a possible limitation on naval armament. Japan participated in the Washington Conference with the intent that an arms race with major powers should be avoided at all costs. Also, , the increasing financial burden for building and maintaining a large fleet was becoming prohibitive, as it was for other major powers as well.

In June 1919, in anticipation of a disarmament proposal from other major powers, the Japanese government formed a study group to explore policy options for the conference. The report submitted by the group recommended that Japanese naval strength be more than seventy percent of that of the United States, particularly in terms of capital ships. Likewise, the Japanese Navy firmly believed that it was critical to maintain at least seventy percent of capital ships that the U.S. Navy had in order to win a decisive fleet battle, which could be achieved through the eight-eight fleet.[106]

However, the Japanese delegation headed by Admiral Tomosaburo Kato prioritized international cooperation, particularly with the United States, over the 10:7 force ratio. Kato had been a key proponent of the eight-eight fleet plan as the Navy Minister, but he also understood the fiscal realities and the threat of

[106] Kiyoshi Ikeda, *Nihon no kaigun, yakushin hen* [The Japanese Navy, vol. 2] (Tokyo: Asahi Sonorama, 1993), 71-91.

bankruptcy so well that he determined to compromise with the United States to strike a reasonable deal.[107] After intensive negotiations at the Conference, the Washington Naval Treaty was signed on February 6, 1922. Despite furious opposition within the navy, the treaty went into effect and eventually forced the navy to abandon the eight-eight fleet plan. Furthermore, the treaty had a significant impact on the navy's build-up plan throughout the interwar period.

The treaty allowed Japan to have 315,000 tons of capital ships and limited the total number of battleships to ten. Based on this agreement, seven capital ships under construction and ten old ones totaling about 450,000 tons were to be scrapped.[108] Under the treaty, capital ships were limited to less than 35,000 tons in standard displacement and guns of no larger than 16-inch caliber. No new construction was allowed for ten years after the treaty went into effect, and capital ships could only be replaced after they reached twenty years of service.

Under the Washington Treaty, the Japanese Navy was forced to review its force structure in the new security environment. The navy's original plan to build the eight-eight fleet was abandoned and it sought new tactics to counter the U.S. fleet. Accordingly, the Imperial Defense Policy was revised for the second time in 1923. In this revision, the United States was identified as the most likely threat in future contingencies. Behind this change, there was a perception that the United States had invaded China by economic means and aggressively developed Siberia, which was not in line with Japan's national interest. Furthermore, the Policy went on to state that anti-Japanese feelings

[107] Before the Washington Conference, Kato secretly invited the Navy Vice Minister, the Director of the Military Affairs, and the Director of the Technical Department from the Navy Ministry to the Prime Minister's office and confessed that he had hard time in dealing with this fiscal situation since it was clear that the government could not maintain the ongoing policy. NIDS, *DKRK*, vol. 1, 183.
[108] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi*, vol. 3, 49.

exemplified by the opposition to Japanese immigrants in California and Hawaii did not allow Japan to take an optimistic view toward the United States.

The policy concluded that "…the long-term conflicts caused by these economic problems and racial discrimination are difficult to reconcile and the conflict of interests and the detachment of feelings would be worsened in the future."[109] It thus predicted that the Asia policy of the United States, with its strongholds and robust military power in the Pacific and the Far East, would inevitably lead to a clash between the two countries and made the United States a top priority in terms of national defense.[110] Through this revision, the United States was, for the first time, clearly designated as a potential threat and the vast Pacific was identified as a stage for strategic competition.

As *Senshisosho* acknowledges, it was the Washington Treaty which saved Japan from a possible fiscal collapse since it was clear to anyone within and out of the navy that building, and much less sustaining, the eight-eight fleet was almost financially and economically impossible. However, there was a perception within the Japanese Navy that Japan was forced to accept an inferior ratio of capital ships by the United States and Britain. The navy turned to vigorously exploring ways to fill this gap by any possible means.

Alternatives to Battleships

The Washington Naval Treaty limited Japanese battleship tonnage to sixty percent of that of the U.S. Navy. After the treaty went into effect in 1922, the

[109] NIDS, *DKRK*, vol. 1, 198.
[110] Nomura, *Nihon kaigun no rekishi*, 115.

Japanese Navy sought to make up deficiencies with smaller ship categories. In particular, the navy emphasized the attrition of U.S. battleships by utilizing those alternatives before the two sides engaged in a fleet battle fought primarily by battleships.[111]

As Emily Goldman points out, the Washington Treaty "…encouraged technological innovation, force structure change, exploitation of loopholes and ambiguous treaty provisions, cheating, and innovation and tactics."[112] One of the major innovations encouraged by the treaty was the aircraft carrier. The treaty allowed two battleships or battle-cruisers under construction to be converted into aircraft carriers. The total tonnage for carriers allowed under the treaty was 135,000 tons for the United States and Britain, 81,000 tons for Japan, and 60,000 tons for France and Italy. As Goldman notes, "…by freeing up the hulls of large battle cruisers for conversion to carriers," the Washington Treaty, "…led directly to the second generation of aircraft carriers, which in all likelihood would never have been built so large."[113]

In accordance with the treaty provisions, the Japanese Navy converted *Akagi,* which had been under construction as battle-cruiser, into an aircraft carrier. *Akagi* displaced 26,900 tons and could house 60 aircraft in its hanger. The navy had designated *Amagi* for conversion into another aircraft carrier, however its hull was damaged by the Great Kanto Earthquake in 1923. Instead, *Kaga,* which had been originally built as a battleship, was chosen as a substitute. *Kaga*, also capable of carrying 60 aircraft with 26,900 tons in standard displacement, was completed in 1928. After constructing *Akagi* and *Kaga*, the

[111] Mark R. Peattie, "Japanese Naval Construction, 1919-1941," in O'Brien, 97.
[112] Emily P. Goldman, *Sunken Treaties: Naval Arms Control between the Wars* (University Park: Pennsylvania University Press, 1994), 247.
[113] Ibid., 248.

navy still had 27,000 tons left in the quota for aircraft carriers. In 1925, the navy asked the Diet to build one 27,000 ton aircraft carrier and three 10,000 ton aircraft transport ships. However, the navy's plan was too ambitious and it had to scale down the original plan due to budget constraints. The Japanese Navy also tried to build small aircraft carriers to take advantage of what the naval treaty did not cover. The treaty did not limit naval vessels with a displacement of less than 10,000 tons. In 1927, the navy decided to build the 8,000 ton *Ryujo* as a replacement of the aging *Wakamiya*.

It is certain that the Japanese Navy had greater interest in naval aviation, particularly large carriers, due to the Washington Treaty. However, the navy thought aircraft carriers alone were insufficient to fill the gap, since they were also capped by the treaty. Thus, the navy sought other platforms which were outside of the treaty limitations. Three possible naval platforms received particular attention: 1) submarines, 2) heavy cruisers, and 3) torpedo operations by destroyers. In addition to nine capital ships and three aircraft carriers, which were in line with the Washington Treaty, the revised Imperial Defense Policy required the navy to have 40 cruisers, 16 flagships for torpedo and submarine squadrons, 144 destroyers, and 80 submarines.[114]

After the First World War, the mainstream view in the Japanese Navy emphasized the firepower of capital ships and discounted new weapons platforms like aircraft and submarines.[115] However, at the Paris Peace Conference after the First World War, while the United States and Britain made efforts to ban submarines, Japan, along with France and Italy, opposed the idea based on the notion that submarines were an effective way for an inferior navy to counter a

[114] NIDS, *DKRK*, vol. 1, 199.
[115] Nomura, *Nihon kaigun no rekishi*, 107.

superior one. Consequently, submarines were increasingly seen as a potentially powerful weapon against an enemy fleet after the Washington Treaty.

Submarines were widely used by the German Navy to conduct "unrestricted submarine warfare," and posed a grave threat to Allied merchant shipping during the First World War. In dealing with the German submarine threat, the Japanese Navy sent a flotilla comprising one cruiser and seven destroyers to the Mediterranean at the request of the British and escorted Allied shipping in the Mediterranean. Even though other navies saw submarines as best suited for attacking merchant ships, the Japanese Navy instead planned to use them for attacking capital ships. In particular, after the Versailles Peace Treaty was signed, seven German U-boats were brought to Japan as a part of war indemnity and put under intensive research and experimentation, which contributed to improving Japanese submarine capabilities. The development of the *Kaidai*-type submarines with great surface speed (more than twenty knots) and seaworthiness enabled the navy to intercept the U.S. fleet sallying forth from Hawaii.[116]

The strategic value of submarines was increased after the Washington Naval Treaty was signed because submarines were not limited by the treaty. To counterbalance the disadvantage in the number of battleships imposed by the treaty, the Japanese Navy planned to attack U.S. battleships before they came to the expected battlefield in the South Pacific. Submarines were one of the primary weapons for this purpose. They were expected to perform surveillance on, track, and attack the U.S. fleet in forward deployed areas. To enable them to perform

[116] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi*, vol. 3, 93.

these missions, Japanese submarines were much heavier and bigger than those of the United States.

When the Washington Treaty was signed, the first platform the Japanese Navy turned to as an alternative to battleships was the cruiser. Because of their relatively heavy armament, cruisers were considered to be the best substitutes for battleships by the navy's top brass. Under the treaty, the signatories were allowed to build auxiliary ships that weighed less than 10,000 tons. The Japanese Navy took advantage of this clause and built 10,000-ton heavy cruisers with eight-inch guns, which were the heaviest guns allowed by the treaty. Before the Washington Conference, Japan already possessed nineteen cruisers, whereas the United States had ten. Five years after the treaty, the Japanese Navy had built six cruisers and another six were under construction, while the United States had built ten cruisers and an additional eight were being built.[117]

The Japanese Navy also emphasized the use of torpedo operations in order to reduce the number of U.S. battleships before they engaged with Japanese battleships. The torpedo operations were mainly conducted by destroyers led by light cruisers. The navy gave intensive study to the design of destroyers with outstanding speed and firepower and constructed twenty-four *Fubuki* class destroyers between 1926 and 1931.[118] Those destroyers were used in night-time operations against the enemy fleets to avoid severe losses.

During this period, the navy sought long-range torpedoes to increase the effectiveness of torpedo operations. As Samuel Eliot Morrison pointed out, Japanese torpedo development was an "outstanding technical achievement."[119]

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[117] Ibid., 96.
[118] Peattie, "Japanese Naval Construction," 97.
[119] Samuel Eliot Morison, *History of United States Naval Operations in World War II,* vol. 3*, The Rising Sun*

The Japanese Navy started to develop oxygen-fueled torpedoes, also referred to as the *Long Lance* torpedoes. The development and experimentation of the *Long Lance* began in 1924, but it was temporarily abandoned because of technical difficulties. However, the navy restarted intensive research again in 1928 and finally developed the Type 93 torpedo in 1933. The torpedo could cruise at forty-eight knots and had a range 40,000 meters without a wake.[120] The development of the *Long Lance* was a closely guarded secret throughout the interwar period, which indicated that the navy considered it a critical war-winning weapon.

As those options show, the Japanese Navy sought innovations to overcome their perceived strategic inferiority by constructing not only aircraft carriers, but also other surface ships. Submarines, cruisers, and destroyers were under more intensive research to achieve technological superiority because they fit well in the navy's traditional war plan. Although the Washington Treaty induced the Japanese Navy to construct two large carriers, their operational role was not clear due to technological and operational immaturity. As Mark Peattie points out, because of this ambiguous role of carrier aviation, no established place was given to it in Japanese war plans for decisive fleet battle.[121]

The London Naval Treaty

The new platforms tested aggressively in the 1920s were limited in terms of quality, quantity, or both by the London Naval Treaty. The Washington Conference focused on the limitation of battleships and battle cruisers, but left

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in the Pacific, 1931-April 1942 (Urbana: University of Illinois Press, 2001), 23.
[120] Evans and Peattie, *Kaigun*, 266-272.
[121] Peattie, "Japanese Naval Construction," 97.

other platforms untouched.[122] However, as major powers had rushed to build them competitively, the focus of negotiation was shifted to those categories of ships. After the initial negotiation at Geneva had failed in 1927, renewed efforts were made in 1930, which culminated in the London Naval Treaty.

In negotiating the treaty, the Japanese delegation, same as the Washington Conference, pursued the long-sought 10:7 force ratio against the United States and Britain as the minimum necessary foundation for self-defense. However, the total construction cost of heavy and light cruisers, destroyers, and submarines was estimated to consume nearly half of the entire annual budget for the navy and there was a pressing need to reduce the fiscal burden through the arms control treaty.[123] In addition, the Japanese government headed by Prime Minister Osachi Hamaguchi considered it critical to maintain cooperation with the United States and Britain and decided to make some concessions to strike a deal.[124] After three months of negotiations, the London Naval Treaty was signed on April 22, 1930 to be effective until the end of 1936.

First and foremost, the Treaty limited the total tonnage of auxiliary ships, namely heavy and light cruisers. Under this treaty, Japan was allowed to possess up to 108,400 tons in total of heavy cruisers and 100,450 tons of light cruisers while the United States was authorized 180,000 tons and 143,500 tons respectively. On paper, Japan could not achieve the 10:7 ratio against the United States, but, in effect, it achieved seventy percent because the United States

[122] At the Washington Conference, limitations on auxiliary ships were discussed, but they were opposed by France and Japan, both of which were frustrated by the inferior ratio of capital ships imposed by the Treaty. Nomura, *Nihon kaigun no rekishi*, 112.
[123] NIDS, *Senshisosho: Kaigun gunsenbi 1, showa 16 nen 11 gatsu made* [War history series: Naval armaments and war preparations until November 1941, vol. 1] (Tokyo: Asagumo Shimbunsha, 1969), 373.
[124] NIDS, *DKRK*, vol. 1, 227.

agreed to delay their construction plans for three cruisers while the London Treaty was in force.[125]

Also, submarines which had not been covered by the Washington Treaty were also restricted in quantitative and qualitative terms. In this category, Japan was accorded parity and allowed to have 52,700 tons. However, the Japanese Navy initially opposed this limitation since it was deemed critical to possess at least 78,000 tons to counter the U.S. fleet. In addition, the navy had already built 70,000 tons of submarines, and therefore was forced to retire existing submarines throughout the duration of the treaty in order to meet the treaty limit. Ceasing production of new submarines could have had a significant negative impact on Japan's military industrial base. In addressing this concern, the Treaty allowed Japan to replace its existing submarines earlier than the end of their theoretical operational life so that it could at least maintain the capability. In terms of qualitative limitation, each submarine to be built should be less than 2,000 tons in displacement and its guns were limited to 5.1 inch at the maximum.[126]

In terms of capital ships, the London Treaty extended the "battleship holiday" for another five years up to 1936. Also, the treaty urged the signatories to scrap excess capital ships in order to fully comply with the quota set by the Washington Treaty. As a result of this agreement, the United States and Britain possessed fifteen battleships, and Japan had nine by designating *Hiei* as training battleship.

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[125] NIDS, *DKRK*, vol. 1, 224 and Baer, *One Hundred Years of Sea Power*, 117.
[126] NIDS, *Senshisosho: Sensuikanshi* [War history series: A history of submarines] (Tokyo: Asagumo Shimbunsha, 1979), 25-26.

Lastly, the London Treaty included small carriers lighter than 10,000 tons into each country's quota. Under the Washington Treaty, small carriers whose standard displacement was less than 10,000 tons were not counted in each country's quota. Both the Japanese and U.S. Navies built small carriers during the 1920s, one of which, *Ryujo*, was purposefully built to evade the treaty limit and test its effectiveness. The London Treaty thus closed the loophole and effectively ended the experimentation with small carriers.

The London Treaty did not prevent the Japanese Navy from exploring other alternatives. Land-based aircraft was a case in point. The Japanese Navy started to develop land-based aviation in the mid-1910s. However, its offensive potential was not recognized due to the limited payloads and ranges of early aircraft. With the rapid development of aviation technology, the Japanese Navy took a serious look at the possibility of using land-based aircraft as an offensive weapon against the U.S. fleet primarily because they were not limited by the London Naval Treaty.

In 1931, Vice Admiral Shigeru Matsuyama, Director of the Naval Aviation Department, questioned the effectiveness of submarines and destroyers against the U.S. fleet. On the other hand, he believed aircraft carriers were effective, but they were under treaty limitations. He studied the effectiveness of land-based aircraft operating in cooperation with the Japanese main fleet and concluded that the navy should develop heavy land-based bombers or airboats.[127] Based on his idea, the navy developed the Type 96 Attack Bomber which achieved a maximum range of more than 3,000 nautical miles and carried an 800

[127] Nihon Kaigun Kokushi Hensan Iinkai, *Nihon kaigun kokushi*, vol. 1, 240-241.

kg offensive load in 1936.[128] It also developed the Type 1 Attack Bomber based on the same concept, and altogether 324 of them were deployed before the Pacific War.[129]

At the time of the London Conference, however, those who were air-minded still regarded aircraft as an auxiliary force to submarines. For example, Vice Admiral Seizo Kobayashi, Director of the Technical Department of the Navy Ministry, stated that both aircraft and submarines were tools to attack enemies and both could complement each other. This was such a dominant view of aircraft during this period that even Admiral Isoroku Yamamoto did not fully recognize their full potential.[130]

Post-Treaty Era

The London Treaty stipulated that the next conference was to be held in 1935 and the Japanese Navy prepared in advance for the upcoming negotiation. After the first London Conference, there were two groups with different attitudes toward the treaties emerging within the navy. Some thought the Washington and London Treaties were unsatisfactory, but still reasonable and considered the ratio imposed by the treaties more restrictive to the United States rather than vice versa given the huge disparity in power. Others, who later became a majority within the navy believed strongly, and perhaps wrongly, in the

[128] René J. Francillon, *Japanese Aircraft of the Pacific War*, new ed. (Annapolis: Naval Institute Press, 1979), 350-357.
[129] NIDS, *Kaigun koku gaishi*, 161.
[130] Shizuo Seki, *Rondon kaigun joyaku seiritsushi* [A history of formation of the London Naval Treaty] (Tokyo: Minerva Shobo, 2007), 166. Seki points out that it was the London Conference that opened Yamamoto's eyes to the potential of naval aviation.

inevitability of war with the United States and had overconfidence in Japan's national strength. These perceptions led them to argue that Japan would fare better without the treaties since the navy could not expect to defeat the U.S. fleet with the treaty fleet.[131]

As Japan withdrew from the League of Nations in 1933 and became more isolated, the latter group gained more influence, which led the navy to take a more hardline stance toward the upcoming conference. Frustrated by the perceived inferior ratio imposed by the Washington and London treaties, the navy had already requested that the government withdraw from the Washington Treaty as a matter of course. In renegotiating the London Treaty, the navy was determined to reject the 10:6 ratio and demand parity instead. Behind this decision, there was a sense of crisis within the navy that it could not ensure national security under the London Treaty. This helped generate a growing consensus that the navy should have original and creative armament free from any limitations by withdrawing from the treaty.[132]

At the preparatory negotiation round for the second London Conference in October 1934, the Japanese delegation headed by Vice Admiral Isoroku Yamamoto proposed that the treaty set a common maximum limit under which each country could freely build armament of its own choosing. This proposal was rejected by the United States and Britain, whose geographic conditions made it difficult to concentrate all of their fleets in Asia. The delegation also demanded total abolition of all the existing capital ships and aircraft carriers in order to garner support from smaller naval powers and the general public. As expected by the Japanese side, the preparatory negotiation deadlocked. At the second London

[131] NIDS, *DKRK*, vol. 1, 278.
[132] Kaigun Rekishi Hozonkai, *Nihon kaigunshi*, vol. 3, 374.

Conference held in November 1935, the Japanese delegation had not changed its position and eventually withdrew from the conference prematurely in January 1936. Japan had already announced its intention to withdraw from the Washington Treaty, and thus ushered in the post-treaty era.

After withdrawing the Washington and London Treaties, the Imperial Defense Policy was revised for the third and last time in May 1936. One of the major changes made in this revision was that Britain was included as one of the hypothetical enemy countries along with Russia and the United States. There was a fierce debate between the army and the navy as to whether Russia or the United States should be considered the more serious threat. However, this issue was left unresolved and neither was prioritized.

Based on this threat perception, the policy required the navy to have twelve capital ships, ten aircraft carriers, twenty-eight cruisers, ninety-six destroyers, and seventy submarines as the first-line fleet.[133] With this force strength, the Japanese Navy aimed to achieve parity against the U.S. fleet in the Western Pacific and estimated it would maintain a 10:7 or 10:8 ratio for the next ten years.[134] However, it turned out that the navy's estimate was not accurate, since the United States initiated a series of massive building programs in the post-treaty years.

As one of the efforts to develop the "unique" naval force, the Japanese Navy focused on building aircraft carriers. After Japan withdrew from the League of Nations, the navy decided to build two aircraft carriers with the displacement of 10,050 tons each, which filled the limit of the Washington Naval

[133] NIDS, *DKRK*, vol. 1, 319.
[134] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi*, vol. 3, 381.

Treaty. The *Soryu* and *Hiryu* were completed in 1937 and 1939, respectively, and took part in the Pearl Harbor Attack. In 1933, the navy also built a submarine tender that could be rapidly converted into an aircraft carrier in wartime. In 1937, the navy decided to build two fleet carriers, *Shokaku* and *Zuikaku*. Those two carriers were completed just before the Pearl Harbor Attack and played a critical role throughout the Pacific War. These were the last carriers built before the Pacific War. After that, even though the navy planned to build more fleet carriers, it could build only two fleet carriers during the entire war.

Consequently, before the Pacific War, the Japanese navy possessed six fleet carriers and three small carriers (one of which was converted from an oiler), which together displaced 149,000 tons. The U.S. Navy possessed seven aircraft carriers (155,000 tons in total), which means the Japanese Navy achieved rough parity in terms of carrier forces.[135] However, the parity does not necessarily indicate that the Japanese Navy concentrated its efforts exclusively on its carrier forces in the post-treaty period.

One example that underscored this point was the navy's effort to construct the super-dreadnaughts *Yamato* and *Musashi*. After Japan withdrew from the naval treaties, these ships were considered a "silver bullet" force for the Japanese Navy. *Yamato* had a standard displacement of 64,000 tons and carried 18-inch guns which outranged any U.S. battleship at that time. The cost of building *Yamato* was about three percent of the annual national budget. The navy planned to build at least two more *Yamato* type battleships before the Pacific War, one of which was eventually converted to the aircraft carrier *Shinano* during the war.

[135] NIDS, *Kaigun gunsenbi*, vol. 1, 832.

Japan's War Plan

As discussed earlier, the traditional operational thinking of the Japanese Navy had been heavily influenced by its experience of the Battle of Tsushima, which was further enhanced by lessons learned from the Battle of Jutland during the First World War. The navy basically aimed to repeat the same type of battle against the United States and its war plan in the mid-1920s and early 1930s centered on two objectives: neutralization of U.S. bases in the Philippines and Guam and interception of the U.S. main fleet on its way to Japan in order to seek a decisive battle near Japanese waters.[136]

The first phase of the war plan consisted of prewar preparation and operations at the outset of hostility. In the prewar period, the Japanese Navy was to concentrate its forces to defeat the U.S. fleet while maintaining main bases on the Amami Islands and Okinawa and a forward base in Magong. During this phase, submarines were to be deployed to major ports and straits in the Western Pacific in order to check the enemy fleet.

Immediately after the war broke out, enemy fleets in Hawaii and the Western Pacific would be detected by means of submarines, aircraft and human intelligence. Also, mine layers and submarines would be deployed to major ports. One of the most important operations to be planned for this phase was a surprise

[136] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi*, vol. 3, 93.

attack against the U.S. Fleet, not by air raids but by other means at this time.[137] Offensive land operations against the Philippines and Guam were also planned.

The second phase was comprised of interception and decisive battle against the U.S. fleet. The navy first envisaged attritional warfare against the U.S. fleet by submarines and destroyer squadrons led by cruisers and battle-cruisers. That would have been followed by a decisive battle with battleships. Until the late 1920s, the expected area of the decisive battle had been the west of the Bonin Islands and the Marianas. However, technological development, such as an extended cruising radius and increased speed, enabled the Japanese Navy to seek a decisive battle against the U.S. fleet in areas east of the Bonin and Mariana Islands.

In the early 1930s, while surface ships remained the main focus in Japan's war plan, naval aviation was expected to play an increasingly critical role. Senior leaders within the navy considered it imperative to achieve parity in land-based aircraft since Japan possessed fewer surface ships, including carriers, that were capable of supporting sea-based aircraft, limiting the number of aircraft they could bring to the battlefield. Japanese war planners envisioned that land-based aircraft would be deployed to major air bases including Saipan, Palau, and Truk for attack, defense, patrol, and commerce protection purposes.[138] Aircraft carriers were also considered necessary for a decisive battle, however it was not until the late 1920s that offensive tactical exercises began in earnest. Given the contemporary aviation technology, carrier aircraft were expected to be effective only under permissive conditions in daylight, thus aircraft carriers could only play a marginal role in a decisive battle against battleships.

[137] Ibid.
[138] NIDS, *DKRK*, vol. 1, 215.

The war plan centered on a decisive fleet encounter remained in place throughout the 1930s. Interception operations against the U.S. fleet in the Western Pacific were studied and exercised repeatedly at the Naval Staff College, which indoctrinated generations of senior naval officers. With technological development, aircraft, submarines, and long-range torpedoes came into play and attritional operations and night combat came to be emphasized in the war plan. However, the basic concept that the final victory would be achieved only through a decisive battle by capital ships did not change during the interwar period.[139]

Although the Pearl Harbor attack fundamentally transformed naval warfare during the Pacific War, the operational planning of the attack came only immediately before the outbreak of the war. The initial operational concept was suggested in a private letter of Admiral Isoroku Yamamoto, the commander of the Combined Fleet, to Admiral Osami Nagano, the chief of the Navy General Staff dated on January 7, 1941. Although the headquarters of the Combined Fleet had developed the attack plan according to Yamamoto's idea, the Navy General Staff did not approve it. It was only after conducting a map exercise at the Naval Staff College to test its effectiveness followed by intensive deliberations at the Navy General Staff in September, that the operational plan was approved on October 19, 1941.[140]

This fact indicates that the initial surprise attack by concentrated air power was not a part of the navy's conventional war plan and it took shape rapidly with the maturation of carriers and carrier-borne aircraft in the late 1930s. As discussed later in detail, even after the Pearl Harbor attack had clearly demonstrated the transformed nature of naval combat, traditional operational

[139] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi*, vol. 3, 537.
[140] NIDS, *DKRK*, vol. 1, 552.

and strategic thinking that centered on capital ships dominated the navy top brass so strongly that the Japanese Navy failed to fully embrace one of the landmark innovations in the Second World War.

Conclusion

The strategy of seeking a decisive battle with the U.S. fleet did not change until the outbreak of the Pacific War.[141] The strategic environment in the interwar period enabled the Japanese Navy to identify its opponent and the possible battlefield, the Pacific Ocean. As Krepinevich pointed out: "More than anything else, it is perception of future contingencies and likely enemies that determine whether and when there is full exploitation of the advantages offered by the military revolution."[142] In particular, he took the case of aircraft carrier development and pointed out that the United States and Japan exploited RMA more effectively than Britain in part because they could focus on each other due to their strategic competition across the Pacific. Therefore, in this sense, the strategic environment in the interwar period was conducive to RMA.

However, as discussed above, the Japanese Navy split its bet on many different platforms and tactics to counter the U.S. fleet in the Pacific during the interwar period punctuated by the two naval limitation treaties. The 10:7 force ratio against the U.S. fleet had been critically influential within the navy throughout the interwar period. Minoru Nomura points out that the theory remained vivid among the naval officers for almost forty years after the end of

[141] Ikeda, *Nihon no kaigun*, vol. 2, 25.
[142] Andrew Krepinevich, "Cavalry to Computer: The Pattern of Military Revolution," *National Interest*, no. 37 (Fall 1994): 39.

Meiji period. It was so critical that the fact that Japanese naval strength reached more than seventy percent against the U.S. fleet in 1941 and was projected to decline beyond that point pushed the senior officers who had strongly argued the central importance of battleships and opposed any concession to the United States within the Japanese Navy to agitate for war earlier rather than later.[143] Against this backdrop, as Evans and Peattie rightly point out, the naval limitation treaty "…obliged the navy to make choices and to think carefully about alternative technologies and strategies, and it reinforced the navy's drive for qualitative superiority."[144] In its effort to explore alternatives, aircraft carriers were one of the major platforms, but not necessarily more important than heavy cruisers, submarines, and even destroyers.

This situation was no different for the U.S. and British Navies. In the case of the United States, the U.S. Navy identified Japan as a potential threat and the major part of the U.S. fleet was deployed in the Pacific. War Plan Orange, the blueprint for a war against Japan, was drafted as early as 1906. A mirror image of the Imperial Defense Policy appears in the U.S. war scenarios, in that the United States anticipated a possible seizure of the Philippines and other islands in the Pacific and envisioned that the numerically superior U.S. fleet would cross the Pacific and fight a decisive fleet battle near Japan's home waters.[145]

The U.S. Navy also emphasized battleship supremacy, in the same way as the Japanese Navy.[146] Before the First World War, the U.S. Navy was inspired by Alfred Thayer Mahan and hoped for a decisive fleet battle. Although the

[143] Nomura, *Nihon kaigun no rekishi*, 79.
[144] Evans and Peattie, *Kaigun*, 209.
[145] Sadao Asada, *From Mahan to Pearl Harbor: The Imperial Japanese Navy and the United States* (Annapolis: Naval Institute Press, 2006), 109.
[146] Goldman, *Sunken Treaties*, 106.

United States had fought a deadly anti-submarine war with Germany, as soon as the First World War ended, the U.S. Navy "…immediately reverted to prewar planning and accelerated plans for a battleship fleet."[147] However, the U.S. Navy did not exclusively focus on battleships, either, and the Washington Treaty prevented it from doing so. As George Baer put it, with only a few battleships under the naval limitation treaty, "…renewed attention was given to what cruisers, destroyers, carriers, and submarines could do."[148] As will be discussed later, many of the alternatives had been experimented during the interwar years, some of which, particularly submarines and aircraft carriers, greatly contributed to the final victory of the United States in the Pacific War.

Britain, on the other hand, did not have specific threat after the First World War. In Europe, Germany was defeated and its rearmament was constrained by the Versailles Treaty until1935. Other European powers, including Russia, France, and Italy, did not have major ship-building programs due to their war-torn economies and societies. The United States and Japan possessed strong navies, but both were deemed friendly and geographically distant.[149] Although Britain considered Japan as the most likely challenger, naval rivalry with the United States also played a large role in the British naval strategy during the interwar years.[150] The British Admiralty developed War Memorandum (Eastern), the British war plan with Japan, in which a powerful British battle fleet was to be sent to the Far East at the outset of hostilities in order to defeat the Japanese fleet. However, given the logistical and operational

[147] F. G. Hoffman, "U.S. Strategic Planning, 1919-1939: From Innocence to Improvisation," in *Conflicting Currents: Japan and the United States in the Pacific*, ed. Williamson Murray and Tomoyuki Ishizu (Santa Barbara: Praeger Security International, 2010), 28.
[148] Baer, *One Hundred Years of Sea Power*, 135.
[149] Jon T. Sumida, "British Naval Procurement and Technological Change, 1919-39," in O'Brien, 130.
[150] On this point, see Stephen Roskill, *Naval Policy between the Wars*, vol. 1*, The Period of Anglo-American Antagonism, 1919-1929* (London: Collins, 1968).

difficulties in moving the fleet from Europe to Asia, the Memorandum was primarily used as a justification for the British Navy to have a large battle fleet after the First World War.[151] As a result, unlike the U.S. and Japanese Navies, it was difficult for the British Navy to have a clear sense of danger and a sense of the likely battlefield during most of the interwar years.

As indicated in War Memorandum (Eastern), the British Navy shared the same belief in battleships as the other two navies, but it had particular obstacles in concentrating its resources on them: it built more battleships and battle-cruisers during the First World War, and thus wound up with many capital ships in the post-war years. Although these ships became obsolete quickly after the war, Britain could not replace them with new ones due to chronic financial austerity throughout the interwar period.[152] The Washington Treaty lessened the financial burden for Britain and forced it to change its force structure. However, the British Navy had different priorities for its weapons of choice. Since it had to protect long sea-lanes extended over its overseas territories, Britain focused on light cruisers more suitable for trade protection, which were "…obtained at the cost of battleship modernization and weaker naval aviation."[153] Nevertheless, light cruisers were eventually capped in terms of total tonnage by the London Treaty, which in effect prevented the British Navy from solely focusing on them.

During the interwar period, no single platform was given exclusive attention by the three navies and the two treaties virtually made it impossible to concentrate resources on heavy cruisers, the most promising alternative to battleships, due to the qualitative and quantitative limitations imposed by them.

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[151] Andrew Field, *Royal Navy Strategy in the Far East 1919-1939* (London: Frank Cass, 2004), 230-248.
[152] Sumida, "British Naval Procurement and Technological Change," 129.
[153] Ibid., 142.

The international environment during this period did not necessarily lead to construction and enhancement of particular platforms. Until the outbreak of the Pacific War, the Japanese Navy did not consider that aircraft carriers alone could replace the role of battleships.

However, it was demonstrated during the war that aircraft carriers played a decisive role, particularly in the initial offensive campaigns, much more than any other weapons except land-based aircraft. Therefore, it is necessary to examine how the navy adopted aircraft carriers and translated their potential into military effectiveness. This necessitates detailed scrutiny as to how aircraft carriers became so much more effective than other platforms tested during the same period, even those that had already proven their effectiveness during the First World War.

Chapter 3

Leading Individuals

This chapter discusses key individuals who developed a new theory of victory to address the strategic problems the Japanese Navy perceived during the interwar period. As the intraservice model predicts, the presence of visionaries was critical in developing and promoting new theories of victory. They were innovative enough to advocate the novel idea, but senior enough to influence the navy's policy in developing carrier aviation organizationally. Within the Japanese Navy, there were several key figures that played this contradictory role. Their initiative and tactics to diffuse the new theory within the Navy will also be examined. Finally, this chapter demonstrates that practitioners who helped connect the vision with the operational realities played a critical role in materializing the revolution in military affairs (RMA).

The highly hierarchical nature of armed forces dictates that senior military leaders, endowed with more power and authority, have greater influence over the course of organizational policy. Accordingly, in explaining the process of innovation, organizational leaders tend to attract greater attention. As James Wilson points out, "[w]hether changes are core or peripheral, externally imposed or internally generated, understanding why they occur at all requires one to understand the behavior of the agency executive."[154] Wilson also goes on to state that almost all the major studies on bureaucratic innovation emphasize the great importance of organizational leaders in explaining change. The case of aircraft

[154] James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York: Basic Books, 1989), 226.

carrier development in the interwar period is no exception. Thomas Hone, Norman Friedman, and Mark Mandeles point to the fact that individuals have been focused on as the prime movers of RMAs, particularly by historians, and conclude that personal factors did influence the development of carrier aviation during the interwar period.[155] To what extent do personal factors, particularly the role of senior leaders, matter in explaining the Japanese RMA?

While some individuals did push new ideas and promote innovation, there are numerous cases where officers, particularly senior ones, resisted radical changes to traditional ways of warfare. Senior leaders in any military organizations tend to be conservative because they consider proven weapon systems and tactics as safer bets for any future contingencies. In addition, there are certain vested interests for them to do so. As Richard Gabriel and Paul Savage rightly pointed out, if senior officers who "…have risen to positions of highest rank, authority, and influence have done so by successfully mastering and manipulating the very system that some now seek to change," it is they who "…would have the most to lose by reform."[156] Barry Posen echoes their observation by stating that "…military organizations are so hierarchical that the flow of ideas from the lower levels to the higher levels is restricted and those at the top have achieved their rank and position by mastering the existing doctrine, thus have no interest in innovation."[157] Furthermore, the nature of military organizations also makes it difficult to change from the bottom up by recruiting new leaders outside. As Stephen Rosen points out, military organizations "…are governed by professional officer corps into which new blood can only be

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[155] Thomas C. Hone, Norman Friedman, and Mark D. Mandeles, *American and British Aircraft Carrier Development, 1919-1941* (Annapolis: Naval Institute Press, 1999), 4 and 148.
[156] Richard A. Gabriel and Paul L. Savage, *Crisis in Command: Mismanagement in the Army* (New York: Hill and Wang, 1978), 175.
[157] Barry R. Posen, *Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca: Cornell University Press, 1984), 224.

introduced from below, and only with the approval of the senior leadership."[158] Such obstacles to change seem more difficult to overcome when it comes to creating a new branch, like naval aviation. Military organizations consist of different branches and each branch is represented by senior officers who come from their own branch. Therefore, as Edward Luttwak observes, "…the units yet to be established obviously cannot already be represented by people with institutional power, as they have no bureaucratic advocates."[159]

With these observations in mind, the civilian intervention model emphasizes that military organizations need outside help to innovate. In particular, the model calls for direct civilian intervention to force a reluctant military to change. Posen argues that civilian intervention is a "key determinant" for innovation.[160] In the Japanese case, there were some civilian leaders who were interested in military matters and occasionally raised the issue of strengthening naval aviation at the Diet. One notable example was a question posed by Masatsugu Yamane, who was a senior member of the Japan Aeronautic Association, toward Navy Minister Tomosaburo Kato in 1916. Given the rapid pace of development of aircraft engines, Yamane asked if the navy's aviation-related budget was enough to develop more powerful engines. In response, Kato replied that even if more capable aircraft were developed, they would not be able to disable surface ships, thus the current building program of capital ships should not be affected.[161] Although questions of this kind had been frequently raised in the subsequent Diet sessions, the influence of civilian policymakers over military policy was minimal in Japan during the interwar period. The Diet

[158] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press), 8.
[159] Edward N. Luttwak, *Strategy: The Logic of War and Peace*, revised ed. (Cambridge: Harvard University Press, 2001), 99.
[160] Posen, *Sources of Military Doctrine*, 54-59.
[161] Nihon Kaigun Kokushi HensanIinkai, *Nihon kaigun kokushi* [The history of Japanese naval aviation], vol. 1 (Tokyo: Jiji Tsushinsha, 1969), 73-74.

played only a marginal role in formulating the aviation policy of the navy and it oversaw only the overall navy budget, not specific items.

The lack of civilian oversight of the military was more evident with the fact that the navy and army ministers were uniformed officers, active or retired, but not elected civilian officials. As David Evans and Mark Peattie pointed out, although the navy minister was chosen by the civilian prime minister as a member of the cabinet, he was only directly responsible to the emperor, thus in practice greatly under the influence of the Navy General Staff.[162] In the early 1930s, the Navy General Staff, which was primarily in charge of operational matters, became more powerful even in terms of budget and personnel, which were supposed to be under the Navy Ministry's jurisdiction. This was more so when the Japanese Navy criticized the Hamaguchi administration for violating the "right of supreme command" of the emperor when the London Treaty was signed. Frustrated by the limitations imposed by the London Treaty, Kanji Kato, chief of the Navy General Staff, argued that any decisions concerning naval strength should have been consulted with the Navy General Staff because any operations would be greatly influenced by the overall naval strength. Otherwise, Kato insisted, the government infringed the "right of supreme command" of the emperor. As a result of Kato's accusation, a fierce debate between the Navy Ministry and the Navy General Staff took place and the latter won over in a protracted struggle. The regulations were changed so as to give substantial authority to the Navy General Staff, which was independent from both the executive and legislative branches. Since the emperor did not interfere with the day-to-day business of the government, the "right of supreme command" meant that except for their annual budgets, the Japanese Navy was essentially

[162] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941* (Annapolis: Naval Institute Press, 1997), 29.

accountable to no one.[163]

The civilian intervention model also calls for the presence of "military mavericks" to provide detailed military information to assist civilian reformers. This is precisely because, as Andrew Bacevich observed, military officers defended their military orthodoxy by "…alluding to secrets of the warrior's craft, those deep and immutable truths to which they alone as high priests of the military art had access."[164] Posen attributes this information gap to the intense division of labor between civilians and military officers. Civilians tend to lack the military knowledge to enable innovation, thus need to seek sources of it inside or outside of the military in order to fill this gap. Posen points to two individuals, Air Chief Marshall Sir Hugh Dowding of the Royal Air Force and General Heinz Guderian of the German Army, who played a critical role in the two cases of innovation, the development of air defense in Britain and, to a lesser extent, the advent of blitzkrieg in Germany. In particular, Dowding closely worked with the civilian leaders and helped turn their vision into a functional air defense system. Dowding himself was not well-liked within the bomber-dominant Royal Air Force; however, he managed to become head of the Fighter Command, where he laid the groundwork for the workable air defense network centered on radars. At the civilians' request, Dowding readily provided a detailed plan specifying necessary components. Posen goes on to state that, had it not been for Dowding, "…one wonders if the innovation would have unfolded as quickly or as successfully as it did."[165]

However, in the Japanese case, both the civilian leaders in the government and the Diet did not have any authority over the navy's personnel

[163] Ibid., 26.
[164] Andrew J. Bacevich, "Preserving the Well-bred Horse," *National Interest*, no. 37 (Fall 1994): 44.
[165] Posen, *Sources of Military Doctrine*, 175.

and promotion policy. There was no confirmation process or procedure for nominating senior leaders within the navy by the executive and legislative branches. Therefore, it was virtually impossible for civilian leaders to identify who could help translate their vision into viable options. In addition, even if the detailed military information had been provided by mavericks, the navy's independence from both branches would have given civilians no leverage to enforce their vision. Taken together, civilian intervention does not have sufficient explanatory power for the RMA by the Japanese Navy.

Other models also recognize the role of individuals. In particular, the intraservice model emphasizes the need for individual leadership for innovation. Rosen points out that the RMA "…occurs when respected senior military officers formulate a strategy for innovation, which has both intellectual and organizational components."[166] In terms of intellectual components, senior officers need to develop "…new ideas about the new ways wars would be fought in the future and how they might be won."[167] Barry Watts and Williamson Murray concur that developing visions of the future is important for innovation. However, at the same time, they also emphasize that vision is not enough to produce successful innovation. Vision, they contend, must be "…balanced and well connected to operational realities."[168]

As Hone, Friedman, and Mandeles indicate, the role of individuals has been emphasized in the case of the U.S. Navy's development of carrier aviation. For example, based on the intraservice model, Andrew Krepinevich identifies five "building blocks" for sustaining innovation, one of which is "[a] vision that has

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[166] Rosen, *Winning the Next War*, 21.
[167] Ibid., 57.
[168] Barry Watts and Williamson Murray, "Military Innovation in Peacetime," in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996), 407.

the potential to inspire dramatic change."[169] He names Admiral William S. Sims, who advocated after the First World War that an aircraft carrier had the offensive potential to destroy a battleship, as one of the visionaries within the U.S. Navy. Sims later became president of the Naval War College and significantly contributed the development of carrier aviation by conducting numerous simulations and war games to test and validate the effectiveness of carriers.[170]

In connecting the vision to operational realities, Rosen identifies Rear Admiral William Moffett as a key individual in the case of the U.S. Navy's development of carrier aviation. Moffett was a battleship admiral, but after becoming director of the Bureau of Aeronautics, he came to believe that aircraft carriers could play not an auxiliary, but independent role in future naval warfare through the simulations and war games conducted at the Naval War College. By arguing that carriers could be the future capital ships, Moffett created a new set of missions for them. Furthermore, Moffett established himself quickly and lobbied to both civilian and military leaders for building additional carriers and developing various types of capable aircraft. For this role, Krepinevich describes Moffett as a "…superb bureaucrat and consummate public relations chief," and "…a determined, vocal advocate" for carrier aviation.[171]

Similar to the U.S. Navy's ideological transition in the interwar period the ideological struggle concerning the theories of victory within the Japanese Navy was intense since the Washington and London Treaties limited the number of capital ships and forced it to look for other alternatives. Same as the U.S.

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[169] Andrew F. Krepinevich, Jr., "Transforming to Victory: The US Navy, Carrier Aviation, and Preparing for War in the Pacific," in *The Fog of Peace and War Planning: Military and Strategic Planning under Uncertainty*, ed. Talbot C. Imlay and Monica Duffy Toft (London: Routledge, 2006), 180.
[170] For Sims's contribution, see Hone, Friedman, and Mandeles, *American and British Aircraft Carrier Development*, 1919-1941, 33-35.
[171] Krepinevich, "Transforming to Victory," 180-183.

Navy during the interwar period, the struggle was led by visionaries who envisioned the independent role of carrier aviation with the help of those who could connect the vision with the operational realities. However, due to the absence of effective civilian oversight of the military, those individuals were chosen by the navy's top brass based on their own preference and they were obviously not mavericks who, by definition, were not well liked by other navy officers for their unconventional vision. Consequently, the intraservice model is expected to have a greater promise to explain the role of individuals in the Japanese RMA.

According to the intraservice model, there seem to be three steps through which visionary leaders promote innovation. First, visionaries draw early attention from their organization by offering a new theory of victory in which a particular platform or weapon system may replace existing platforms or create a new combat arm. In this case, aircraft and aircraft carriers were totally new to the existing fleet, thus someone needed to create a theory in which the navy could actually employ aircraft to achieve their objective. Second, the vision has to be tested and put into practice so that the majority of the members of military organizations could realize its potential. Given the lack of civilian intervention in the Japanese political system, this phase was particularly important for the Japanese Navy. Since different branches within the navy competed for scarce resources, it was critical to demonstrate the potential of a new combat arm in order to garner support among members of the navy, particularly senior officers. Lastly, the new capability has to be developed and utilized in order to win a victory or achieve a new level of military effectiveness. In so doing, visionaries are not necessarily experts on the new platform they are promoting and need assistance from junior officers who are the foremost practitioners for detailed

information. This was particularly true of aircraft, which developed so quickly that there were virtually no admirals with long flying and operational experience during the interwar period.

Early Visionary

The Japanese Navy took relatively early interest in aircraft and started to gather basic technical information through newspapers and magazines in addition to military attachés stationed in Europe and the United States. One of the technology-minded officers who considered aircraft as a promising weapon platform was Eisuke Yamamoto. Being influenced by his uncle, Gonbei Yamamoto, a very powerful navy admiral who later occupied important political positions including the prime minister, Yamamoto naturally pursued his career as a naval officer.

Yamamoto had been trained as a torpedo officer and accumulated extensive foreign experience through training cruises and private foreign trips early in his career. When he was a lieutenant junior grade, he took keen interest in radio communication and asked the navy to send him to a training school for radios, which was considered exceptional and even unacceptable for his rank and age. But, he strongly requested this assignment and was permitted to attend the school consequently. After acquiring the necessary technological skills, he returned to the fleet. Yamamoto later took part in the Russo-Japanese War as a staff officer in charge of improving radio communication of the fleet.

While he continued to work on radio communications for the navy, he became interested in the submarine. Even before the Russo-Japanese War, Yamamoto and Lieutenant Denzo Mori both read *Scientific American* in order to

gather up-to-date technical information and compiled his knowledge and insights on the submarine into a couple of notebooks. After graduating from the Naval Staff College at the end of 1907, Yamamoto was assigned to the Navy General Staff as a staff officer. During this assignment, he subscribed to *Yorozu Choho*, a newspaper which carried a lot of articles on aircraft, and clipped those articles.[172] In March 1909, Yamamoto came to believe that he accumulated enough information and drafted a policy proposal on aircraft.

In the proposal, Yamamoto pointed out that, while the navy had already started research on the submarine, the result of which demonstrated their potential as a combat arm, the navy had not initiated any research on aircraft yet. He warned that, in a few years' time, aircraft would come to possess enough combat power so as to be called as "mid-air battleships" and that naval warfare would become three dimensional including subsurface and air. Based on this perception, he urged the navy to conduct research on aircraft.

Yamamoto submitted this proposal to his superior at the Navy General Staff, Captain Tanin Yamaya, and asked his judgment. Yamaya agreed to Yamamoto's proposal but insisted that the research on aircraft should be conducted not by the navy alone, but jointly with the army.[173] For this reason, Yamaya visited the Army General Staff to test the water on his ideas, but found that the army was reluctant to engage in the research without clear guidance from the technical branches within it. The captain decided to go alone, and two junior officers were selected for further research.

However, Yamamoto clashed with Yamaya on how to conduct research

[172] Hideho Wada, *Kaigun koku shiwa* [A historical account of naval aviation] (Tokyo: Meiji Shoin, 1944), 10-11.
[173] Nihon Kaigun Kokushi HensanIinkai, ed., *Nihon kaigun kokushi*, vol. 1, 53.

with the two officers.[174] On one hand, Yamamoto believed it was more reasonable for them to work at the Navy General Staff under his guidance because he was the most knowledgeable on this matter. On the other hand, Yamaya thought it best to send them to the Naval Staff College as students for research, to which Yamamoto disagreed because he believed no instructor there could teach them about this novel platform. But, in the end, Yamaya prevailed and those two officers were sent to the college.

In promoting his idea, Yamamoto was politically savvy. At the same time of submitting the policy proposal to Yamaya, he was invited to a dinner party hosted by Navy Minister Makoto Saito. In the middle of the party, Saito happened to take a seat beside Yamamoto, who took this chance to speak directly with the minister about the proposal. Saito, who had frequently discussed the matter with his army counterpart, but seen no tangible progress, asked him to submit detailed proposals. Yamamoto lost no time in handing the proposal to the minister along with his opinions about radio communications.[175]

Saito's own belief that research on aircraft was necessary, coupled with Yamamoto's incitement, pushed Saito to intensify negotiation with his counterpart, which resulted in an agreement to create a joint army-navy committee on aircraft. The committee was called as the Rinji Gunyo Kikyu Kenkyukai (Provisional Committee for the Study of the Military Application of Balloons). As this name indicated, the committee was initially intended to focus on lighter-than-air aircraft, but Yamamoto, when asked his opinion from his superior on the committee, strongly insisted that the navy should focus on heavier-than-air craft instead and change its name and focus accordingly. As a

[174] Eisuke Yamamoto, *Nanakorobi yaoki no chi, jin, yu* [The wisdom, benevolence, and courage of the vicissitudes of life] (Tokyo: Privately published, 1967), 225-226.
[175] Wada, *Kaigun koku shiwa*, 20-22.

result, both the army and the navy agreed to work on both platforms under the committee without changing its name.

Yamamoto believed that he was the best candidate for the job, but he was not included in the commission by Yamaya. Yamaya attributed his decision to Yamamoto's many other duties at that time. However, Yamamoto felt that he was excluded from the commission since he believed Yamaya considered him too stubborn for his insistence on how to conduct research with the two junior officers. Being infuriated by this decision, Yamamoto was firmly determined not to engage in any jobs or tasks related to aircraft from this point on.[176]

Notwithstanding his firm determination, Yamamoto subsequently played a critical role in promoting the development of naval aviation by increasing its presence. The first public demonstration of aircraft by the Japanese Navy took place in the ship review held in November 1912. Two seaplanes operated by Yozo Kaneko and Sankichi Kohno, who came back from France and the United States, respectively, flew over the fleet and demonstrated their maneuver in front of the Emperor Meiji. This demonstration was made possible by Yamamoto who stationed in Germany as naval military attaché. Yamamoto thought it best to demonstrate the potential of aircraft publicly, particularly on a special occasion, thus chose the annual ship review as an ideal stage. Yamamoto lost no time in contacting Kaneko, who was in Paris to receive flight training, to ask if a demonstration flight was feasible.

After getting a positive response from Kaneko, Yamamoto sent a letter to the Navy Ministry to persuade the top leaders that aircraft should participate in the review. The navy deliberated his proposal and decided to recall Kaneko and Kohno who was in flight training in the United States to take part in the review.

[176] Yamamoto, *Nanakorobi yaoki no chi, jin, yu*, 229-230.

Kaneko steadfastly shipped two seaplanes and three engines and hurried back to Japan by train. Both the pilots and aircraft reached Japan in time and they made successful flights during the ship review.

Along with his proposal for the public demonstration of aircraft, Yamamoto also detailed other policy recommendations.[177] He proposed that the navy should create its first airfield near Yokosuka and construct airfields in each military port. He also recommended recruiting pilots among young ensigns and gradually transferring gunnery, torpedo, and communications officers to naval aviation. Finally, Yamamoto proposed future research on equipment that could launch aircraft from naval vessels. He deliberately sent his proposal directly to the Vice Navy Minister because this would be much faster than the formal process via the embassy, which shows his political skill in the bureaucracy.[178]

After coming back from Germany in 1914, Yamamoto went through various staff and administrative assignments and was promoted to rear admiral in 1920 and vice admiral in 1924. However, he was out of naval aviation until 1927 when the Naval Aviation Department, a central institution focusing on naval aviation, was established. Yamamoto was nominated as its first head and eventually made a comeback to naval aviation, which was welcomed by many aviators.[179] He was in the position for 20 months and made important contributions in terms of technological and administrative policy of naval aviation.

On the technological front, Yamamoto promoted the development of catapults, bombsights, and machine guns. Among other things, he thought it necessary to develop a long-range bomber which could fly directly from Yokosuka

[177] Nihon Kaigun Kokushi HensanIinkai, ed., *Nihon kaigun kokushi*, vol. 1, 62.
[178] Yamamoto, *Nanakorobi yaoki no chi, jin, yu*, 267.
[179] Wada, *Kaigun koku shiwa*, 182.

to Cavite in the Philippines to attack naval vessels there.[180] The bombers could attack battleships while they were at anchor or before going out from the port. Naval vessels were expensive to build, thus he argued that sinking them by aircraft would be very cost effective. Yamamoto believed that, if the long-range bomber were developed, there would have been no need for battleships and cruisers. He consequently requested a budget, but it was eventually diverted to operational costs for the military actions taken around Jinan in China.

On the administrative front, Yamamoto made an important contribution to improve the quality of pilots. He asked one of his subordinates, Lieutenant Commander Kikuji Okuda, to conduct research on a new recruiting system of pilots. Following the model in the area of radio communications, the new system aimed to recruit youths aged from fifteen to seventeen years in order to give them basic academic education and flight training.[181] This system was formally adopted in 1929 and called as the Flight Reserve Enlisted Trainee (Yokaren) course system.

Yamamoto became the commander of the Combined Fleet in 1929 and was promoted to a full admiral in 1931, which means he reached the most senior position and rank within the navy. This fact indicates that Yamamoto might have played a critical role in not only creating a theory of victory and but also institutionalizing it as an operational commander. However, there is no clear historical evidence or a personal account by Yamamoto as to what he achieved in the area of naval aviation, particularly carrier forces, during his tenure as the commander of the Combined Fleet.

Given his early focus on aircraft and zealousness, Peattie described him

[180] Yamamoto, *Nanakorobi yaoki no chi, jin, yu*, 680-681.
[181] Ibid., 683.

as "the conceptual father of Japanese naval aviation."[182] However, it is difficult to conceive Yamamoto as a thorough aviation visionary. Yamamoto described himself as having a peculiar characteristic of noticing something new and pioneering them, which drove his research on radio communications, submarines, and finally aircraft in his career.[183] However, there were some indications that Yamamoto emphasized the potential of submarines more than that of aircraft. In 1934, after retiring from the navy, he was invited to give a lecture on the naval disarmament issue, which was broadcasted nationally through the public radio. In the lecture, Yamamoto pointed out that both aircraft and submarines were critical for the defense of Japan, but emphasized that submarines were more effective than any other platforms.[184] Given the fact that Yamamoto was chosen by his seniors as commander of the Combined Fleet, he might have had a more balanced view toward naval weapon platforms than the widely-shared image of his vision.

In addition, Yamamoto distanced himself from the area of naval aviation until he was appointed as director of the Naval Aviation Department in 1927, which reduced his opportunities to develop the naval aviation organizationally. He later recalled that if he had been allowed to lead naval aviation from the start, it would have been much more effective.[185] However, he had been influential throughout his career in provoking the navy's interest in aviation, as Peattie rightly points out, "…quite possibly through his family connections."[186] His political influence coupled with his open mind to new technologies enabled him to explore new possibilities brought by aircraft. Notwithstanding his vision,

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[182] Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2001), 3.
[183] Yamamoto, *Nanakorobi yaoki no chi, jin, yu*, 224.
[184] Ibid., 719.
[185] Ibid., 678.
[186] Peattie, *Sunburst*, 219.

Yamamoto was not given any formal flight training and did not have much firsthand flying experience to conceptualize it further. For his vision to take effect, Yamamoto needed other officers to test, operationalize and practice it.

Pioneering Aviator

Around the same time as Yamamoto focused on the potential of aircraft, other officers were keenly interested in aviation. For example, Hisatsune Iida, Shiro Yamauchi, and Yozo Kaneko were considered early visionaries who first foresaw aircraft as a future weapon platform for the navy and gathered relevant information through foreign journals.[187] In particular, Kaneko was selected to serve as a member of the Provisional Committee for the Study of the Military Application of Balloons. In 1911, as a mission of the committee, he was sent to Paris to learn how to fly aircraft and balloons.

While receiving flight training in Paris, Kaneko gathered information on the state of aircraft development in Europe and urged the navy to establish its first air group as soon as possible. In the report to the Vice Navy Minister dated on April 14, 1912, he detailed his personal proposal to set up a new group.[188] Given the rapid pace of aircraft development, Kaneko believed that aircraft would be advanced quickly and of great use for the navy. He first compared the utility of land-based aircraft launched from a ship with that of seaplanes and concluded that the former required a specialized ship with a flat deck or special equipment to operate. He argued that the latter only needed a base with an open

[187] Nihon Kaigun Kokushi HensanIinkai, ed., *Nihon kaigun kokushi*, vol. 1, 49.
[188] Yozo Kaneko, "Kengaku hokoku narabini kaigun hikotai shinsetsu ni kansuru shoken teishutsu no ken [Site visit reports and observations concerning the establishment of naval aviation groups]," April 14, 1912, Kaigunsho kobun biko [Official document files of the Ministry of the Navy], Gaikoku chuzaiin hokoku [Foreign correspondents' reports], 1911, vol. 5, Japan Center for Asian Historical Records, Ref. C10100756100.

sea and consequently recommended that the navy purchase four seaplanes and acquire necessary personnel and facilities. Also, at this stage, he emphasized that training pilots should take precedent over manufacturing aircraft, thus proposed to build the first air base near Yokosuka for the sake of training.

Shortly after submitting his report to the navy, Kaneko was contacted by Yamamoto and responded favorably to his request to conduct a demonstration flight in front of the emperor. In his written communications with Yamamoto, Kaneko expressed his formative opinion on the offensive potential of aircraft. In reply to Yamamoto's inquiries about aircraft, Kaneko stated that aircraft could attack enemy ships anchored in a port along with torpedo boats on calm and clear nights. He also went on to say that, even if the port was heavily defended against possible invasion of torpedo boats, there would be no barrier to attack from the sky. Kaneko concluded that aircraft were a very effective weapon to force enemy ships out of the port, thus it was indispensable to make them part of the navy at all costs.[189]

Kaneko was one of the few officers who took part in the air operations against the German base in the Siege of Tsingtao during the First World War in September 1914. For this air campaign, *Wakamiya* was converted from a transport ship into a seaplane carrier and Kaneko was in charge of conversion and refitting.[190] The aircraft launched by *Wakamiya* conducted various missions including reconnaissance, surveillance, and air raids against land and naval targets. The Tsingtao campaign was the first real battle involving Japanese naval aircraft, which took place only two years after the first demonstration flight had been made. Kaneko led the air group as the most senior officer pilot until Commander Shiro Yamauchi took command of the group.

[189] Wada, *Kaigun koku shiwa*, 47.
[190] Ibid., 89.

After the Tsingtao campaign, the navy decided to set up its first air group in Yokosuka and requested a budget for building and maintaining it. Consequently, the budget was approved by the Diet and the Yokosuka Air Group was formed in April 1916. The first commander of the group was Yamauchi, and Kaneko served as the commander of the training air group and his deputy.[191] After setting up the air group, the navy top brass came to recognize the importance of operating aircraft with the fleet and emphasized close cooperation between the two, which resulted in the formation of the Fleet Air Group, with *Wakamiya* as its flagship, in September 1916. After three months of exercising with the fleet, the Fleet Air Group was dissolved and returned to the Yokosuka Air Group. While this practice was considered valuable and continued annually from the following year, it was increasingly realized that the seaplane carrier was affected by adverse weather so much that seaplanes could not be launched under challenging conditions. For this reason, many aviators strongly argued for building a fast aircraft carrier that could launch and recover aircraft more freely.

Against this backdrop, Kaneko was dispatched to Europe in the fall of 1917 to gather relevant information on aircraft carriers and brought back with him up-to-date technical and operational information, particularly from Britain, which employed operational aircraft carriers for the first time in the world during the First World War.[192] He provided the materials brought back from Britain to ship designers for reference and cooperated for building the first aircraft carrier *Hosho*.[193]

As his early proposal had indicated, Kaneko was a keen advocate of

[191] Torao Kuwabara, *Kaigun koku kaisoroku, soso hen* [Recollections of naval aviation, formative years] (Tokyo: Koku Shimbunsha, 1964), 115.
[192] Ibid., 120.
[193] Masanori Ito, *Daikaigun wo Omou* [Reflections on the Japanese Navy] (Tokyo: Kojinsha, 2002), 356-357.

establishing an airfield on land for training carrier pilots.[194] However, the navy did not feel strongly about the necessity and was reluctant to secure a budget for this sake. When Kaneko was a liaison officer to the army, he was given an opportunity to promote his cause by chance.[195] When he visited the Army Ministry, Kaneko was asked by Major General Ikutaro Inoue if the navy was interested in Kasumigaura for a possible airfield. If not, Inoue said, the army was planning to buy the land for its use. Although the navy had not had any concrete plan, Kaneko replied to Inoue that the navy was already in a process of purchasing the land and wasted no time to visit Vice Navy Minister Ide. Ide decided to go ahead with the plan and swiftly got an approval from the minister. Kasumigaura and its surrounding area turned out to be one of the most suitable places for an air base and later became the center of pilot training for the navy.[196]

Kaneko was the first aviator who achieved the rank of rear admiral, but he retired prematurely after serving as an instructor at the Naval Staff College in 1927. Despite his relatively short professional career, Kaneko's role was instrumental in that he encouraged the Japanese Navy to take the potential of aircraft carriers seriously by demonstrating actual air operations in person. At the same time, he vigorously lobbied to his superiors about the effectiveness of aircraft carriers and accumulated enough technical and operational knowledge on the new weapon platform. In particular, the successful construction of *Hosho* was attributed to Kaneko, who had been a pioneer aviator and foremost expert within the navy.[197]

Kaneko did not stop his efforts there and argued for developing land-based aircraft and constructing air stations for the navy, which were

[194] Nihon Kaigun Kokushi HensanIinkai, ed., *Nihon kaigun kokushi*, vol. 1, 194.
[195] Kuwabara, *Kaigun koku kaisoroku, soso hen*, 151.
[196] Ibid., 151.
[197] Nihon Kaigun Kokushi HensanIinkai, ed., *Nihon kaigun kokushi*, vol. 1, 194.

indispensable for building an effective carrier force. Because of his vital role in expanding the carrier force, Masanori Ito, a prominent naval historian, dubbed him as the "champion" of Japan's naval aviation.[198] However, he could not achieve a higher rank than rear admiral, thus was not posted to more influential positions such as the director of the Naval Aviation Department or the commander of the Combined Fleet. As Rosen points out, in order to fully develop the carrier force, the navy needed other senior leaders who were more respected among officers and able to formulate a strategy for innovation.

"Father" of the Japanese Naval Aviation: Isoroku Yamamoto

Among many individuals who contributed the development of Japanese naval aviation, Isoroku Yamamoto was arguably the most influential leader. As early as in 1944, Hideho Wada, then retired vice admiral, published a book on Japan's naval aviation history and praised how much Yamamoto contributed to the development of naval aviation thorough his work at the Naval Aviation Department.[199] Also, Toshio Yoshida, a former naval officer and military commentator, even went so far as to state that Yamamoto led the way in building up Japanese naval aviation without any help from others. "If not for Yamamoto," Yoshida continued, "the naval aviation group could not have played such an independent role as it did during the Pacific War."[200] As these statements clearly demonstrate, Yamamoto's individual role was clearly recognized by many studies even before the war ended. Yamamoto was known to have an exceptional vision toward air power, encouraged the navy to expand naval aviation, and forcefully

[198] Ito, *Daikaigun wo Omou*, 343.
[199] Wada, *Kaigun Koku Shiwa*, 184-5.
[200] Toshio Yoshida, *Eiko to higeki, rengo kantai, Togo Heihachiro to Yamamoto Isoroku* [The glory and tragedy, the Combined Fleet: Heihachiro Togo and Isoroku Yamamoto] (Tokyo: Akita Shoten, 1968), 247.

promoted his idea to employ aircraft carriers offensively in the war against the United States.

Yamamoto entered the Naval Academy with the second highest score in his class. After graduating the academy seventh in the class standing, he was commissioned as an ensign.[201] Only one year after the assignment, Yamamoto took part in the Battle of Tsushima as an officer of the armored cruiser *Nissin*. During the battle, he was seriously injured by a blast on the ship and lost two fingers from his left hand. Even though he was trained as gunnery specialist of surface ships, Yamamoto turned his eye on aircraft relatively early in his career.

The fact that Yamamoto witnessed the rapid development of aircraft in the United States facilitated his understanding of airpower. In his career, he was sent to the United States for three assignments. First, Yamamoto was sent to Harvard to study English. Second, from 1919 to 1921, he was assigned as assistant military attaché. Lastly, he served as military attaché in Washington from 1926 to 1928. Hiroyuki Agawa, author of the most popular biography of Yamamoto, pointed out, "…his two periods of duty in America – from 1919 to 1921 and from 1926 to 1928 – directed his gaze toward the skies."[202] For example, when Yamamoto was a defense attaché to the United States, he reported on the famous bombing experiments conducted by the U.S. Army against a German battleship. He also reported on debates in the United States on whether aircraft could sink a battleship. Through his experience in the United States, Yamamoto came to recognize its enormous industrial capability and advanced technology. Along with his study in the United States, his further research at the Naval Staff

[201] Eiichi Sorimachi, *Ningen Yamamoto Isoroku, jo* [Human, Isoroku Yamamoto, vol. 1] (Tokyo: Kowado, 1951), 136, 148.
[202] Hiroyuki Agawa, *The Reluctant Admiral: Yamamoto and the Imperial Navy* (Tokyo: Kodansha International, 2000), 72.

College made him recognize the importance of air power. In 1921, Yamamoto became an instructor on strategy and politics at the college. During this time, he already declared that aircraft would be the weapon of future, particularly after signing the Washington Naval Treaty.[203]

Yamamoto was also assigned to some important posts in naval aviation both in the field and in administrative capacities. From 1924 to 1926, Yamamoto was assigned as the deputy commander of the Kasumigaura Air Group, which educated and trained aviators. In Kasumigaura, it is believed that Yamamoto learned how to fly, which, as Peattie pointed out, was "…an unusual initiative in the navy at this time for someone of his rank." [204] He was also captain of *Akagi*, one of the largest aircraft carriers the Japanese Navy built in the 1920s. He subsequently served as the commander of the First Air Flotilla, which consisted of two aircraft carriers, *Akagi* and *Ryujo*. It is difficult to know specifically how he perceived aircraft carriers per se because the Japanese Navy made no clear distinction between land-based aircraft and aircraft carriers in its strategy for the decisive battle with the United States. However, these assignments to aircraft carriers surely helped him to appreciate the potential of aircraft carriers. In particular, the First Air Flotilla, formed around two aircraft carriers as its core, was a test bed to experiment new air tactics. It is not difficult to assume Yamamoto learned a great deal about the potential of aerial attack launched from aircraft carriers by a series of experiments.

His experience in the field made him aware of the importance of air power better than most senior leaders in the navy. However, his vision was not considered as radical as Admiral Shigeyoshi Inoue who advocated an "air navy."

[203] Sorimachi, *Ningen Yamamoto Isoroku,* vol. 1, 252-4.
[204] Peattie, *Sunburst*, 32. For Yamamoto's flight training, see Agawa, *Reluctant Admiral*, 79.

Also, when he was vice navy minister, Yamamoto did not oppose the idea of building super Dreadnaught battleships, *Yamato* and *Musashi*, and even authorized the plan to build additional battleships when he was the vice navy minister. Yamamoto considered battleships as a political symbol and did not seek to abolish them altogether. He once stated to junior officers that battleships could serve more symbolic than military purposes. Thus, Asada considered Yamamoto as a "transitional" leader whose vision was not radical enough to change the navy's orientation completely.[205] However, as Geoffrey Till pointed out, Yamamoto "…was particularly important in changing the Japanese navy's overall attitude towards naval aviation in his role as vice navy minister from December 1936 to August 1939." [206]

On the administrative side, Yamamoto served three times at the Naval Aviation Department, once as head of the technical division and twice as head of the department, through which he lobbied for expanding naval aviation. In particular, Yamamoto served three years as chief of the Technical Bureau of the Naval Aviation Department from 1930 to 1933, which was considerably long for senior officers like Yamamoto. In this period, Yamamoto contributed to the design and production of capable aircraft and laid the foundation for indigenous aircraft development.[207] He drafted the first official plan of aeronautical technological development, the Koku Gijutsu Jiritsu Keikaku (Independent Aeronautical Technology Plan). The plan stipulated that all aircraft and engines procured by the Japanese military should be designed by Japanese engineers. Richard Samuels point out that the Japanese aircraft industry produced 400

[205] Sadao Asada, *Ryotaisenkan no nichibei kankei: Kaigun to seisaku kettei katei* [U.S.-Japan relations in the interwar period: the navy and policymaking process] (Tokyo: Tokyo Daigaku Shuppankai, 1993), 220.
[206] Geoffrey Till, "Adopting the Aircraft Carrier: The British, American and Japanese Case Studies," *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996), 212.
[207] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi,* vol. 1, 115.

airplanes in the decade before the plan was announced. However, ten years after the plan, the aircraft industry produced nearly 5,000 aircraft. Samuels also pointed out, even though the plan did not eliminate dependence on foreign technologies, it precipitated two important changes in terms of aircraft technological development: the creation of the Naval Air Arsenal and the introduction of the prototype system.[208]

Yamamoto was also instrumental in expanding the cadre of carrier pilots. Carrier pilots were considered as the elites of the elites among pilots because of highly specialized skills required for taking off from and landing on a carrier deck. Many aviators failed to pass the selection, thus only a tiny number of carrier pilots existed in the mid-1920s. However, Yamamoto, when he was vice commander of the Kasumigaura Air Group, declared that even aviators with ordinary skills should be selected as carrier pilots so that more officers would be qualified for the job.[209] Yamamoto also reorganized flight training by encouraging instrument flying. Japanese aviators at first relied heavily on their instinct and experience when flying, but he altered this style and introduced a more standardized way of training.

Finally, Yamamoto was successful in connecting his idea to operational realities. Yamamoto was a mastermind of the Pearl Harbor attack. John Potter described the Pearl Harbor operation as "…Yamamoto's daring, magnificently planned and executed attack——the greatest air operation ever seen up to this time."[210] This grandiose operational plan was a reflection of Yamamoto's own calculation of the international security environment. Through his living

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[208] Richard J. Samuels, "*Rich Nation Strong Army": National Security and the Technological Transformation of Japan* (Ithaca: Cornell University Press, 1994), 115-6.
[209] Yoshitake Miwa, "Yamamoto gensui no omoide [Reflections on Fleet Marshal Yamamoto]," *Suikosha kiji* [Naval club magazine] 41, no. 3 (September 1943): 122.
[210] John Dean Potter, *Yamamoto: The Man Who Menaced America* (New York: Viking, 1965), 120.

experience in the United States, Yamamoto clearly recognized the disparity in national power between the two countries and firmly believed that Japan should avoid a protracted war at all costs. In case of war, Yamamoto determined to seek early termination of hostility through a daring active operation in order to demoralize the United States. Therefore, he did not support the traditional defensive operation which would most likely invite a prolonged war.[211]

Instead of the conventional war plan, Yamamoto, who knew the offensive potential of aircraft carriers through his experience, planned to employ aircraft carriers for a surprise attack against the U.S. fleet in Hawaii. His intention was first revealed in his letter to Navy Minister Koshiro Oikawa dated on January 7, 1941 (drafted in late November 1940). In it, Yamamoto emphasized that the most important thing the navy had to do first was "…to fiercely attack and destroy the U.S. main fleet at the outset of the war." He believed that the strength necessary for the operation was the First and Second Carrier Divisions in order to "…launch a forced or surprise attack with all of their air strength, risking themselves on a moonlit night or at dawn."[212]

As the Japan-U.S. relations deteriorated, Yamamoto asked Takijiro Onishi, whose role will be discussed later, to draft an operational plan for the attack in January 1941. The draft plan was modified by Yamamoto and brought into the Navy General Staff by Onishi. However, the Navy General Staff considered the plan too risky and stuck to the traditional operational plan centered on a decisive engagement. In response, Yamamoto and his staff strongly insisted that the surprise attack against Hawaii was indispensable for the whole

[211] Boeicho, Boei Kenshusho, Senshishitsu, *Senshisosho: Kaigun kokugaishi* [A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 156.
[212] Isoroku Yamamoto, Letter to Navy Minister Koshiro Ogawa, January 7, 1941, in *The Pearl Harbor Papers: Inside the Japanese Plans*, ed. Donald M. Gold Stein and Katherine V. Dillon (Dulles: Brassey's, 1993), 116-117.

war plan. After intensive war gaming and detailed planning, even the commander and the staff of the First Air Fleet, which was supposed to be a main carrier force for the attack, came to be concerned about the feasibility of the surprise attack. However, Yamamoto revealed his firm determination to execute the attack and forcefully persuaded his subordinates to seriously prepare for the operation. He even threatened his resignation to push through the attack plan. As a result, all the six operational fleet carriers were employed for the attack and achieved his operational objective by defeating the U.S. fleet.

There were many myths that were created immediately after his death during the war, but available evidence points to the fact that Yamamoto demonstrated some exceptional leadership skills in the Japanese Navy. Terry Pierce concluded that Yamamoto "…coupled his visionary view of naval aviation with his political acumen in military bureaucracy to champion carrier warfare."[213] In fact, Yamamoto's contribution to the development of naval aviation was significant, particularly in terms of technological development. Although his vision was not radical enough to fundamentally change the navy's orientation, Yamamoto forced the navy to venture on the new way of warfare. This was made possible precisely because he was a battleship admiral who was promoted to one of the highest ranks in the existing hierarchy.

Leading Aviators

Although Yamamoto played a critical role in expanding the naval aviation and pushed the idea of the Pearl Harbor attack, he was not a trained aviator, thus did

[213] Terry C. Pierce, *Warfighting and Disruptive Technologies: Disguising Innovation* (London: Frank Cass, 2004), 144.

not have detailed knowledge as to how to put his theory into practice. He needed support from senior officer pilots and make best use of them in planning and conducting the attack. They were few in number, but played a critical role in materializing the new theory of war centered on aircraft carriers.

The Japanese Navy started recruiting a small number of officers as aviators in 1911, and one of the earliest officer pilots was Takijiro Onishi. Onishi, a Naval Academy Graduate. He was assigned to seaplane carrier *Wakamiya* in 1915 and started flight training next year. Onishi held many aviation posts, including assignments to seaplane carriers *Wakamiya* and *Notoro*, aircraft carriers *Hosho* and *Kaga*, and air stations in and out of Japan.

Since he received flight training, Onishi had been a strong airpower advocate and argued an aircraft-first policy. Frustrated by the navy's conservative policy emphasizing battleships, Onishi even demanded that the navy's insignia featuring an anchor be changed into something symbolizing aviation.[214] In addition, he submitted a number of opinions and proposals on aviation in both administrative and operational matters. For example, after the London Treaty was signed, Onishi, as a member of the Education Bureau of the Naval Aviation Department, submitted a policy recommendation to his superior. In it, he recommended setting up a new division specialized in aviation within the Navy General Staff since there was no operational section in charge of air operations. Also, he proposed to build as many aircraft carriers as possible under the naval treaties and increase the number of aircraft carried by them.[215]

One of the major achievements resulting from his lobbying activities was the establishment of the Kuchu Heiryoku Iryoku Kenkyukai（Air Power Study

[214] Ko Onishi Takijiro Kaigun Chujo Kankokai [The publishing association for Late Vice Admiral Takijiro Onishi], ed., *Onishi Takijiro* [Takijiro Onishi] (Tokyo: Suikokai, 1957), 38.
[215] Ibid., 38-40.

Group). When Onishi was the director of the Educational Bureau of the Naval Aviation Department, he proposed the Navy General Staff to seriously study how effective aircraft would be in ten years. At his urging, the study group was formed in June 1937. The group conducted thorough research on the offensive potential of various types of aircraft and their ordnance. In March 1938, after nine meetings over six months, the group submitted a final report to both the navy minister and the chief of the Navy General Staff. The report argued that aircraft had a potential to sink battleships and emphasized that naval aviation would become more than an auxiliary force in ten years. The report was well received by aviators and the Naval Aviation Department but not considered seriously by other branches, namely the Navy General Staff.[216]

However, Onishi originally intended to use this study group to enlighten both the operational and planning sections about aircraft, therefore the group, which attracted nearly forty senior officers, served well for his purpose. Onishi later told junior officers his belief that Japan could not match the United States by building up its naval force under the same concept centered on battleships. He went on to argue that airpower was the most economical and powerful force suitable for Japan. Based on this belief, Onishi had tirelessly lobbied to the members of the Supreme War Council and high-ranking admirals. As a result of his aggressive lobbying, Onishi believed the navy top brass could not ignore his opinion and had no choice but to set up the study group.[217]

Onishi also played an important role in translating the vision envisaged by Yamamoto into a real operation. In January 1941, Yamamoto secretly invited Onishi to ask him to study if an attack on the U.S. fleet in Hawaii was feasible. Yamamoto chose Onishi, who was not under his direct command, primarily for

[216] Nihon Kaigun Kokushi HensanIinkai, ed., *Nihon kaigun kokushi*, vol. 1, 189.
[217] Ibid., 191.

two reasons. First was that Onishi could garner support from other air-minded officers in both operational and technical aspects due to his long distinguished career in aviation. Second, Yamamoto wanted to keep his plan secret as long as he was confident enough about the feasibility of the operation, thus assigned the study to Onishi, whom he trusted most.[218] After finding serious issues in conducting the operation, Onishi opposed the idea and tried to persuade Yamamoto to call off the operation. Yamamoto did not follow his advice and decided to conduct the operation; however, Onishi's study actually contributed to the successful attack by highlighting the issues to be addressed. Also, the result of the Air Power Study Group, particularly on the effectiveness of ordnance delivered by aircraft, greatly contributed to planning the attack.[219]

During the Pacific War, Onishi served two administrative posts, including the director of the General Affairs of the Naval Aviation Department. Onishi achieved the rank of vice admiral in May 1943, was subsequently assigned to the First Air Fleet as its commander, and eventually appointed as the deputy chief of the Navy General Staff in May 1945. However, it was too late for him to launch any substantial carrier operations at that point since there was virtually no carrier force left at his disposal.

Another officer pilot who played a critical role in developing aircraft carriers was Minoru Genda. He was also a graduate of the Naval Academy graduate and trained as a fighter pilot from the very beginning of his career. He had been first assigned to the Kasumigaura Air Group for initial training and later to the Yokosuka Air Group. In Yokosuka, Genda practiced launching and landing aircraft on an aircraft carrier and was subsequently assigned to a series

[218] Yamamoto later revealed his intention to Shigeru Fukutome, his chief of staff. Ko Onishi Takijiro Kaigun Chujo Kankokai, ed., *Onishi Takijiro*, 27-28.
[219] Minoru Genda, *Shinjuwan sakusen kaikoroku* [Recollection of the Pearl Harbor operation] (Tokyo: Bungei Shunjusha, 1998), 75-78.

of aviation-related posts including the aircraft carriers *Akagi* and *Ryujo* as a fighter pilot. When Genda was assigned to the Yokosuka Air Group in 1934, he worked with Onishi who was vice commander of the group.

Same as Onishi, Genda was also known as a radical airpower advocate who insisted that aircraft should take precedence over battleships. In 1936, when he was a student at the Naval Staff College, Genda wrote a controversial paper for one of his class assignments. In it, he argued that the navy should reorganize its force and put land-based and carrier air forces supported by submarines as its core. He went on to contend that while destroyers and cruisers, which could support the forementioned forces, would be maintained at a minimum necessary level; other forces, namely battleships, should be scrapped. His argument was so unconventional that one of his fellow students even suspected him as going out of mind.[220]

He also pushed his idea to form the First Air Fleet which consisted of six fleet carriers for concentrated offensive power. From December 1938 to September 1940, Genda was dispatched to Britain as assistant military attaché. There, he learned the effectiveness of concentrated air power in air raids conducted by the German Air Force. At that time, the doctrine emphasizing dispersed deployment of aircraft carriers was dominant within the Japanese Navy. In October 1940, after returning from Britain, Genda became a staff officer to the First Air Fleet which would later be the main force for the attack. Based on his experience, he strongly advocated for concentrating on aircraft carriers, which was adopted for fleet exercises in 1941 and eventually for the Pearl Harbor attack and subsequent carrier operations. Because of his radical vision and contribution to the operational development of aircraft carriers, Max Boot

[220] Minoru Genda, *Kaigun kokutai, hasshin* [The naval aviation group, take off] (Tokyo: Bungei Shunjusha, 1997), 180-181.

dubbed Genda a "Japanese Billy Mitchell."[221]

Genda was also instrumental in drawing an operational plan for the Pearl Harbor attack. In February 1941, while he was still a staff officer to the First Air Fleet, Genda was asked by Onishi, who had also been consulted by Isoroku Yamamoto, to study the feasibility of attacking the U.S. fleet in Hawaii. Since he had worked under Onishi, Genda personally knew him well and admired his leadership and personality. Genda accepted Onishi's request and conducted a detailed study for the attack. Genda's study emphasized the importance of torpedoing in shallow water and later found a technological remedy to it, which solved one of the critical operational challenges Onishi had identified. Genda did not participate in the attack by flying but was directly involved in planning and directing the operation as a staff officer. In spite of his junior rank in the headquarters, his opinion was well regarded by senior leaders, including Vice Admiral Chuichi Nagumo, the commander of the First Air Fleet, who did not have any prior flight experience.

Onishi and Genda contributed greatly to translate the theory of victory proposed by Isoroku Yamamoto into practice. Without their operational skills, the theory could not have been operationalized so as to make the Pearl Harbor attack possible. However, those two officers, along with many other officer pilots, were too young to occupy more important positions during much of the interwar period. By the time of the Pacific War, Onishi achieved the rank of rear admiral and was assigned as a chief of staff to the Eleventh Air Fleet, which was in charge of air operations conducted mainly by land-based aircraft in Southeast Asia. Genda played a key role in planning the Pearl Harbor attack, but he was promoted to lieutenant commander in 1940, just a year before the attack, and eventually

[221] Max Boot, *War Made New: Weapons, Warriors, and the Making of the Modern World* (New York: Gotham Books, 2006), 260.

attained the rank of captain in October 1945. Both Onishi and Genda were well-connected to key individuals, namely Isoroku Yamamoto and often exerted more influence than other officers with the same rank could have. However, given the hierarchical nature of their institution and the lack of civilian intervention in the Japanese political system, it was very difficult for junior officers like them to force the conservative navy to accept their innovative ideas through the formal chain of command.

Conclusion

As both the civilian control and intraservice models predict, only a few senior officers envisioned naval aviation as a promising weapon platform, which is well documented through personal memoirs, official history, and even popular books. However, the way they promoted their vision was different from that of the civilian control model. Because of the different structure of civil-military relations, both innovators and visionaries lobbied to their superiors within, rather than political leaders outside. Those officers contributed first to create a fertile conceptual ground for naval aviation to build on. In particular, Eisuke Yamamoto, the earliest visionary, who did not have any firsthand flight experience, studied aircraft by himself and advocated the potential of airpower. As discussed, Yamamoto directly appealed to Navy Minister Saito when he tried to promote his cause.

Kaneko played a critical role in demonstrating the feasibility of the early vision laid out by Eisuke Yamamoto. Kaneko was one of the first aviators who demonstrated the potential of aircraft both in wartime and peacetime. He was also an airpower advocate and used the same lobbying technique as Yamamoto

did when he wrote directly to the navy minister for recommending the early establishment of an air group in Japan. Through his firsthand experience acquired in foreign countries and on the field, Kaneko provided critical technological and operational information for the development of the carrier force. Although he became the first pilot who attained a flag officer rank, Kaneko did not serve long enough to influence the navy's overall aviation policy.

Arguably, the most important individual in materializing the RMA was Isoroku Yamamoto. He was not an aviator by training but made every effort to understand its potential through his firsthand experience during his command assignments both at sea and shore. As a superb bureaucrat, Yamamoto pushed the development of advanced aircraft at the Naval Aviation Department and lobbied to his superiors for expanding naval aviation. His lobbying was more successful than others primarily because he was a mainstream officer who served such important posts as vice navy minister and the commander in chief of the Combined Fleet. Yamamoto's vision was certainly not radical enough to argue for replacing battleships with aircraft carriers as capital ships. However, he clearly recognized the dire international security environment and sought a way to counter the perceived inferiority imposed by the Naval Treaties. For this sake, Yamamoto adopted a radical operational plan which resulted in the Pearl Harbor attack. In order to connect his vision to operational realities, Yamamoto surrounded himself with capable and dedicated aviators and entrusted operational planning to them.

Lastly, there were practitioners who translated the visionary's idea into a concrete operational plan and actually executed it. Onishi and Genda were junior officer pilots during most of the interwar period, but they had disproportionate authority and influence to their rank in the area of aviation because of their

firsthand flying experience. They were well connected among themselves and with senior leaders beyond their formal chain of command. Through the informal network, they were secretly consulted by Isoroku Yamamoto and provided detailed expert opinion that could not be obtained from people in his headquarters.

Certainly, there were other individuals who contributed the development of naval aviation by proposing new ideas. For example, Shigeyoshi Inoue, then the director of the Naval Aviation Department, submitted a provocative naval build-up plan emphasizing the use of land-based aircraft and submarines to intercept the U.S. fleet in January 1941. Inoue was a gunnery officer and battleship captain, but he was known for unconventional thinking. Although he believed land-based aircraft were more effective than aircraft carriers, Inoue insisted in the report that the navy stop building the *Yamato*-class battleships and be changed into an "air navy." He was considered so radical that he was moved to a less important command post shortly before the Pacific War. Another air-minded admiral, Jizaburo Ozawa played a key role in increasing the offensive potential of the carrier force. Ozawa was not an aviator or a successful battleship captain but was assigned to the commander of the First Air Flotilla, with fleet carrier *Akagi* as its flag ship, in 1939. At that time, three operational fleet carriers were divided into two flotillas attached to the First and Second Fleets comprising battleships. However, in June 1940, Ozawa submitted a report arguing all the aircraft carriers should be commanded by a single commander so that the fleet could conduct unified training in peacetime and launch concentrated aerial attacks in wartime. He initially submitted the report to the commanders of the Combined Fleet and the Second Fleet, but they strongly opposed it because they believed carriers should belong to each fleet to support

battleships. Ozawa subsequently sent the report directly to the navy minister to garner support for his idea. His plan, which was totally in line with aforementioned Genda's idea, was eventually approved in April 1941 and demonstrated its effectiveness through the Pearl Harbor attack. However, despite their innovative ideas, both Inoue and Ozawa had limited influence on overall aviation policy due to their short terms of positions directly related to naval aviation during the interwar period.

One of the major obstacles which kept visionary leaders from promoting their novel ideas in the Japanese Navy was their relatively short terms of office. For example, there were twelve changes of command at the Naval Aviation Department since its establishment in April 1927 until the beginning of the Pacific War, three of which were co-assignments with other posts, including the commander of the Combined Fleet. The average term of assignment was approximately fourteen months, which was too short to initiate significant top-down changes in policy. Eisuke Yamamoto served less than two years as its first director and Isoroku Yamamoto served twice, whose terms of assignment were less than nineteen months in total.[222]

This was clearly different from the case of the U.S. Navy, where Moffett held the same position, director of the Bureau of Aeronautics, for more than ten years. While his case was very unusual even for the U.S. Navy since the usual term of assignment was two to three years, there were only four chiefs including Moffett from its establishment in 1921 to the outbreak of the Pacific War. In particular, the long tenure enabled Moffett to translate his vision into policy and exert long-term influence over the U.S. Navy's overall aviation policy. Therefore, Japanese leaders exercised much less personal influence over aviation policy

[222] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi* [A history of the Japanese Navy], vol. 7 (Tokyo: Daiichi Hoki Shuppan, 1995), 69.

than their U.S. counterparts, and it can be argued that the development of aircraft carriers by the Japanese Navy was more to do with other factors than individual leadership.

In addition, Moffett exerted his influence through his organizational base, the Bureau of Aeronautics. The Japanese Navy also followed suit and established a similar institution, the Naval Aviation Department, in 1927, where Eisuke Yamamoto and Isoroku Yamamoto served as its head, despite their short terms of office. While Hone, Friedman and Mandeles acknowledge that individuals do matter, they also argue that "…what individuals could do was constrained by the positions open to them in the organizations that existed at the time."[223] This was clearly contrasted with the case of the British Navy where no such centralized organization for naval aviation existed. Even worse, the British Navy was deprived of a fundamental organizational base by the independence of the Royal Air Force, which subsumed much of naval aviation and put it under "Dual Control."[224] There were certainly some visionaries within the British Navy that built the first aircraft carrier during the First World War and came out of the war as a leader in carrier aviation. Hone, Friedman, and Mandeles identify Captain Murray Suter, who considered aircraft carriers as an independent offensive force as early as 1914. Also, Rear Admiral R. G. H. Henderson is seen as an outstanding leader of carrier aviation.[225] However, they did not play an equivalent role in expanding its carrier forces during the interwar period. Till attributed this to the difference of administrative system between the United States and Japan on the one hand and Britain on the other.[226]

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[223] Hone, Friedman, and Mandeles, *American and British Aircraft Carrier Development*, 153.
[224] Till, "Adopting the Aircraft Carrier," 207-209.
[225] Ibid., 152. Stephen Roskill also calls Henderson as "one of the most ardent advocates of naval aviation." Stephen Roskill, *Naval Policy between the Wars,* vol. 1*, The Period of Anglo-American Antagonism, 1919-1929* (London: Collins, 1968), 50.
[226] Till, "Adopting the Aircraft Carrier," 226 and Geoffrey Till, *Air Power and the Royal Navy, 1914-1945: A*

Thus, in order to fully explain the development of carrier forces by the Japanese Navy, another level of analysis which centers on institutions has to be employed, even when taking a full account of individual roles played by the innovative and visionary leaders.

Historical Survey (London: Jane's Publishing, 1979), 191-201.

Chapter 4

The Organizational Foundation of Carrier Aviation

Only a handful of visionaries would have difficulty changing military organizations, particularly large ones, due to their highly hierarchical and bureaucratic nature. Even if a small number of influential senior officers promote a particular vision, there has to be certain organizational acceptance by members of the organization to institutionalize and operationalize it. However, there are many functional organizations within a service, and they compete with each other over scarce resources, namely budget and personnel. In particular, for newly created combat arms like naval aircraft, resistance from established organizations would be strong because their creation would just add one more actor to intensify competition. This is particularly true for naval aviation that was about to take root during the time of fiscal austerity after the First World War.

Both intraservice and interservice rivalries worked against the establishment of naval aviation as an established combat arm. However, intraservice competition is not as severe as interservice rivalry because, as Samuel Huntington points out, "…officers generally put loyalty to the service ahead of loyalty to either a subordinate unit of the service or to a supraservice function."[227] He based his argument on the fact that officers can be transferred easily across different functional organizations within a service. However, this is not the case with naval aviation, where totally different skill sets are required for

[227] Samuel Huntington, *The Common Defense: Strategic Programs in National Politics* (New York: Columbia University Press, 1961), 407.

pilots than for surface ship or submarine officers. Accordingly, as Huntington also acknowledges that naval officers cannot easily convert to air force officers, it would be quite difficult to transfer aviators to sailors and vice versa, even within the same navy. As a result, in the case of naval aviation, it is safe to assume that intraservice rivalry is more intense than other functional organizations within the navy.

In competition among functional organizations, established organizations have an advantage over newly created ones since, as Daniel Drezner rightly points out, older ones have "…more resources, information, skill, and expertise in the bureaucratic trenches."[228] Every functional organization has its own members who represent its organizational interests. In addition, it is they who request personnel and budget for the organization they belong, which is critical for both organizational survival and expansion. Therefore, for naval aviation to establish itself and expand further, it was critical to have an organizational standing within the navy.

In so doing, the task would be made much easier if there is a specialized organization, or an "organizational home," focusing on a new combat arm to coordinate among different branches to make the policy effective. James Wilson suggests that a specialized subunit that will take on the new tasks would often be required for innovation. Wilson counts the Bureau of Aeronautics of the U.S. Navy as one of those subunits.[229] Hone, Friedman, and Mandeles gave four reasons why the Bureau of Aeronautics was important in the U.S. case.[230] First, they point to the fact that the Bureau represented the interests and needs of

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[228] Daniel W. Drezner, "Ideas, Bureaucratic Politics, and the Crafting of Foreign Policy," *American Journal of Political Science* 44, no. 4 (October 2000), 735.
[229] James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York: Basic Books, 1989), 231.
[230] Thomas C. Hone, Norman Friedman and Mark D. Mandeles, *American and British Aircraft Carrier Development, 1919-1941* (Annapolis: Naval Institute Press, 1999), 190.

naval aviation at the highest level of the U.S. political system and military bureaucracy. Second, they argue that it offered an alternative to the land-based establishment, namely the Army Air Force. Third, the Bureau provided relevant data as to the progress and potential of naval aviation for experimentation and simulation. Lastly, the Bureau gave naval aviation technology equal status accorded to other existing branches like naval ordnance and engineering.

The establishment of a centralized organization has three distinctive merits for innovation. First, a centralized organization gives a new combat arm an institutional status with which newcomers could expect a fair share of budget and personnel along with other established branches. As is often the case with any novel combat arm, they do not nicely fit into any established branches of the armed forces. Their authority and jurisdiction are usually divided by different branches. Accordingly, they usually lack organizational representation, thus their bargaining power for budget and personnel tends to be weak. However, once the centralized organization is established, it gives a formal organizational footing for requesting additional budget and personnel through an established communication channel.

Second, a centralized organization can facilitate development of a new combat arm by combining new and existing technologies and initiating specific research and development programs. There exist some existing technologies which can be put to great use for a new combat arm, but others have to be developed from scratch. A centralized organization can give clear direction to research and development efforts by establishing a technical branch or attracting specialists from other relevant technical fields.

Third, a centralized organization can provide coherence and persistence to policy by constantly bringing people, outsiders, and newcomers alike, into it.

Visionaries can develop and propagate new ideas, but they cannot stay forever within the organizations to which they belong. They need followers to perpetuate their ideas. In order for new ideas to be materialized, there must be people who can put the new theories into practice and make them institutionalized.

As the intraservice model suggests, peacetime innovation is made possible when senior officers create a new promotion pathway for junior officers who practice a new way of war. However, their policy has to have organizational support so that the pathway will become permanent. What separated the Japanese and U.S. navies from their British counterpart was that they each created a specialized bureau or department focusing on naval aviation. Millett concludes that the U.S. and Japanese Navies "…produced bureaucratic homes and special opportunities for aviators."[231] However, previous studies have not shed enough light on the Japanese organizational developments.

With these considerations in mind, this chapter first examines the organizational and administrative developments within the Japanese Navy in the interwar period. In particular, how the visionary leaders detailed in Chapter 2 recognized the need for centralization and argued for establishing a central agency for naval aviation will be analyzed. As a result of the internal debates, the Naval Aviation Department was eventually established, which induced further organizational developments and enhanced aviators' standing inside the Japanese Navy. This chapter will also demonstrate that the organizational innovation centered on the Naval Aviation Department was triggered not by interservice rivalry or civilian intervention but by an internal ideological struggle among naval officers.

In parallel with the administrative innovation, coordination of

[231] Allan R. Millett, "Patterns of Military Innovation," in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996), 355.

aeronautical research and development will also be examined in this chapter. Since the Japanese Navy hastily introduced aircraft after the First World War in order to catch up with the major powers, close coordination among research, prototyping and testing was critical. This chapter will focus on the organizational arrangements for research and development of aircraft within the Navy. Same as Britain and the United States, there were arguments for a unified or independent air force, but this chapter will show that the debates did not have critical influence on the process of innovation in the Japanese case. Lastly, this chapter will focus on how the Japanese Navy organizationally tested the effectiveness of aircraft carriers. During the interwar period, no country had a clear idea as to what kind of carriers and aircraft would be needed for effective carrier operations. In order to explore the potential of aircraft carriers, rigorous experimentation through close coordination among operational, administrative, and research sides was critical. The organizational arrangements that made possible positive feedbacks among the three sides will be discussed.

Need for Centralization

When the Japanese Navy first introduced small numbers of aircraft, there was no single administrative body for naval aviation. That was because naval aviation was a small branch in the beginning and there was no urgent need for such a body. Aviation first came under the general control of the Naval Affairs Bureau of the Navy Ministry. Other functional areas were scattered across the Navy. For example, educational and training matters fell within the Naval Education Department, while the Naval Technical Department, which was the central agency for the design and construction of warships, dealt with equipment

and technological matters.[232]

However, with the rapid technological development of aircraft and the expansion of naval aviation during the First World War, there was an increasing voice within the navy to argue for a unified and independent organization where aviation policy would be coordinated effectively. For example, Rear Admiral Kiyokazu Abo, who was stationed in Britain from 1913 to 1915 and traveled Europe for research, submitted a policy recommendation for establishing a centralized organization for submarines and aircraft in August 1917. Given the rapid advancement of both platforms, Abo thought it impossible for the navy's existing organization to keep up with the pace of development. Accordingly, Abo argued for a centralized institution in charge of research and policy on aircraft and submarines.[233]

Against this backdrop, the navy agreed to Abo's opinion and decided to set up a study group for evaluating the feasibility of his plan. As a result, Rinji Seunsuikan Kokuki Chosa Iinkai (the Provisional Research Committee on Submarines and Aircraft) was established in November 1917 in order to conduct research on appropriate organizational arrangements on research and planning for the new platforms. The committee, led by a flag rank officer and supported by two senior officers assigned fulltime for aviation matters, existed until July 1919 when a tentative aviation department was created within the Naval Affairs Bureau. The committee submitted two important recommendations on naval aviation. First, the committee pointed out the necessity to create a system to recruit junior aviators between the ages of fifteen and seventeen, which will be discussed in detail in the next chapter. Second, and more important, the

[232] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics and Technology in the Imperial Japanese Navy 1887-1941* (Annapolis: Naval Institute Press, 1997), 207.
[233] Nihon Kaigun Kokushi HensanIinkai, *Nihon kaigun kokushi* [The history of Japanese naval aviation], vol. 3 (Tokyo: Jiji Tsushinsha, 1969), 20.

committee recommended setting up a central organization of naval aviation. In June 1919, Rear Admiral Junichi Matsumura, the chairman of the committee, submitted a report to the Navy Minister arguing for the establishment of a naval aviation department. Matsumura pointed out that aircraft completely differed from surface ships and other naval weapon platforms, thus requiring a specialized institution to coordinate education, planning, and procurement. He warned that the traditional system of the Navy would retard the development of aircraft and negatively affect naval aviation.

Around the same time of the study conducted by the Provisional Committee, there were others who advocated a centralized organization for naval aviation. In particular, officers who had traveled to Europe and gained first-hand information advocated for such an organization. Rear Admiral Seifu Yoshida, commander of the Yokosuka Air Group, was dispatched to Europe and submitted a report suggesting the establishment of a bureau of aeronautics or aviation department. Even more vocal was Lieutenant Commander Takamaro Ozeki who was also sent to Europe in 1919 and subsequently submitted a report urging the establishment of a naval aviation department. In it, Ozeki based his argument on his belief that all the authority of planning and execution should be concentrated on a single flag officer so that quick decisions could be made. He considered it better to make such an organization independent in order to give it more authority and discretion.[234]

Ozeki also submitted his policy recommendation to Rear Admiral Kenji Ide, director of the powerful Naval Affairs Bureau. He criticized the fact that there was no centralized control over aviators, thus no unified policy on aviation

[234] Takamaro Ozeki, "Ippan seido ni kansuru jiko [Matters concerning the general system]," June 1919, Kaigunsho kobun biko [Official document files of the Ministry of the Navy], 1919, vol. 40, Koku [Aviation] 5 end, Japan Center for Asian Historical Records, Ref. C08021355900.

matters. In order to change this situation, Ozeki argued, a responsible organization should first make decisions on which other branches based their judgments. He even insisted that there be a committee to resolve conflicts among different branches over aviation matters. Ide critically responded to Ozeki's recommendation by noting that there should be an established opinion within the Naval Affairs Bureau in the first place to which other branches give consent. The director absolutely opposed the idea to establish such a committee.

However, the Naval Affairs Bureau strongly opposed such an organization, primarily because its officers believed that naval aviation might become independent from the navy if they had treated it differently from other branches. Thus, they sought to develop naval aviation in tandem with other weapons, such as the gunnery and torpedoes of surface ships, and feared that creation of a specialized administrative body might impede the harmonized development of naval aviation as one of the navy's branches.[235]

In this tentative section, there were at least a captain as its head and two officers with the ranks of commander and lieutenant commander. In June 1921, the department was reorganized into the Third Division in charge of aviation matters, including aircraft and facilities for air groups. This reorganization was intended to put the tentative department on a more permanent footing.[236] However, in April 1923, after the Washington Naval Treaty was signed, the Third Division was dissolved and its authority was divided by the First and Second Divisions. This move was a result of the naval disarmament and was considered, at that point, advantageous for naval aviation to be subsumed by the more powerful divisions within the Naval Affairs Bureau in terms of budget and

[235] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 23 and Torao Kuwabara, *Kaigun koku kaisoroku, soso hen* [Recollections of naval aviation, formative years] (Tokyo: Koku Shimbunsha, 1964), 153.
[236] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 25.

resource allocation.[237]

Despite this apparent setback, the need for centralized administration of naval aviation was still advocated by some notable admirals. Among those, Rear Admiral Yuji Tajiri, commander of the Yokosuka Air Group, submitted a proposal urging the unification of aviation related institutions and the establishment of a flight school in the beginning of 1922. He emphasized the shortcomings of the existing system and argued for the establishment of a naval aviation department in charge of administration, education, and procurement. His opinion attracted renewed attention within the navy, which led the Navy Affairs Bureau to closely study the feasibility. However, the bureau concluded that it was not advisable to reorganize the navy's central institutions in order to avoid any disturbances in this critical moment of establishing the foundation.[238]

In June 1922, Abo, achieving the rank of vice admiral by then, submitted a report again after taking a study trip to Europe. In it, he reiterated the need for a bureau of aeronautics within the Navy Ministry and aviation staff officers in the fleet and naval bases. Abo came to recognize the necessity more strongly after witnessing the European and American systems in person.[239]

As these individual initiatives suggest, there emerged an increasing perception that centralized administration on aviation matters was critical to keep pace with the development of aviation by major countries. In particular, the rapid development of naval aviation centered on aircraft carriers during the First World War made those officers aware of the need for a centralized organization. However, the establishment of the Naval Aviation Department was delayed at least six years from the establishment of the Bureaus of Aeronautics in 1921 and

[237] Ibid., 26.
[238] Ibid., 40.
[239] Ibid., 40-41.

nine years from the independence of the Royal Air Force in 1918. Torao Kuwabara, an air-minded admiral, attributed this delay to Admiral Kenji Ide, who opposed giving independent stature for naval aviation. Ide eventually became Vice Navy Minister in September 1920 and kept the post until May 1923, which indicates that his personal influence prevented the establishment of the Naval Aviation Department. However, the fact that it took another four years to establish the department after his departure underscores that Ide's idea was institutional rather than personal.

Despite the many policy recommendations submitted by air-minded officers, the Naval Affairs Bureau was very slow to accept the establishment of the Naval Aviation Department. However, practical considerations helped to overcome the organizational resistance. In particular, the number of air groups was increased and two battle-cruisers were to be converted into aircraft carriers under the Washington Naval Treaty. Also, new aviation-related institutions, including aircraft manufacturing and testing facilities, were established by the early 1920s. These new developments required detailed coordination and directives, which in turn increased administrative burden on the small number of officers in charge of naval aviation scattered across different branches in the Navy Ministry. As a result, the need for centralization was also clearly recognized from the practical administrative point of view.[240]

Naval Aviation Department

The Naval Aviation Department eventually came into existence under the Navy Minister in April 1927. The Naval Aviation Department had administrative

[240] Ibid., 42.

control over weapons and facilities related to naval aviation. It consisted of three bureaus: administration, technology, and education and training. What set it apart from its surface ship counterpart was that the Department contained its own education and training bureau and a powerful administration bureau. The primary reason why the aviation department dealt with educational and training matters was that the navy thought it critical to coordinate technology, equipment, and operations in a coordinated manner in the rapidly developing field of naval aviation.[241] With these two bureaus, the Naval Aviation Department could exercise administrative control over almost all areas of naval aviation except operational matters, which were controlled by the Navy General Staff.

While research and development of aerial weapons was overseen by the Naval Aviation Department, other weapons, including machine guns, torpedoes, and radio communication devices, were still under the jurisdiction of the Navy Technical Department, thus the size of the Naval Aviation Department was rather small at the beginning. However, the Naval Aviation Department expanded steadily throughout the interwar period. It started out with Vice Admiral Eisuke Yamamoto as its head and three bureaus headed by two rear admirals and one captain in April 1927. After the London Naval Treaty was signed, naval aviation was rapidly expanded in both qualitative and quantitative terms, which demanded more personnel for administrative and technical matters within the Department. In April 1933, two divisions were created under the Administrative Bureau. In July 1937, one more division was added to the Administrative Bureau and two divisions were formed under the Technical Bureau. With these expansions, when Vice Admiral Isoroku Yamamoto headed

[241] Boeicho, Boei Kenshusho, Senshishitsu [Office of Military History, National Institute for Defense Studies, Japan Defense Agency] (hereafter NIDS), *Senshisosho: Kaigun koku gaishi* [A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 8.

the Department in 1936, it had two rear admirals and six captains and one commander. In April 1937, the Logistic Bureau was newly created by upgrading one division of the Administrative Bureau in order to deal with the increasing logistical demands for air operations in China, and another division focusing on aerial engines was added to the Technical Bureau. After this reorganization, the Department maintained the same organizational structure until the outbreak of the Pacific War, and there were two rear admirals, seven captains, and two commanders, in addition to its head.[242]

As these figures show, the successive expansions of the Naval Aviation Department during the interwar period created important posts for aviators. These posts also played a critical role in educating and training non-aviator officers who occupied them. As a newly created combat arm, there were few officer pilots during much of the interwar period. Accordingly, the Navy had to fill aviation posts, including captains of aircraft carriers and commanders of air stations, with officers from other branches. The Naval Aviation Department served as a rotating hub of their career paths. A number of notable officers had multiple tours to the Department including Isoroku Yamamoto and Takijiro Onishi.[243]

The creation of the Naval Aviation Department had significant influence over the development of naval aviation. As Admiral Shigeyoshi Inoue, an air-minded admiral, later pointed out, it was the establishment of the Naval Aviation Department that brought about the success of naval aviation in the Sino-

[242] During the Pacific War, the Department was further expanded by adding new technical sections in charge of various aerial weapons and equipment. By the final reorganization made in March 1945, the Department eventually had 10 bureaus and 22 divisions with 9 rear admirals and 21 captains under Vice Admiral Michitaro Totsuka. Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 73.
[243] As discussed in the previous chapter, Yamamoto served once as bureau chief, twice as department head. Onishi did four tours to the Department including twice as bureau chief.

Japanese War and the Pacific War.[244] Geoffrey Till also reached the same conclusion: "…the revolution in naval administration which began in 1927 explains the impressive surge in the development of Japanese naval aviation from the mid-1930s."[245]

This development in the Japanese Navy paralleled the creation of the Bureau of Aeronautics in the U.S. Navy in 1921, which was the primary agency for U.S. carrier development. However, there were significant differences between the two institutions. First, the Bureau of Aeronautics had broader responsibility than that of the Naval Aviation Department. The responsibility included design and construction of aircraft, management of personnel, development of aerial operations at sea, and the provision of funding for naval aviation.[246] In contrast, the Naval Aviation Department did not deal with operational matters and had limited responsibility in personnel management.

Second, even though the naval aviation department influential senior leaders from time to time, the Bureau of Aeronautics had a single influential leader, Rear Admiral William Moffett. As discussed in the previous chapter, Moffett was the first chief of the Bureau of Aeronautics and kept the position until his death in 1933. His case was unusual for the U.S. Navy, where the term of assignments was normally two to three years. If the term of his assignment for the post was four years, it might have been difficult even for Moffett to exercise significant influence over the course of policy within a single term. For example, in securing appropriations for naval aviation, he and his staff had to begin their work more than a year before each fiscal year. In theory, he could execute the budget he had planned for only two years within his single term of assignment.

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[244] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 44.
[245] Geoffrey Till, "Adopting the Aircraft Carrier: The British, American and Japanese Case Studies," in Murray and Millett, 213.
[246] Ibid., 210.

Furthermore, the process itself was arduous and time-consuming and required some years for him to master the political activities necessary to secure greater funding.[247] In contrast, there were eighteen changes of command in the Japanese Naval Aviation Department until it was abolished in November 1945, and the average term of assignment was approximately fourteen months, which was too short to initiate significant top-down changes in policy, even with the Naval Aviation Department as an organizational base.

Even though the Naval Aviation Department was less influential than the Bureau of Aeronautics, it served as a central agency that contributed to the development of naval aviation. It also contrasted greatly with the British case, where the navy shared responsibility on naval aviation with the Royal Air Force, which hindered the effective development of carrier aviation.[248] One historian has concluded that the Japanese case "…does much to justify the view that the bureaucratic/administrative environment is of decisive importance in the evolution of military capability and the process of innovation." [249]

Coordinated Technical Research

Among many factors which brought about initial success during the Pacific War, rapid technological development in naval aviation made a significant contribution. As Allan Millett has pointed out, in "…the strictest technological terms, the all-round leader was probably the Imperial Japanese Navy, whose officers and engineers pursued technical excellence with a single–mindedness

[247] William F. Trimple, *Admiral William A. Moffett: Architect of Naval Aviation* (Washington: Smithsonian Institution Press, 1994), 167-168.
[248] For this point, see Geoffrey Till, *Air Power and the Royal Navy, 1914-1945: A Historical Survey* (London: Jane's Publishing, 1979), 116-117.
[249] Till, "Adopting the Aircraft Carrier," 213.

that amazed Europeans."[250] In most areas of naval technology, the Japanese learned critical technologies from Britain, Germany, and the United States throughout the interwar period. Naval aviation was no exception. However, the Japanese Navy managed to develop indigenous fighters and bombers of considerable sophistication by the mid-1930s. In this respect, the navy's administrative policy was effective in promoting research and development in naval aviation.[251]

Again, organizational innovation pushed the pace of technological development. In particular, the establishment of the Kugisho (Naval Air Arsenal) was critical for the rapid development of aviation technology. The London Naval Treaty of 1930 led the Japanese Navy to focus on naval aviation. As a way to enhance naval aviation, the Navy decided to consolidate research and testing institutions, and the Kugisho was established in April 1932. Before the Kugisho, the main research body was the Aeronautical Research Bureau of the Navy Technical Research Institute, which was established by the Navy Technical Department. The Bureau had been originally set up in Tokyo but was moved to Kasumigaura after the Great Kanto Earthquake of 1923. However, there were two branches in charge of manufacturing airframes and testing engines within the Yokosuka Arsenal, which was about one hundred miles from the Bureau. The fact that the Bureau was under the Navy Technical Department frustrated the Naval Aviation Department, since the latter did not have direct control of research and development of aircraft. Also, the separation of research and development on one hand and prototyping and testing on the other was not suitable for efficient coordination between the two sides.

The Kugisho had eight bureaus in charge of administration, science,

[250] Millett, "Patterns of Military Innovation," 347.
[251] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 33.

aircraft, engines, weapons, aircraft testing, accounting, and medicine respectively. The first head of the Kugisho was Rear Admiral Yuriichi Edahara, and there were two rear admirals, four captains, one commander under his command. It was duly expanded by adding new bureaus and establishing a new branch arsenal before the Pacific War. The Kugisho was located in Oppama, close to Yokosuka, where the Yokosuka Air Group in charge of testing operational concepts was stationed. The physical proximity enabled close cooperation between the operational, research, and testing sides. The Kugisho was officially under the jurisdiction of the Yokosuka Naval Base, but it received technology-related directives from the heads of the Naval Aviation Department and the Naval Technical Department. In terms of aviation technology, however, the Kugisho was directed mainly by the head of the Naval Aviation Department, thus effective coordination on aeronautical research and development between the two institutions was made possible.[252]

Moreover, the Kugisho was instrumental in developing prototypes of aircraft and providing directions to private manufacturers. It was further assisted by the so-called the Kyoso Shisaku Seido (Prototypes System), which was one of the key systems that facilitated cooperation among the Navy, aviation industry, and government. This system aimed at extending and leveling the technological and research capability among aircraft manufacturing companies. Under this system, if one company met the requirement from the Navy and won the competition, the other companies, which lost the competition, could help produce the aircraft with parts such as engines. Mark Peattie pointed out this system was "…a revolutionary step in the way the aircraft industry came to

[252] NIDS, *Kaigun koku gaishi*, 66.

compete, integrate components, and build aircraft."[253] He also argues that this system was a "…very Japanese approach to procurement…" because it did not exclude the losers in design competition.[254]

The development of capable aircraft had a positive impact on the expansion of naval aviation. By demonstrating the effectiveness of naval aviation with high-performance aircraft, air-minded officers succeeded in expanding their influence throughout the navy. This was contrary to the British case where the British Navy failed to develop capable aircraft because of dual control over naval aviation with the British Air Force. After naval aviation had been integrated into the single air force, the Air Force was in charge of research and development of naval aircraft. It gave higher priority to the development of land-based fighters and bombers than naval aircraft, such as torpedo bombers or dive bombers. As a result of this system, British naval aircraft were distinctly inferior to American and Japanese ones by the late 1930s, which "…paradoxically justified the low expectations that the skeptical had of naval aviation in the first place."[255] On the other hand, the Japanese Navy decided to maintain its own aviation and opposed any plans to create a separate air force, reasons for which will be discussed in the next section. Consequently, the development of capable naval aircraft made the Japanese Navy aware of the increasing effectiveness of aircraft and contributed to the rapid expansion of naval aviation in the 1930s.

Debating on a Unified Air Force

During the First World War, aircraft were initially primarily employed for

[253] Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2001), 28.
[254] Ibid.
[255] Till, "Adopting the Aircraft Carrier," 209.

reconnaissance but were increasingly used for land-attack and air-to-air operations as the war went on. The Japanese Navy and Army also used aircraft for the Tsingtao campaign against Germany and gained hard-earned operational experience. However, European countries and the United States expanded their air power in a very rapid manner and made far more progress in both quantitative and qualitative terms than Japan.

At the outset of the war, the British Navy had 93 aircraft, of which about 50 were operational. However, it came out with 55,000 officers and 3,000 land and seaplanes when the British Air Force subsumed the naval aviation in 1918.[256] The U.S. Navy did not yet have a formal organization of naval aviation when the United States declared war in April 1917. At the time, the U.S. Navy had 48 officers and 239 enlisted personnel with 54 training aircraft.[257] However, after 19 months, U.S. naval aviation "…had grown to a force of 6,716 officers and 30,693 enlisted men in Navy units and 282 officers and 2,180 men in Marine Corps units, with 2,107 aircraft, 15 airships, and 215 kites and free balloons on hand."[258]

Compared to Britain and the United States, Japan underwent a totally different process during the First World War. When Japan declared war against Germany in August 1914, the Navy had 15 officer pilots and 12 aircraft, of which five were domestically manufactured.[259] In 1916, the Navy planned to set up two air groups in addition to one training group, which was the first official plan to establish permanent air groups. At the request of the Navy General Staff, each air group was organized to have four operational aircraft with two aircraft and four engines in reserve. However, even when the build-up plan was realized at

[256] Till, *Air Power and the Royal Navy*, 85.
[257] Adrian O. Van Wyen, *Naval Aviation in World War I* (Washington: Chief of Naval Operations, 1969), 8.
[258] Ibid., 89.
[259] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 4.

the end of the First World War, the Navy had less than fifty operational aircraft, mostly composed of seaplanes. This build-up plan was later expanded by adding five air groups in 1918 and nine air groups in 1920. The final plan to set up 17 air groups was delayed due to the Washington Naval Treaty and the Great Kanto Earthquake and finally achieved in November 1931.[260] In addition, the Navy did not start building its first aircraft carrier, *Hosho*, until the end of 1919 whereas the British Navy operated at least six seaplane or aircraft carriers during the war.[261]

In contrast to the hurried wartime expansion of both countries, Japan, in a sense, was in an objective position to wait and see to decide how to proceed with its own naval aviation since it did not suffer much from the war.[262] However, at the same time, it was apparent that the Navy was left far behind from the rapid pace of aeronautical development in Europe and the United States. Recognizing the changing environment and its backwardness in aviation, there was an increasing voice arguing for an independent and unified air force within the Japanese military, particularly the Army. In April 1919, the Army set up the Army Aviation Bureau directly under the army minister by the imperial edict. The Bureau was in charge of administration and education related to aviation and Inoue became its first head. Inoue initially took a cautious attitude toward a unified air force since he deemed it too early to establish with only a few hundred aircraft possessed by both services. However, by summer of 1920, he changed his mind and recommended Army Minister Giichi Tanaka establish a study group on aviation matters, one of the agendas was the creation of an independent air force.

Following Inoue's advice, Tanaka asked Navy Minister Tomosaburo Kato

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[260] Ibid., 10.
[261] Till, *Air Power and the Royal Navy*, 85.
[262] Hideho Wada, *Kaigun koku shiwa* [A historical account of naval aviation] (Tokyo: Meiji Shoin, 1944), 161.

to conduct a joint study concerning the establishment of a unified air force and the joint operation of the army and navy air forces. Subsequently, Rikukaigun Koku Iinkai (the Joint Army-Navy Aviation Committee) was established in October 1920, where advantages and disadvantages of the unified air force were examined. In this study, the navy pointed out that Japan's strategic environment differed greatly from that of Europe, thus aircraft required by both services were also different due to their respective area of operation. While the unified air force had an economic advantage in procuring a large number of aircraft with the same design, the navy thought it critical to focus on developing specialized aircraft with long endurance for naval operations. Also, the navy learned from the British case, whose navy suffered greatly from the independence of the air force.[263]

Even within the Japanese Army, there was certain reluctance to embrace the unified air force. In particular, the Army General Staff including General Yusaku Uehara, its Chief of Staff, strongly opposed the idea based on the traditional operational concept centered on infantry. Because of this reluctance, even Army Minister Tanaka who brought up this matter secretly asked his navy counterpart to reject the proposal since there was no stomach for the General Staff to accept it.[264] Due to these reasons, the navy insisted that it was too immature for Japan to create an independent air force, to which the army eventually agreed. After the committee concluded that it would not recommend creating a unified air force, the army and navy ministers exchanged a memorandum not to alter the status quo.

The establishment of the committee itself was notable for the Japanese military in terms of its breadth of scope and participants. Not only aviators, but

[263] NIDS, *Kaigun koku gaishi*, 73.
[264] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 444.

also mainstream officers from the two services took part in the study, which was made possible by strong leadership of Army Minister Tanaka and Navy Minister Kato.[265] However, the committee did not produce any influential proposals to drastically change the existing aviation policy. This was possibly because the idea of the unified air force was stimulated by other major powers' initiatives, not by Japan's own operational experience during the First World War.[266]

In parallel with the interservice negotiation, the issue of a unified air force was raised at the Diet. This was one of the rare cases where the civilian leaders took an initiative to promote military innovation during the interwar period. In February 1921, a proposal to expand the aviation industry and consolidate air-related institutions was submitted and deliberated. One of the diet members who submitted the proposal argued that a unified air force would be advantageous to catch up with European countries. In response, both the Navy and Army Ministers stated that it would be difficult to unify all the air forces since there were clear differences in areas of operation between the two services.[267] While the Navy did not necessarily oppose the idea to create a unified air force, it strongly believed that its own air armament exclusively for naval use should be retained.

After four sessions, the proposal to consolidate air-related institutions was unanimously approved by the committee. However, Deputy Army Minister Hanzo Yamanashi stated before the committee that he supported the proposal in principle, but could not guarantee it would be realized soon.[268] The proposal did

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[265] NIDS, *Senshisosho: Rikugun kouku no gunbi to unyo: Showa jusannen shoki made* [The army's air arm and its employment: up to early 1938] (Tokyo: Asagumo Shimbunsha, 1968), 152.
[266] Ibid., 152.
[267] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 444.
[268] Japanese Diet, Dai 44 kai teikoku gikai, shugiin, koku jigyo no kakucho oyobi sono gyosei kikan no toitsu ni kansuru kengian iinkaigiroku dai 4 kai [Diet record, House of Representatives, 44th Session, the Committee on the Proposal to Expand the Aviation Industry and Consolidate Aviation-related Institutions, 4th session], February 24, 1921, 2.

not contain any enforcement mechanism, thus it was up to both services to implement or even disregard it. No further proposal or session followed after this committee.

As the dust of the First World War settled, it was increasingly apparent that Japan, which had not experienced the air war in Europe was left far behind compared with major European countries. In the field of civil aviation, new world records in altitude, flight time, range, and speed of aircraft had been set by France and the United States in the 1920s, which highlighted Japan's technological backwardness. In addition, Italy made its air force independent in 1925, which Giulio Douhet had argued for after the First World War. His vision articulated in his book, *The Command of the Air*, which attracted much attention from other major powers, of which Japan was no. Against this backdrop, there was a brewing atmosphere, particularly within the Army, arguing for the independence of air force in order to catch up with the rapid pace set by the major powers.

The final debate took place after Germany started rearmament in 1933 and declared independence of its air force in 1935. The Japanese military dispatched a delegation headed by Army General Shujiro Ito to Germany, Britain, France, Poland, and the United States. By this time, in addition to Britain, France already made its air force independent in 1933, and the United States established the General Headquarters Air Force as a centralized command in 1935. Against this backdrop, the delegation submitted a final report in January 1936 arguing that an independent air force would be necessary for national defense. The report went on to point out that, even if an independent air force would not fit Japan's national characteristics, joint operations should be studied

seriously.[269]

The developments in Europe also stirred up internal debates within the Japanese military toward the independence of air force. In particular, Commander Tomeo Kaku, an air tactics instructor at the Naval War College and Major Takashi Aoki, also an instructor at the Army War College, jointly submitted a proposal to create an independent air force to the Presidents of the War Colleges in May 1936. Both Kaku and Aoki were not aviators by training, but they had been assigned to aviation-related posts since the middle of their career and accumulated their experience in aviation. Kaku and Ozeki before him were the only two naval officers who openly argued for an independent air force during the interwar period.[270]

In their proposal, they acknowledged the fact that the pace of aeronautical development had been very fast, which led major countries to have their air forces independent in the past decade. They pointed out that European countries developed aviation under close civil and military cooperation centered on the independent air forces. In addition, the United States, whose air force had not gained independence, surpassed the European countries by close cooperation among the Army, Navy and civil aviation. However, from their point of view, there was no sign for Japan to put all aviation sectors under national control any time soon. They criticized that Japan did not even standardize aircraft materials and parts between the Army and Navy and lagged well behind from the European countries and the United States.[271]

Based on this recognition, they argued for establishing an independent

[269] Shujiro Ito, "Showa ju nen shi gatsu yori donen juni gatsu rikugun koku shisatsudan obei koku jijo shisatsu hokoku [The report of the army aviation delegation on European and U.S. aviation from April to December 1935]," February 1936, Rikugunsho mitsu dainikki [Secret document files of the Ministry of the Army], 1936, vol. 7, 24-26, Japan Center for Asian Historical Records, Ref. C01004242500.
[270] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 438 and NIDS, *Kaigun koku gaishi*, 74-75.
[271] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 447.

air force mainly composed of large bombers and called for the air ministry and air chief of staff as its central administrative and commanding bodies. However, at the same time, they acknowledged that the Army and the Navy would have different operational requirements and, consequently, allowed the two services to retain organic air components. They even went on to say that a centralized permanent command to control the three services would be necessary for effective cooperation.

Their proposal invited mixed response from the services to which they belonged. On the Navy front, Vice Admiral Ryozo Nakamura, President of the Naval War College, protested to his army counterpart by saying that navy officers should not directly submit an opinion to the Army and vice versa. Nakamura believed that both officers deserved punishment for their insubordinate action, to which his counterpart, Lieutenant General Toshiro Obata opposed.[272] On the Army front, the proposal was received by General Obata and forwarded to the Army General Staff and the Army Ministry. The Army, with its strong interest in an independent air force, was urged by the report to offer the Navy to conduct a joint study on this matter, but the Navy totally rejected the army's proposal.[273]

After the debate, the Navy was still concerned about further proposals from the Army. In September 1939, Germany started war in Europe, and its air force played a critical role in the successive campaigns. In December 1940, the Japanese Army and Navy sent a large delegation to Germany and Italy to study the effectiveness of their air forces. The Navy expected that the Army would raise the issue of an independent air force and, consequently, the Diet would also take this issue again after the delegation coming back to Japan in June 1941. The

[272] Ibid., 453.
[273] NIDS, *Rikugun kouku no gunbi to unyo,* 493-494.

Navy believed that the German Air Force focused on close air support to its Army and was not effective for naval operations. However, from a theoretical point of view, an independent air force would have some merits, particularly in terms of increasing aircraft production. In anticipation of the Army's proposal, the Navy took pains to prepare counterarguments in order to persuade the Army and to save face for each other. However, possibly because the war with the United States was imminent, the Army refrained from raising the issue.[274]

As these initiatives demonstrate, the Army basically proposed the Navy to jointly study the possibility of a unified air force throughout the interwar period. However, the Army's proposals were not considered seriously by the Navy. This was primarily because navy officers including aviators firmly believed that naval aviation was an inseparable part of the Navy. A group of naval aviation historians identified five reasons behind this belief.[275] First, air forces were an indispensable part of the surface fleet which would have lost its value without naval aviation. Second, naval operations would not be possible if air forces were independent and not commanded and controlled by the Navy. Third, naval and land operations were so different that naval air forces had to be trained as a permanent naval component. Forth, the Navy would not absolutely oppose the idea to create an independent air force composed of large aircraft, but it was critical to have an organic air force necessary for the Navy. Lastly, the Navy was superior in both operations and technology of military aircraft, therefore the unification of air forces would slow down the pace of development the Navy had enjoyed. This was primarily because the navy believed if a unified air force was to be created, army officers, whose number was greater than that of naval officers, would have dominated senior positions. As a result, the navy assumed

[274] NIDS, *Kaigun koku gaishi*, 80.
[275] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 438-439.

that the newly created air force would focus on providing air support for ground warfare and gaining air superiority over support for naval engagements.

The Navy was also concerned about a possible delay in developing its own desired air arm through the integration with the army counterpart. The Army lagged behind the Navy in terms of both quantity and quality of aircraft.[276] The navy suspected that the army tried to fill this gap by simply subsuming naval aviation. Also, a number of army aviators were frustrated with the low esteem they received from Army senior leaders. Some of them even went on to state that the Army Air Force should be integrated under the Navy's command since they felt the Navy was more open-minded and accommodating to aviation.

One of the possible positive outcomes resulting from the interservice rivalry was that the army's establishment of the Army Aviation Department might have pushed the navy to create its own counterpart, the Naval Aviation Department. The Army Aviation Bureau was reorganized into the Army Aviation Department in May 1925, two years earlier than the Naval Aviation Department. The function of the Department was almost identical as the Bureau, but its staff was significantly increased from 51 to 139.[277] This reorganization might have fostered the Navy's decision to establish the Naval Aviation Department in order to match the Army's effort. Given the long years of intense rivalry between the two services, this seems highly plausible. However, as we have seen, there had been a lot of arguments raised within the Navy for the establishment of the Naval Aviation Department well before 1925. Although the Navy might have taken notice of the Army's move and its implication, there was no concrete evidence available to connect the two events.

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[276] A. D. Harvey, "Army Air Force and Navy Ari Force: Japanese Aviation and the Opening Phase of the War in the Far East," *War in History* 6, no. 2 (April 1999): 175. Harvey pointed out that this was "unique" about the Japanese naval aviation.

[277] NIDS, *Rikugun kouku no gunbi to unyo,* 255-256.

Till states that the primary difference between the organizational environments of British naval aviation and those of Japan and the United States was the fact that "…neither Americans nor Japanese suffered the consequences of an independent national air force."[278] Both the Japanese and U.S. Navies were successful in retaining naval aviation throughout the interwar period. However, the Japanese Navy was in a better position than the U.S. Navy in that there were no influential air force advocates like Billy Mitchel within and without the Navy. Also, under the weak civilian control system, there was no direct civilian intervention to enforce the idea of an independent air force from outside. In this sense, the Japanese Navy was less threatened by the possible secession of naval aviation, thus required less efforts to protect its air arm from the Army.

Testing Carrier Operations

Japanese naval aviation eventually had its organizational home by the establishment of the Naval Aviation Department in 1927. This organizational development contributed to both land-based and carrier-based aviation, particularly in administrative terms. However, operating aircraft carriers required intensive experimentation because no one country, including Britain and the United States, had a clear picture of future aircraft carriers throughout the 1920s. Although the Japanese Navy sent *Wakamiya* to attack the German naval base in Tsingtao and operated seaplanes from it for reconnaissance and bombing, it did not conduct any substantial carrier operation during the First World War. In order to fill this gap, the Navy sent delegations to Britain to gain first-hand information about the state of development of aircraft carriers. Before

[278] Till, "Adopting the Aircraft Carrier," 209.

the construction of Japan's first aircraft carrier, *Hosho,* started, the British Navy already had laid the keel of HMS *Hermes*, which was constructed as an aircraft carrier from the beginning.

After *Hosho* was commissioned in 1922, the navy took about three years to test equipment and train carrier pilots.[279] In particular, arresting wire was tested vigorously throughout the interwar period. The Japanese navy first introduced a British arresting wire, which equipped wires parallel to flight decks and used friction caused by hooks attached to aircraft in order to stop landing aircraft. However, it was not effective to stop even the slow and light-weight aircraft of the 1920s primarily because it was difficult to spot the right place for landing. Later in 1930, the Japanese Navy replaced it with the one equipped across the deck that was developed originally by France.[280]

Coupled with *Hosho's* short flight deck and ineffective arresting gear, carrier pilots required considerable time to acquire skills and experience to operate from aircraft carriers. It took about four to six months for carrier pilots to be able to land on and take off from the carrier. Therefore, even after *Hosho* was commissioned to the Combined Fleet in 1926, she spent the first half of each year to train new carrier pilots only for taking off and landing. This training consumed the time that could be used to conduct operational experimentation by this carrier. However, as did other first-generation carriers, namely HMS *Hermes* and USS *Langley*, *Hosho* served very well as an experimental carrier to test carrier operations. Experience obtained through *Hosho* gave the Japanese Navy valuable information for later carrier development. After the construction of *Hosho*, *Akagi*, the first fleet carrier converted from a battleship under the

[279] Nihon Kaigun Kokushi Hensan Iinkai, *Nihon kaigun kokushi*, vol. 1, 195.
[280] Sozaburo Chiba, "Hatchaku heiki oyobi kichi heiki [Taking off and landing equipment and base weapons]," in *Koku gijutsu no zembo, ge* [Complete outline of aviation technology, vol. 2] (Tokyo: Hara Shobo, 1976), 326.

Washington Treaty, was completed in 1927. *Akagi* had a displacement of 26,900 tons and could house 60 aircraft in its hanger. In 1928, *Hosho* and *Akagi*, with four escort destroyers, formed the First Air Battle Group, which enabled the navy to conduct full-fledged experimentation of carrier operations year-round.

In the late 1920s, it was unclear as to what kind of carriers would be appropriate for future naval warfare. There was a debate on whether small carriers were more cost-effective than fleet carriers. Obviously, small carriers are less capable than fleet carriers in terms of protection, seaworthiness, and the number of aircraft they carry. On the other hand, small carriers are cheaper and easier to build, thus the Navy could have built more of those than large fleet carriers. The Japanese Navy tried to figure out which option was more cost-effective under the treaty limit. For this sake, the Japanese Navy decided in 1927 to build the 8,000 ton *Ryujo* as a replacement of the aging seaplane carrier, *Wakamiya*. While *Ryujo* was under construction, it was soon realized that its hull deemed too small to support the number of aircraft the Navy originally planned to operate from the carrier. As a result, the Navy decided to redesign *Ryujo* to carry more aircraft, which increased the displacement and greatly reduced its stability and capability.[281] However, the Navy learned from this experimentation and avoided further investment in small carriers.

Akagi and *Kaga*, the second converted carrier commissioned in 1930, had ten twenty-centimeter guns and heavy armor around their hulls, which are unnecessary for these types of ships. This configuration was intended for possible encounters with enemy cruisers. They also had three-layered flight decks which the navy thought useful for launching and landing aircraft simultaneously. However, with the development of carrier operations, two carriers underwent

[281] The Navy later reconstructed *Ryujo* in order to strengthen its stability and structural liabilities after being damaged in the fleet exercises in the typhoon. Peattie, *Sunburst*, 237.

major renovations for more than five years after their commencement. The fact shows that not only *Hosho* and *Ryujo*, but also *Akagi* and *Kaga* were still experimental aircraft carriers and the Navy still did not understand clearly what their operational role was.[282]

By the early 1930s, aircraft carriers were assigned a supporting role in fleet battles. Aircraft carriers were thought to be used for scouting and spotting enemy fleets with their aircraft. The Navy also planned to use them to release smoke screen to cover its own fleet from enemy's eye. After the Navy figured out the usefulness of aircraft carriers for those missions, the roles of aircraft carriers were shifted to attack an enemy's carriers first and maintain air superiority over its fleet. However, up to this point, offensive operations by aircraft carriers were not considered seriously. Stimulated by the famous bombing tests against the German battleship *Ostfriesland* by the U.S. Army and Navy in July 1921, the Japanese Navy also conducted its first bombing test against the former Russian battleship *Iwami* in July 1924. The aircraft successfully sank the battleship, which demonstrated their offensive potential to the Navy's top brass. However, the test was considered inconclusive because aircraft dropped bombs at low altitudes and under favorable weather conditions. It was also because the battleship did not maneuver, shoot at the aircraft, or have any air cover.

The construction of the experimental carriers and the formation of the Air Battle Groups enabled the Japanese Navy to conduct more realistic bombing tests against actual ship targets. In terms of level-bombing, the first test by carrier-borne aircraft took place in August 1927. Aircraft taking off from *Hosho* dropped two 240-kg bombs against a decommissioned light cruiser. The second test was conducted in February 1927 against a decommissioned destroyer.

[282] NIDS, *Kaigun koku gaishi*, 22.

Bombers launched from *Akagi* and *Hosho* that formed the First Air Group took part in the experimentation and dropped twelve 240-kg bombs to test their lethality. The third test was held in April 1930 with the participation of *Akagi*, *Kaga*, and *Hosho* in addition to land-based air groups and the seaplane carrier *Notoro*. The final test took place in February 1931 against a decommissioned ship by 24 bombers launched from *Akagi* and *Hosho*. The main objective of this test was to study coordinated-attack techniques by a mass formation of bombers.

However, the accuracy of level-bombing was not accurate enough to disable enemy aircraft carriers on first strike. For this sake, the Navy came to focus on dive bombing. In 1929, Vice Admiral Masataka Ando, Director of the Naval Aviation Department, encouraged dive bombing tests and the Japanese Navy started a series of tests against actual ship targets.[283] For example, from 1930 to 1933, the First Air Battle Group conducted dive bombing tests against decommissioned ships to gauge the accuracy of dive bombing. From 1935, the first operational dive bomber, the Type 94 Bomber, was deployed to Ryujo. The air group studied dive bombing at various altitudes and angles and tested new bombing sights in order to improve accuracy. Through this basic research, the Navy found that dive bombing achieved satisfactory accuracy, thus continued experimentation by deploying more dive bombers to other carriers.

At the same time, the Navy also studied aerial torpedoing and developed relevant tactics. The Navy traditionally emphasized torpedoing as a way to counter the numerically superior U.S. Navy, thus it was a natural extension to equip carrier-borne aircraft with torpedoes. In testing torpedoing tactics, while individual carriers were used to test and exercise aerial torpedoing, the formation of the First Air Battle Group played an important role. By forming the

[283] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 684.

Air Battle Group, its carriers could operate together with the main fleet on a daily basis and improve their coordination with surface ships and submarines. In addition, increasing lethality of aerial torpedoes also contributed further development of torpedoing tactics. In 1935, the Japanese Navy introduced the Type 91 Aerial Torpedo, which enabled aircraft to launch torpedo at a higher altitude and speed.[284] It drastically increased the effectiveness of torpedo attacks by aircraft.

By this time, the Japanese Navy recognized the offensive capability of aircraft carriers by observing the annual air combat exercises, called sengi. They were a source of operational innovation. The sengi training started in 1927 and was planned annually at the Education and Training Bureau of the Naval Aviation Department. In planning, the Bureau designated primary air groups or ships in charge of the sengi training and determined major research and training items by taking advice from the Yokosuka Air Group. After coordinating with the Education and Training Bureau of the Navy Ministry and the Navy General Staff, these plans were submitted to the Navy Minister by the head of the Naval Aviation Department. In order to ensure better understanding between the headquarters on one hand and the air groups and fleets on the other, the Department also distributed to each relevant section documents detailing its expectation in conducting the sengi training.[285]

One of the notable examples where the sengi training promoted operational innovation was dive bombing. After finishing initial experimentation, dive bombing was incorporated into the sengi training in 1933. Although the first training was conducted by carrier-borne fighters, it proved that dive bombing was very accurate and effective particularly against aircraft carriers. After

[284] NIDS, *Kaigun koku gaishi*, 42.
[285] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 604.

introducing Type 94 Bombers, the fleet could develop more sophisticated dive bombing techniques and gauge the most effective angle and altitude for bombing. Through the sengi training, the Japanese Navy came to believe that tactical surprise was vital for dive bombing.[286]

The sengi training was also utilized to develop night torpedoing techniques. In its operational planning, the Japanese Navy emphasized night operations and planned to use carrier aircraft for night torpedoing attacks. In order to strengthen the night operations capability, carrier pilots had to first improve skills to take off from and land on carriers at night. For that sake, the Japanese Navy started night landing and taking-off practice from February 1930, and all the carrier pilots became proficient in night operations before the Pacific War. Based on their night flight capability, the Navy initiated the sengi training for night torpedoing from 1934 and found it feasible in two years.

After each sengi training, there would be a post-exercise review including representatives from the Navy Ministry, Navy General Staff, and other air groups. Through the review, air groups could learn lessons for future training and the Navy Ministry and other related institutions also could recognize current problems in naval aviation. Peattie describes the importance of the sengi training by pointing out that there "…is little doubt that sengi training contributed significantly to the combat proficiency of Japanese naval air groups in the decade before the war."[287]

In developing operational concepts, military educational institutions were another source of the RMA. In the case of the U.S. Navy, the Naval War College played a critical role in developing carrier operations. As mentioned before, it started war-gaming carrier operations even before the U.S. Navy had an

[286] Ibid., 690-94.
[287] Peattie, *Sunburst*, 133.

operational aircraft carrier. As Krepinevich pointed out, in 1919, Admiral William S. Sims, President of the Naval War College, "…established procedures designed to facilitate an examination of how air power might influence war at sea."[288] Krepinevich also went on to say that the games and simulations conducted at the Naval War College "…inspired efforts to enhance naval air power by maximizing the number of aircraft on carriers and compressing the cycle for launching and recovering planes." [289] By testing new operational concepts in a relatively free and less threatening environment, the Naval War College became a test bed for carrier operations.

The Japanese Navy also conducted numerous war games and simulations at the Naval Staff College, which gave the operation planners critical insights into carrier operations. The Naval Staff College was directed by the Chief of the Navy General Staff to do research on operational matters. One of the famous studies was compiled in November 1936. The study included air raids against the U.S. fleet anchored at the Pearl Harbor.[290] The Naval Staff College also conducted war games for major operations. One of the notable examples was the special table top exercise conducted in September 1941. Isoroku Yamamoto, commander of the Combined Fleet, took part in the exercise and simulated the Pearl Harbor attack. Through this war game, Yamamoto and operational planners under him identified that an element of surprise was critical for the attack.[291]

However, the Japanese Navy first assigned a naval aviation specialist to

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[288] Andrew F. Krepinevich, "Transforming to Victory: The U.S. Navy, Carrier Aviation, and Preparing for War in the Pacific," in *The Fog of Peace and War Planning: Military and Strategic Planning under Uncertainty*, ed. Talbot C. Imlay and Monica Duffy Toft (London: Routledge, 2006), 183.
[289] Ibid.
[290] NIDS, *Senshisosho: Kaigun gunsenbi 1, showa 16 nen 11 gatsu made* [War history series: Naval armaments and war preparations until November 1941, vol. 1] (Tokyo: Asagumo Shimbunsha, 1969), 165-174.
[291] Yuzuru Sanematsu, *Kaigun daigaku kyoiku: Senryaku Senjutsu dojo no kozai* [Education at the Naval Staff College: Merits and demerits of the training field for strategy and tactics] (Tokyo: Kojinsha, 1993), 171-176.

the Naval Staff College in 1928. Since then, only one instructor was in charge of education on naval aviation until the Pacific War broke out. The Navy's intention to set up the post was to facilitate instructors and students at the College to recognize the importance of air power and to encourage testing new tactical and operational concepts of naval aviation. However, it was almost impossible for one instructor, whose rank was commander, to change the dominant operational concept of the Navy at that time, the "big ships and big guns" doctrine. For this reason, air power advocates inside the Navy did not sell their innovative concepts aggressively because doing so might have heightened tensions with mainstream senior officers. Rather, they chose to show the effectiveness of air power through fleet exercises and enlighten other officers through the evidence obtained from them, which was the general attitude among air-minded officers.[292]

Although the organizational arrangements did not change the dominant operational concept of the Japanese Navy, the interrelationship among the Air Battle Groups, the Naval Staff College, and the Naval Aviation Department played an equivalent role to that of the U.S. counterpart. Krepinevich called the interrelationship between the Naval War College, the Bureau of Aeronautics and fleet exercises as the "Naval Trinity."[293] The Japanese Naval Trinity also greatly helped the navy to test its rudimentary aircraft carriers and their operations.

In tandem with the establishment of the Naval Aviation Department, the Naval Trinity also helped naval officers rotate through aviation-related posts, which facilitated the flow of ideas from operations to research and education and vice versa. As Mark Mandeles points out, the rotation of Captain Joseph M. Reeves was the notable example in the U.S. Navy. He was moved from the Naval

[292] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 80.
[293] Krepinevich, "Transforming to Victory," 183. Mark Mandeles added the General Board to the Naval Trinity and called it as the "multiorganizational system." Mark D. Mandeles, *Military Transformation Past and Present: Historic Lessons for the 21st Century* (Westport: Praeger Security International, 2007), 36.

War College to the Aircraft Squadrons, which had an important effect on exploring carrier operations by making it possible to test his idea generated at the College with the carriers.[294] In the same manner, the Japanese Navy moved capable officers around within the Trinity. In addition to Yamamoto, who did multiple tours to the Naval Staff College, the Naval Aviation Department, and the First Air Battle Group, Tomeo Kaku, who later became the commanding officer of the aircraft carrier *Hiryu,* had had similar assignments. He served at the Naval Aviation Department from 1928 to 1929 and the Naval Staff College from 1934 to 1936 in addition to staff and commanding positions of air stations and fleets.[295] These assignments enabled non-pilot officers like Yamamoto and Kaku to accumulate sufficient operational and technical expertise to command aircraft carriers and to feedback their operational experience into research and education.

Conclusion

The establishment of the Naval Aviation Department came not as a result of civilian intervention or interservice competition. Establishing a new organization was clearly within the jurisdiction of the Navy Ministry and it could do so without any explicit authorization by the Diet.[296] The fact that the Army had established its own aviation department did not critically influence the Navy's decision. Also, unlike the British and U.S. Navies, the argument for an independent air force did not put much pressure on the Japanese Navy in

[294] Mandeles, *Military Transformation Past and Present*, 37.
[295] Kaku's last assignment before the Pacific War was director of the Administrative Bureau at the Kugisho from 1939 to 1941.
[296] The establishment of the Naval Aviation Department was authorized by a Cabinet meeting, not by the Diet. Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 42-43.

protecting its air arm. The Diet held sessions to consider a unified air force, but the Navy rejected the proposal singlehandedly. As the proposals submitted by the visionary officers clearly demonstrate, it was primarily through the internal ideological struggle that brought about the establishment of the Naval Aviation Department.

The Naval Aviation Department played an indispensable role in promoting innovation by carrier aviation. It served three distinctive purposes. First, the Naval Aviation Department gave a formal organizational footing for naval aviation within the Japanese Navy. As discussed in this chapter, the Navy's top brass initially resisted the idea to create the Department. However, with the rapid development of aeronautical technology, they could not do anything but to acknowledge the establishment of it. Once the Naval Aviation Department was established, it soon became an "organizational home" for naval aviation. Also, there formed the Naval Trinity consisting of the Naval Staff College, the Air Battle Group and the Naval Aviation Department as its hub. A number of aviators had assignments to some or all of the Naval Trinity and brought positive feedbacks between operations on one hand and research and education on the other. At the same time, these assignments helped non-aviators to gain first-hand technical and operational expertise, which contributed to expand a pool of aviation experts by bringing officers from other branches into naval aviation.

Second, the Naval Aviation Department encouraged the Navy to integrate aeronautical research institutions. Research and development of aircraft initially belonged to the Naval Technical Department, which, by its organizational stature, mainly focused on research and design of surface ships. In addition, there were a number of technical branches engaged in aeronautical research, and they were scattered within the Navy's bureaucracy. However, once senior officers realized

the need for integration of research, development and experimentation, the Navy moved to set up the Kugisho around which coordination took place effectively.

Lastly, the Naval Aviation Department made it possible to formulate cohesive and long-lasting aviation policies within the Navy. As discussed in the previous chapter, there were fifteen changes of command at the Naval Aviation Department, and none of the chiefs had comparable personal influence to that of William Moffett. However, the Department constantly retained a cadre of capable senior officers, which gave it certain continuity in policy formulation.

Within the Japanese Navy, the same kind of success achieved in naval aviation can be seen in the development of submarines. Because of submarines' complex structure and equipment different from those of surface ships, closer cooperation among technical, operational, and construction branches was critical. For this reason, the Navy set up an independent department specializing in submarines in the Kure Naval Arsenal, which facilitated coordination among different sections. [297] This development shows striking similarities between submarines and aircraft, both of which were considered as novel, powerful weapons in the interwar period.

The case of Britain contrasts Japan's success. As Geoffrey Till points out, responsibility for British naval aviation was uneasily divided between the Admiralty and the Air Ministry in the system of "Dual Control" throughout the interwar period.[298] Under the dual control system, the British Navy lost control of designing its own aircraft to the Air Force and, more important, an "organizational home" for its naval aviation. For fear of being deprived of the naval air arm again, the British Navy was reluctant to reinvest its scarce

[297] Shizuo Fukui, *Nihon sensuikan monogatari* [A tale of Japanese submarines] (Tokyo: Kojinsha, 1994), 51-53.
[298] Till, "Adopting the Aircraft Carrier," 208.

resource and personnel to naval aviation.

With the development of the organizational foundation for naval aviation, the Japanese Navy had to deal with two major organizational challenges in expanding naval aviation. First, the Navy needed a lot of aviators for operating an ever increasing number of aircraft. Unlike its surface ship counterpart, aviators needed to be trained from scratch, and it was very difficult to make officers from other branches into aviators. Accordingly, the Japanese Navy had to create a new career path for aviators separate from traditional ones. In addition, what exacerbated this problem was the fact that many young aviators lost their lives in flying rudimentary aircraft, which posed a complex challenge to create a stable and attractive career path for aviators.

Second, there were too few senior officers who could command air stations and aircraft carriers. There had to be newly recruited aviators to give life to the new combat arm. At the same time, since naval aviation was established in 1909 and grew very rapidly, there were only a small number of aviators senior enough to fill high-ranking positions throughout the interwar period. The establishment of the Naval Aviation Department made it possible for the Japanese Navy to systematically address these challenges, which will be the main topic of the next chapter.

Chapter 5

Recruiting Aviators

This chapter discusses how the intraservice model explains the expansion of Japanese naval aviation during the interwar period. In particular, this chapter will focus on recruiting, training and promoting aviators within the Japanese Navy. Aviators in this chapter refer to pilots, observers, and other personnel who received some form of formal flight training and had substantial flight experience. By focusing on differences in personnel policy among the three navies, it will demonstrate how the Japanese Navy dealt with the administrative and organizational challenges the British and U.S. Navies also faced and where it differed from them.

The First World War saw a rapid growth of aviation in both qualitative and quantitative terms. In particular, the First World War brought about a drastic increase of aviators. At the start of war, the British Navy had less than 100 aircraft and little more than 700 personnel in its naval aviation. As the war progressed, the British Navy's air force, the Naval Air Service, expanded into a force of some 60,000 personnel by the spring of 1918.[299] In terms of both equipment and personnel, as Norman Polmar described, Britain came out of the war as the "world leader in carrier aviation."[300]

In the same manner, the United States, another major belligerent, also had a small number of aviators at the start of war. The United States did not

[299] Geoffrey Till, "Adopting the Aircraft Carrier: The British, American and Japanese Case Studies," in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett (Cambridge: Cambridge University Press, 1996), 206.
[300] Norman Polmar, *Aircraft Carriers: A History of Carrier Aviation and Its Influence on World Events*, vol. 1*, 1909-1945* (Washington: Potomac Books, 2006), 36.

initiate massive expansion of naval aviation until it entered the war in April 1917. As of April 6, 1917, just before its entry into war, the U.S. Navy had only 48 officers and 230 enlisted personnel for its naval aviation.[301] Although the U.S. Navy did not build aircraft carriers during the war, it came to have nearly 40,000 personnel with more than 2,000 aircraft by the time of Armistice on November 11, 1918.[302] Therefore, both the U.S. and British Navies found themselves to have an impressive pool of naval aviators at the end of the First World War.

However, the courses of action taken by the two navies were strikingly different, particularly in terms of organizational development. As discussed in the previous chapter, Britain made its air force independent in April 1918 and most naval aviators were transferred to the new service. The newly created Fleet Air Arm was controlled both by the air force and the navy, and the latter did not have full control over its own personnel. After being deprived of its resources and personnel by the air force, the British Navy tried to rebuild a separate naval air service under its own control. However, the bid was blocked by the air force, and the Fleet Air Arm was put under "Dual Control" throughout the interwar period. According to Stephen Roskill, the most serious consequence of the independent air force was "…the loss to the Royal Navy of nearly all its officers who were experienced in and enthusiastic advocates of naval aviation."[303] Although the British Navy finally regained full control over the Fleet Air Arm in 1939, Roskill goes on to say that "…its repercussions made themselves felt with most serious effects throughout World War II."[304]

The U.S. Navy was also deprived of its personnel and budget after the

[301] Archibald D. Turnbull and Clifford L. Lord, *History of United States Naval Aviation* (New Heaven: Yale University Press, 1949), 91.
[302] R. D. Layman, *Naval Aviation in the First World War: Its Impact and Influence* (Annapolis: Naval Institute Press, 1996), 207.
[303] Stephen Roskill, *Naval Policy between the Wars,* vol. 1, *Anglo-American Antagonism, 1919-1929* (London: St James's Place, 1968), 241.
[304] Ibid.

First World War by a massive demobilization. However, in contrast to the British Navy, the navy did not lose its control over naval aviation, despite chronic political attacks led by Billy Mitchel. As will be discussed in this chapter, the U.S. Navy clearly recognized the need to train aviators under its control and promote them in accordance with other officers in different branches. In so doing, the U.S. Navy was skillful in both keeping naval aviation within the navy by pacifying aviators who demanded more independence and rebuilding naval aviation under the massive demobilization.

On the other hand, the Japanese Navy did not produce a large number of aircraft and aviators during the First World War. After declaring war against Germany, the Japanese Navy sent its first sea-plane carrier, *Wakamiya*, to Qingdao to conduct reconnaissance and limited bombing missions. Japan did not expand naval aviation further during the war unlike other major belligerents, namely Britain and the United States. Though there is no detailed evidence to show precisely how many aviators existed at the time of Armistice, there were in total little over fifty aviators trained by the navy, including four trained abroad, with less than a hundred airframes by the war's end.[305]

In terms of organizational arrangements, both the U.S. and Japanese Navies were in a better position than the British Navy since they did not establish an independent air force in the interwar period. However, the Japanese Navy needed to train aviators from scratch primarily because naval aviation was a new combat arm. Piloting early aircraft was extremely hazardous since they were fragile and easily broke down. Consequently, early aviators had higher

[305] Kaigun Koku Honbu [Naval Aviation Department], *Kaigun koku enkakushi*, dai 3 pen, dai 9 sho, dai 2 setsu [History of naval aviation, vol. 3, ch. 9, sec. 2] (Tokyo: Naval Aviation Department, 1935), Table 1. As for aircraft, the navy had initially purchased both airframes and engines from abroad, but only airframes were soon manufactured domestically. There is no clear evidence to indicate how many airframes existed at the time of Armistice, but about ten airframes had been imported from abroad and around seventy manufactured in Japan from 1912 to 1919. Ibid., vol. 4, ch. 12, sec. 2, table 3; vol. 6, ch. 18, sec. 2, 1-15.

chances of experiencing mechanical failures and other troubles leading to fatal accidents. Although aircraft had evolved rapidly in the interwar period, this situation did not change much during the 1920s and the 1930s. In addition, with the increasing capability and lethality of aircraft, naval aviation was expanded rapidly. In consequence, a steady stream of new aviators was necessary for every navy to cover the loss of pilots in training and operations.

As Carl H. Builder points out, the ability to attract and retain capable people is critical to most military institutions and their future.[306] In expanding naval aviation, it was natural for the navy to recruit aviators from various sources. Usually, a professional officer corps takes new members only from below and naval aviation was no exception to it.[307] Recruiting aviators from outside meant additional new personnel to the existing organization, but it was politically difficult for any navy to increase the total number of navy personnel under the fiscal austerity after the First World War. Transferring officers from other branches into naval aviation was also difficult, if not impossible, not only for organizational resistance within the navy, but also for totally different skill sets required for aviators.

Recruiting new aviators was more difficult than officers specialized in other traditional areas since naval aviation had less organizational representation within the navy. Because naval aviation came new to the navy, there was no established officer corps comprising of senior officers who had much political clout in decision making. As David Chisholm rightly observed:

> Unlike most large organizations, in closed institutions such as the military, entry into executive positions is secured only through advancement from one grade to another, after having been commissioned at the lower grade. There are, with few exceptions,

[306] Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore: Johns Hopkins University Press, 1989), 15.
[307] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), 8.

> no lateral entries into the higher grades from without. This renders technological innovation, such as the introduction of aviation into the Navy, profoundly difficult.[308]

Without any lateral entries into the higher ranks from outside, it would take at least two generations to promote junior officers to higher positions. This hierarchical nature of military organization made it difficult for naval aviation to compete with established branches for such scarce resources as budget and personnel.

Early Aviator Recruitment and Training

The core of naval aviation was aviators and their skills. The Japanese Navy realized its importance and trained aviators at the same time of introducing aircraft. When the Japanese looked to other major powers for reference, they found that most of the navies trained officer pilots and only France partially employed noncommissioned officers as aviators. The reason behind this decision seemed to be that while noncommissioned officers could perform regular duties under normal circumstances, commissioned officers were deemed more suitable to deal with emergencies with their broader tactical skills. Therefore, the mainstream opinion within the navies held that only officers should be trained as pilots, which the Japanese Navy initially followed suit.

Under the auspice of Rinji Seunsuikan Kokuki Chosa Iinkai (the Provisional Research Committee on Submarines and Aircraft), the Japanese Navy started training its first pilots in 1911 by sending a handful of officers to France and the United States, including Yozo Kaneko. After completing their

[308] Donald Chisholm, "Big Guns versus Wooden Decks: Naval Aviation Officer Personnel, 1911-1941," in *One Hundred Years of U.S. Navy Air Power*, ed. Douglas V. Smith (Annapolis: Naval Institute Press, 2010), 66.

training abroad, they became instructors and initiated their own training program after their return. This was a rather ad-hoc system, but the Committee managed to produce twenty-eight pilots over six years.[309] In so doing, the navy set up the Yokosuka Air Group in 1912 in order to create a formal training course for aviators.[310]

The first systematic training course for officers, Kokujutsu Gakusei (the Aviation Technical Student program), was set up in 1916 when the plan to establish three air groups was authorized by the Diet. Its term of training was about one year, and the system continued until 1925. Under this course, ninety-nine officer pilots were trained.[311] However, as time went by, fewer and fewer naval officers volunteered for aviator training due to the increasing number of aviation accidents. From 1915 to 1925, 55 aviators, including 21 officer pilots, were killed by accidents, which was rather high given 433 aviators trained during the same period.[312] As a result, in 1922, only one out of ten officers in the same class volunteered; others were appointed by order.

However, this adverse situation was completely changed by the Sempill mission. The Japanese Navy planned to invite experienced British officers to train its own aviators right after the First World War. This plan was primarily motivated by the interservice rivalry with the Army that had invited a French delegation headed by Colonel Jacques-Paul Faure, in which many navy officers also participated. At the request of the Japanese Navy, a British delegation led

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[309] Kaigun Koku Honbu, *Kaigun koku enkakushi*, vol. 3, ch. 9, sec. 2, Table 1.
[310] Boeicho, Boei Kenshusho, Senshishitsu [Office of Military History, National Institute for Defense Studies, Japan Defense Agency] (hereafter NIDS), *Senshisosho: Kaigun koku gaishi* [War history series: A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 3.
[311] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi* [The history of Japanese naval aviation], vol. 2 (Tokyo: Jiji Tsushinsha, 1969), 775.
[312] Kaigun Koku Honbu, *Kaigun koku enkakushi*, vol. 3, ch. 10, sec. 7, Table 1; Kaikukai, ed., *Kaigun kuchu kinmusha (shikan) meibo* [The list of naval aviators (officers)] (Tokyo: Kaikukai, 1959), 1-7. For the number of aviators trained during this period, see Kaigun Koku Honbu, *Kaigun koku enkakushi*, vol. 3, ch. 9, sec. 2, Table 1.

by Colonel William Sempill arrived in Japan in July 1921 and conducted training until October 1922. The training course provided by the Sempill mission was intended to improve operations, maintenance, and other skills for land-based aircraft and seaplanes. More than 100 officers, including 43 officer pilots, participated in the training course in the hope that they could serve as instructors in the future.[313] The Sempill mission laid a foundation for more systematic training within the navy, which raised the status of naval aviation among naval officers.

After the Sempill mission, the navy set up a separate training course for observers in 1925. However, as aviators were expected to assume commanding positions in the future, there was an increasing need for pilots to know other areas of aviation, including maintenance and reconnaissance. The term of training was thus extended by three months to give both pilots and observers necessary education to better understand all aspects of aviation. In June 1930, the two separate courses were integrated, and both pilots and observers came to be trained under the same training course. This integrated training system continued essentially in this form until the end of the Pacific War.

External factors spurred the process of innovation by forcing the Japanese Navy to seek a new way of warfare. As discussed in Chapter 1, the Washington Naval Limitation Treaty of 1922 limited the number of battleships, and the London Naval Limitation Treaty of 1930 put limitations on other types of combat ships, including heavy cruisers and submarines. While the Japanese Navy decided to build surface ships and submarines up to the treaty limits, the treaties spurred the navy to turn its focus on air force, which was not limited by the treaties. In October 1930, the navy submitted to the prime minister a plan to

[313] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 715.

build twenty-eight air groups in six years. However, in the following year, the Diet approved half of them to be built in eight years instead. Although the navy did not get what it wanted, naval aviation was duly expanded in order to fill the perceived gap in naval strength posed by the treaty.

Japan's military push into China in the 1930s also prompted the Japanese Navy to expand naval aviation. After the Mukden Incident of 1931, the navy sent its force to Shanghai on the pretext of protecting Japanese and foreign expatriates from the Chinese Nationalist forces. For this sake, naval vessels including a seaplane carrier and two aircraft carriers and associated carrier air groups were deployed to support the ground operations. This was the first real air combat the navy experienced. But, the most important turning point was the Second Sino-Japanese War, which broke out in July 1937. While the army took primary responsibility for waging the war, the navy was also heavily involved with its air force. With a large force of land-based bombers, the navy conducted strategic bombings against China but did so without adequate fighter escorts. This resulted in a huge loss of aviators, which necessitated the navy to train more aviators.

The U.S. plan to increase naval vessels and aircraft in the mid-1930s also accelerated the navy's efforts further. In March 1934, the U.S. Congress passed the so-called Vinson-Trammell Act that authorized building ships up to the limit set by the London Treaty. The act also stipulated that naval aircraft be procured for ships and other purposes and increased the number of aircraft from 1,000 to 1,650. This act was an authorization only, not an appropriation of money, but the announcement itself provided enough shock to push the Japanese Navy to revise its buildup plans.[314] The U.S. Congress subsequently passed a series of buildup

[314] George W. Baer, *One Hundred Years of Sea Power: The U.S. Navy, 1890-1990* (Stanford: Stanford

plans in the latter half of the 1930s with the intention to counter Japanese military expansion, which in turn invited further Japanese reaction.

As the Japanese Navy quickly expanded naval aviation, it was increasingly apparent that the navy's early recruitment system could not systematically produce enough aviators to keep pace with the growing number of aircraft. At the same time, under the fiscal austerity during most of the interwar period, it was politically difficult for the navy to increase the total number of officers so as to train more aviators out of them. Whereas existing branches vied for scarce resources, naval aviation as a new combat arm had to find a way to win the zero-sum game to make headway within the navy.

Officer Aviator Corps

For the Japanese Navy, the most important source of commissioned officers, particularly those promoted quickly, was its cadet schools, namely Kaigun Heigakko (the Naval Academy). The Naval Academy was established in 1873 for the purpose of educating students to be line officers. Since its establishment, the number of students in each class had been limited to less than 100 until around the turn of the twentieth century. After the First Sino-Japanese War of 1894, class sizes were expanded, but the total number of graduates rarely exceeded 200 until 1933. Only the classes from 1922 to 1924 graduated more than 200 students in order to meet the manpower requirement for the massive eight-eight fleet plan. Immediately after these exceptional years, the Washington Treaty set a limit on the number of battleships, which brought about a sharp reduction in the number of cadets. In 1925, there were only 62 graduates compared to 236 in the

University Press, 1993), 130.

preceding year.[315]

Early aviators were mostly chosen from this elite group of officers. When the Japanese Navy decided to introduce aircraft, the first five Naval Academy graduates, along with two engineering officers, were sent abroad for flight training from 1910 to 1912. Since then, a handful of officers were selected from the graduates and provided flight training each year while those officers trained abroad served as instructors. As noted, early aviators were trained under the Aviation Technical Student program until 1924, but the name of flight trainee was changed into Hiko Gakusei (Flight Student) thereafter. Under the Flight Student Program, officers were given one year of flight training to become pilots or observers.

As aircraft demonstrated their strategic utility during the First World War, the number of students chosen for naval aviation was gradually increased. Out of 255 cadets who graduated in 1923, 54 officers in total were selected for the Flight Student program. As the number of air groups and aircraft carriers steadily increased throughout the 1920s, the ratio of aviators among Naval Academy graduates also increased. After the Washington Treaty was signed, more than twenty percent of graduates from the same class entered the Flight Student Program, which underscored the navy's emphasis on naval aviation. This trend was further accelerated by the signing of the London Treaty of 1930. More than a third of graduates who entered the Academy at the time of signing the London Treaty were designated as aviators. However, due to the limited number of total cadet students throughout the interwar period, officer aviators did not drastically increase in number (See Table 1).

There were other sources of commissioned officers within the Japanese

[315] There were 68 graduates in 1926, but from 1927 and on, the number of graduates exceeded 100.

Navy. Kaigun Kikan Gakko (Naval Engineering College) and Kaigun Keiri Gakko (Naval Accounting School) were considered equal in status to the Naval Academy. In particular, the Naval Engineering School was originally established as a branch of the Naval Academy and became an independent institution in 1881. Entering the Naval Engineering College was as competitive as the Naval Academy, but what set the Naval Engineering College apart was its requirement for a stronger background in natural sciences due to its technical nature.[316] Most of the graduates were commissioned as engineering officers serving on naval vessels. However, after the navy introduced aircraft, some graduates were selected annually as aircraft maintenance officers. They were initially given flight training when they were trained under the Aviation Technical Student program. However, the Japanese Navy followed the British educational model brought by the Sempill mission and stopped providing flight instruction for those maintenance officers in 1922. The training course for aircraft maintenance officers was renamed to the program of Hikoki Seibi Gakusei (Aircraft Maintenance Student) in 1925 and this program continued until October 1944.

These maintenance officers expanded the cadre of officers who understood the nature of naval aviation. A notable example was Chikuhei Nakajima. Nakajima, a graduate of the college and naval engineer, was one of the first two engineering officers sent abroad to learn aircraft operation and maintenance. He left the navy early in his career but founded the Nakajima Aircraft Company in 1918, which later became a major supplier of naval aircraft. However, within the navy, aircraft maintenance officers did not have equal footing with aviator

[316] For example, in 1933, only 60 students were admitted out of 1,719 applicants. Kanya Miyauchi, "Kaigun kikan gakko no rekishi [A history of the Naval Engineering School]," in *Kaigun heigakko, kaigun kikan gakko, kaigun keiri gakko* [The Naval Academy, the Naval Engineering School, and the Naval Accounting School], ed. Kanya Miyauchi, Koichi Hayashi, Nobukiyo Nanbu, and Hideaki Fukata (Tokyo: Akimoto Shobo, 1971), 99.

officers. In the navy's chain of command, engineering officers did not have the right to command over line officers. As a result, even in cases where their superiors could not take command due to their possible injuries or death, engineering officers were not in a position to take over. Instead, other line officers, even if their rank was lower than that of engineering officers in the same chain of command, were supposed to take command. Only after engineering officers were merged with line officers and treated equally in 1943 did a few engineering officers receive flight training to become pilots.[317] In 1944, the Naval Engineering College was reintegrated with the Naval Academy and became a branch school of the academy. Given the traditional focus of the Japanese Navy on operational matters, those engineering officers did not accrue high esteem they deserved due to the discriminatory treatment throughout the interwar period. As a result, aircraft maintenance officers had less organizational representation compared to officers who graduated from the Naval Academy.[318]

It was clear that the shortage of aviators could not be fundamentally solved without increasing new entries from below or expanding the officer corps by granting engineering officers equal status. However, the navy did so only a few years before the Pacific War or, as for the latter, in the final stage of the war. One of the primary reasons for this was that the Japanese Navy did not want to drastically change the existing hierarchy in its officer corps. Within the navy, there was clear class distinction between commissioned and noncommissioned officers. By limiting the number of commissioned officers, the navy aimed to maintain a stable promotional pathway so that every junior officer could be

[317] In January 1943, 14 engineering officers officially enrolled in the Flight Student program along with 151 Naval Academy graduates. Kaikukai, *Kaigun kuchu kinmusha (shikan) meibo*, 60.
[318] The U.S. Navy had experienced the same problem in the nineteenth century and integrated the separate engineering officer corps with the line officers in 1899. Because of this bitter experience, William Moffett pointed out that the separate engineering officer corps had badly fractured the officer corps, on which he based his argument against a separate flying corps. Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), 78.

promoted up to a certain rank at the same pace.

On the other hand, the U.S. Navy took a different approach to personnel policy for carrier commanders. Stephen Rosen argues that successful innovations occurred when senior military officers were convinced that structural changes in the security environment created the need for innovation. They then turned to create new career paths along which junior officers with novel skills could be promoted. And Rosen points out that the U.S. Navy's creation of the carrier task force illustrates this point.[319] In creating a new career path for aviators, Rosen identified two politically difficult problems. First, due to a high attrition rate of aviators in war, a lot of aviators were needed in peacetime. As discussed, aviators were basically commissioned officers, which disturbed a balance of power between aviators and non-aviators within the U.S. Navy. Second, as aircraft developed rapidly and demonstrated its utility, aviators became frustrated by putting themselves under the command of non-aviators, who did not fully understand their strategic potential. They increasingly demanded that aviators occupy commanding positions of air stations and aircraft carriers, which inevitably caused friction with traditional naval officers. In tackling these challenges, Rosen concludes that William Moffett "…was challenging the entire political structure of the navy by introducing new cohorts of officers in to the promotion system and by challenging the existing procedures for promotion."[320]

In particular, Moffett was successful in increasing the number of aviators, particularly those of commissioned officers. While the U.S. Navy as a whole suffered a shortage of officers, the percentage of officers in aviation among all the naval officers increased from two percent in 1916 to eleven percent 1928.[321]

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[319] Rosen, *Winning the Next War*, 76.
[320] Ibid, 78.
[321] Turnbull and Lord, *History of United States Naval Aviation*, 264-265.

Moffett also urged Congress to reduce the percentage of enlisted pilots from thirty percent to twenty percent, which was codified in law in 1932.[322] In terms of recruiting new aviators, Moffett focused on the most important source of commissioned officers, the Naval Academy. He testified before the Morrow Board, which was set up by President Calvin Coolidge in 1925 to review all aspects of aviation, that the number of midshipmen at the Naval Academy should be increased in order to expand a pool of aviators. Consequently, an act in 1926 following the board's report authorized an increase in the allowance of cadets at the Naval Academy. Moffett also made efforts to attract more volunteers from the academy. In 1929, a special squadron was set up at the academy to provide flight instruction for cadets in a timelier manner before graduation. Moffett insisted that immediate assignment of aviation upon graduation be possible so that their enthusiasm for air would not fade by two years of sea duty. This policy actually doubled the number of volunteers for aviation in 1930 compared to those in 1926.[323]

Not only new volunteers for aviators, but also senior officers to lead them were in short supply in the interwar period. Thanks to Moffett's inputs and efforts, the Morrow Board decreed that commanders of air stations and aircraft carriers should be aviation officers, thus preserving command positions for aviators.[324] But, in order to fill the expanding command posts in naval aviation, the U.S. Navy transferred senior officers from other branches. In so doing, the U.S. Navy created a training course for naval aviation observers, which provided selected senior officers with basic flying skills. In this way, aviators could have

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[322] William F. Trimble, *Admiral William A. Moffett: Architect of Naval Aviation* (Washington: Smithsonian Institution Press, 1994), 199.
[323] Turnbull and Lord, *History of United States Naval Aviation*, 269.
[324] Thomas C. Hone, Norman Friedman and Mark D. Mandeles, *American and British Aircraft Carrier Development, 1919-1941* (Annapolis: Naval Institute Press, 1999), 40.

senior representation not by officers who were totally new to the field, but by those who at least understood basics of flying aircraft. Chisholm pointed out that creating naval aviation observers and allowing them to command carriers "…would give the aviators breathing room to see sufficient aviators advanced to Commander and Captain, so that in time all such ships would be in charge of naval aviators."[325] One of the most influential individuals to emerge from this course was Joseph Reeves, who made a significant contribution to the development of carrier operations. Reeves had been a battleship captain, but, after graduating from the course, assigned as Commander, Aircraft Squadrons, Battle Fleet. It was during his tenure as commander that, Douglas Smith concluded, carrier aviation was defined.[326]

While the U.S. Navy exclusively recruited officers for aviators, the British Navy also tried to follow the same path. Under an agreement with the air force, the navy was supposed to provide seventy percent of personnel for the Fleet Air Arm. The British Navy, which had struggled to regain sole control of the Fleet Air Arm, had strong incentive to fill the billets, since the navy might have been considered unwilling to take it back otherwise. However, the navy had a hard time to fill the quota of aviators allocated to it. Not many officers volunteered for pilots primarily because they did not see bright prospects for promotion in naval aviation under the Dual Control, and the navy did not proactively encourage them to do so. In consequence, when the British Navy planned to increase the annual output of naval officers trained as pilots from 24 in 1934 to 144 by 1941, there were not enough volunteers to achieve this goal.[327]

The British Navy also suffered a shortage of senior officers in the

[325] Chisholm, "Big Guns versus Wooden Decks," 57.
[326] Douglas V. Smith, "Admiral Joseph Mason 'Bull' Reeves, Father of Navy Carrier Aviation," in Smith, 66.
[327] Geoffrey Till, *Air Power and the Royal Navy, 1914-1915: A Historical Survey* (London: Jane's Publishing, 1979), 46.

interwar period. This problem was more serious than the U.S. Navy since virtually all experienced aviators were transferred to the air force when it became an independent service. However, the British Navy did not create an equivalent flight training course to transfer senior officers from other branches into naval aviation. Nor did the navy make any special provision for aviators to make them command aircraft carriers. This was primarily because the British Navy considered it necessary for carrier captains to have a high degree of seamanship in handling such difficult vessels. As Till pointed out, the navy's view was partly justified since some of the best carrier captains and air advocates were not qualified aviators, but this policy certainly did not give any great future prospect for naval officers attached to the Fleet Air Arm.[328]

The Japanese Navy made efforts to maintain a ratio of at least fifteen percent commissioned officers among all aviators. However, it could not sustain this level, which sometimes fell to ten percent.[329] As of November 1940, there were 340 pilots and 172 observers whose ranks were higher than ensign, in addition to 64 reserve officers. This small number of officer pilots had negative effects on naval aviation during the Pacific War. Even when the navy realized that air war would require many more pilots than anticipated, it could not rapidly expand its pilot corps because there were not enough experienced pilots available as training instructors. In this sense, the Japanese Navy only succeeded in creating enough elite carrier pilots to carry out the initial offensive operations, including the Pearl Harbor attack; it failed to prepare for total war with the United States.

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[328] Ibid., 45.

[329] Vice Admiral Tasuku Nakazawa, director of the department of personnel management, later wrote that the actual ratio of officer pilots was from 6 to 8 percent. Nakazawa Tasuku Kankokai, ed., *Kaigun chujo Nakazawa Tasuku: Sakusen bucho, jinji kyokucho no kaiso* [Vice Admiral Tasuku Nakazawa: His recollections as chief of operations and director of the Personnel Bureau] (Tokyo: Hara Shobo, 1979), 216.

One of the unique features of the Japanese Navy's personnel policy was its training of observers. As discussed, while the U.S. Navy utilized the Observer Training Course as a way to transfer seasoned and capable officers from other branches to command air stations and carriers, the Japanese Navy did not have an equivalent system throughout the interwar period. This decision was largely attributed to the navy's belief that capable commanders could direct air operations without any first-hand flight experience if they had aviators as their deputies or staffs.[330] In addition to this belief, the Japanese Navy had an integrated program to train both pilots and observers. As discussed, the navy believed it necessary for both groups of aviators to know each other to coordinate better in the air, consequently integrating the two separate training courses into one. This policy reflected the navy's view that its observer training program was intended as a rigorous training course for producing dedicated specialists with the same selection criteria as pilots.

Instead, the Japanese Navy simply picked promising senior officers trained in other branches and transferred them into the naval aviation, one prominent example being Admiral Isoroku Yamamoto. Yamamoto was said to have received flight training while he was the deputy commander of the Kasumigaura Air Station. However, his training was conducted on an ad-hoc basis, not under any formal arrangement. Therefore, his case was unique in the environment where flight training then was considered very risky and only a few brave senior officers were willing to receive such training.[331]

In any case, most of the handpicked officers had commanded carriers or

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[330] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 32.
[331] Rear Admiral Masataka Ando also learned to fly and could eventually pilot aircraft solo when he was commander of the Kasumigaura Air Group. But, Ando was considered very active since he was too senior in his rank and age to receive flight training. Ryunosuke Kusaka, *Rengo kantai; Kusaka moto sanbocho no kaiso* [The Combined Fleet: A reflection of Kusaka, former chief of staff] (Tokyo: Mainichi Shimbunsha, 1952), 304.

air groups in their career. Some of them even received brief flight training prior to their assignments. However, once the Pacific War started, the navy did not have time to give introductory training for newcomers and had to assign officers who had any prior experience to command carriers or air groups. On one hand, this policy did have positive influence over the development of naval aviation in that those officers from other branches brought new and broad perspectives among aviators. On the other hand, there were more problems in directing and commanding air operations during the war.

Also, Japanese strategic thinking had substantial influence over its personnel policy. Under the limits of economy and resources and, most important, the treaty provisions, the Japanese Navy had to focus on "defeating many with few." In its intercepting strategy to defeat the numerically superior U.S. fleet, the Japanese Navy emphasized training and tactical skills. Training had been so emphasized so as to become a tradition after the Russo-Japanese War when Vice Admiral Goro Ijuin trained his fleet in order to raise morale. The Washington Treaty of 1922 was also a turning point because it put a limitation on the number of battleships and the total tonnage of aircraft carriers, also led the Japanese Navy to limit the total number of personnel. This tendency was amplified because of the Japanese budgetary system where the navy's personnel costs were estimated only after its procurement budget was approved by the budget authority. However, it was believed within the navy that it took ten years to produce lieutenants and twenty years to train commanders. Therefore, in theory, personnel training should have been at least ten years ahead of any major procurement, but the navy in actuality focused on equipment much more than personnel.

Officer promotion was another area where the Japanese Navy could not

demonstrate its flexibility. The most dominant factor which determined officer promotion was class standing of the Naval Academy. According to one statistical survey, there was a strong correlation between the class standing of the Naval Academy and those who reached flag ranks. Officers' standing might have been slightly affected by their job performance until they reached the rank of lieutenant. However, beyond that point, officers were promoted almost exactly in accordance with the standing.[332] Admiral Tasuku Nakazawa, who had served as Director of the Personnel Bureau of the Navy Ministry during the Pacific War, pointed out that there were three basic and unwritten principles in terms of promotion policy within the navy. First, difference in their ranks among officers of the same graduating class should be limited to two ranks (later expanded to three during the Pacific War). Second, promotion beyond regular consideration should be limited up to captain level. There would be no change in the officer standings beyond flag ranks. Accordingly, senior officers who were out-promoted by junior officers would be put into reserve. Third, Naval Academy graduates should be promoted at least to the rank of captain by their retirement as long as they were healthy and did not show any notable lack of competence in their regular duties. While some of these principles were loosened during the Pacific War under wartime pressure, they had been preserved throughout the interwar period, which reinforced conservatism within the navy.[333]

At the same time, Nakazawa criticized the navy's rigid promotion policy by pointing out that while some who graduated from the Naval Academy below average could demonstrate their true abilities, others with higher standings left no outstanding achievements due to their lack of efforts and mediocre

[332] Mitsuhisa Kumagai, *Nihon kaigun no jinteki seido to mondaiten no kenkyu* [A study on the Japanese Navy's personnel system and its problems] (Tokyo: Kokusho Kankokai, 1994), 260-265.
[333] Nakazawa Tasuku Kankokai, ed., *Kaigun chujo Nakazawa Tasuku*, 214-215.

performance.[334] Despite this kind of observation, the Japanese Navy seldom handpicked junior officers beyond regular promotion. The Japanese Navy divided officers from the same class into several groups and top groups were usually promoted earlier than older officers from the previous classes. However, according to Nakazawa, even in such rare cases, there were only few instances where individuals with unique abilities or outstanding achievements were promoted.

Despite this rigid personnel policy, the navy's assignment of new officers was favorable to the development of naval aviation. Under the Japanese Navy's strategic thinking, it is clear that the navy did not give naval aviation a top priority. However, once naval aviation was recognized as one of the combat arms within the navy, the navy treated the new branch at least equally vis-à-vis other branches in terms of allocation of officers. Thus, the best and brightest officers were assigned evenly, sometimes against their personal preferences, into such specialties as gunnery and torpedoing, as well as aviation according to their class standings at the Naval Academy. In consequence, while annual outputs of Naval Academy graduates were very limited in the interwar period, at least some of the best officers with good prospects for promotion were automatically assigned as aviators, which contributed to enhance organizational representation of naval aviation.

Still, there were not enough aviators in the major commanding positions of air groups and, more importantly, air fleets. As a result of the navy's personnel policy, it is well known that Vice Admiral Chuichi Nagumo, commander of the First Air Fleet which attacked the Pearl Harbor, was a non-aviator. During the Pacific War, it is said that Nagumo did not take any leading role in planning and

[334] Ibid., 214-215.

directing air operations and basically endorsed what his subordinates recommended. In addition, Nagumo's chief of staff, Rear Admiral Ryunosuke Kusaka and his principal senior staff, Tamotsu Onishi were not actively engaged in actual planning since neither of them were aviators.[335] Instead, Commander Minoru Genda, senior staff for air operations, exercised far more influence than his rank to the extent that the First Air Fleet was called as "Genda's Fleet."[336] However, military organizations are hierarchical in nature, and it is commanders who make final decisions. Consequently, the fact that those senior commanders lacked flying experience did have negative impacts when they make quick tactical decisions during actual battles.[337]

In addition, while seven of the forty highest ranking officials in the U.S. Navy were qualified aviators or observers, the Japanese Navy had only one aviator as vice admiral among eleven admirals and fifty-one vice admirals at the start of the Pacific War.[338] Even during the war, there were only two aviators who occupied important posts within the navy: Takijiro Onishi who became vice chief of the Navy General Staff and Misao Wada who became director of the Naval Aviation Department.[339] Onishi and Wada assumed the posts in the final phase of the war where the navy did not have any meaningful air power, let alone carrier force. As Rosen pointed out, in the case of the U.S. Navy, Moffett's success was closely linked to the pace of promotions of both junior aviators, and senior officers turned to aviation. His strategy for innovation was "…based on shaping the

[335] Kusaka actually tried to learn how to fly when he served at the Kasumigaura Air Group. However, he spent only twelve to thirteen hours on a seaplane trainer with an instructor on board. Kusaka, *Rengo kantai*, 300-301.
[336] NIDS, *Senshisosho: Midway kaisen* [War history series: The Battle of Midway] (Tokyo: Asagumo Shimbunsha, 1971), 136.
[337] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 32.
[338] Hone, Friedman and Mandeles, *American and British Aircraft Carrier Development*, 52 and Kaigunsho, Jinji Kyoku [Bureau of Personnel, Navy Ministry], *Geneki kaigun shikan meibo, showa 16 nen 12 gatsu 1 nichi shirabe* [Directory of active-duty naval officers as of December 1st, 1941], 1-9.
[339] Teiji Nakamura, *Nichibei ryokaigun no teitoku ni manabu: Dainiji sekaitaisen ni okeru tousotsu no kyokun* [Learning from the admirals of the Japanese and U.S. Navies: lessons of leadership during the Second World War] (Tokyo: Heijutsu Dokokai, 1988), 29n3.

process of generational change in the officer corps," which took about twenty-five years.[340] However, by not introducing the formal flight training course for senior officers, the Japanese Navy failed to make them acquire flying skills critical for directing air operations. As the navy did not substantially increase the size of Naval Academy until the very end of the 1930s and followed the very rigid promotional policies, it also failed to promote junior officers senior enough to critically influence the navy's policy on naval aviation.

In spite of the limitations in expanding the officer aviator corps, the Japanese Navy achieved relative success in promoting aviators to senior positions compared at least with the British Navy. On one hand, Geoffrey Till pointed out that, by the start of the Second World War, the British Navy had only one rear-admiral and a few commanders and junior captains who received flying pay.[341] On the other hand, the Japanese Navy had more aviators in senior positions than the British Navy. There was one vice admiral, eight rear admirals and thirty-six captains who were aviators by training at the start of the Pacific War without counting other air-minded, but non-aviator admirals like Isoroku Yamamoto and Shigeyoshi Inoue.[342] However, the number of aviators who occupied major command positions was still smaller than those of the U.S. Navy. The more serious problem was that there was no perfect solution to solve an absolute shortage of aviators by recruiting commissioned officers only. Accordingly, the Japanese Navy had to find other viable ways to recruit aviators without threatening the existing personnel hierarchy.

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[340] Rosen, *Winning the Next War*, 80.
[341] Till, *Air Power and the Royal Navy,* 45.
[342] These numbers are based on the following sources. Kaigunsho, Jinji Kyoku, *Geneki kaigun shikan meibo, showa 16 nen 12 gatsu 1 nichi shirabe*, 1-76; Kaikukai, *Kaigun kuchu kinmusha (shikan) meibo*, 1-6. In total, there were 11 admirals, 62 vice admirals, 171 rear admirals, and 492 captains as of December 1st, 1941.

Noncommissioned Officers

In the early days of naval aviation, officers were considered ideal for pilots and observers because aviators were thought to be required to make broad tactical decisions while flying. However, as discussed, there were not enough commissioned officers to man the increasing number of aircraft. In order to fill this gap, many alternatives were tried, but one of the readily available options was to recruit noncommissioned officers. Unlike commissioned officers who came mostly from elitist cadet schools in a small number, noncommissioned officers consisted of the majority of navy personnel. More noncommissioned officers in naval aviation might have as well meant less of them in other branches under the fiscal austerity in the interwar period, which naturally caused organizational resistance within the navy. However, given the fact that all the three navies basically accepted noncommissioned officers in their aviator corps, it was a matter of each navy's decision as to how to strike a balance between commissioned and noncommissioned officers.

Unlike the U.S. Navy which adopted the conscious policy to form a predominantly officer aviator corps, both the British and Japanese Navies needed to assign noncommissioned officers as aviators for different reasons. As mentioned earlier, the British Navy had a hard time recruiting volunteer officer pilots to fill the increasing billets of the Fleet Air Arm. The British Navy planned to train its noncommissioned officers as pilots, which the Air Force refused to accept. Also, one of the original objectives of having naval officers in the Fleet Air Arm was to diffuse knowledge of naval aviation among senior officers. Only after both services agreed that the navy took full administrative responsibility of the Fleet Air Arm, did the navy start training around twenty noncommissioned

officers as pilots in 1938.

The British Navy also wanted to train noncommissioned officers not only as pilots but as observers. As discussed, only officers were assigned for observers as a way to increase naval officers in the Fleet Air Arm. However, as the shortage of officers got worse, the British Navy started training noncommissioned officers as observers by creating a new class of them who could be promoted up to warrant officers in 1935. In any case, it was mainly due to the Dual Control that the British Navy could not recruit noncommissioned officers in earnest for the Fleet Air Arm in order to solve the shortage of aviators.

While the Japanese Navy found it difficult to expand its officer pilot corps without destabilizing the existing hierarchy, demands for aviators were increasing with the rapid expansion of naval aviation. The Japanese Navy tried to solve this dilemma primarily by recruiting noncommissioned officers and consequently established two recruiting systems. First, it began recruiting noncommissioned officers already in fleet service, which was called the Hikojutsu Renshusei (Pilot Trainee), later renamed to Kokujutsu Renshusei, program. Second, the Yokaren (Flight Reserve Enlisted Training) program directly recruited youngsters in civilian life was established.

Recognizing the need to expand a personnel pool for aviators, the navy decided to test if noncommissioned officers in fleet service were fit to fly aircraft as early as January 1916. Two officers were selected out of fifteen candidates who belonged to the Yokosuka Naval Base and given flight training from June 1916. The result was satisfactory; thus, the navy decided to formally set up the program to recruit noncommissioned officers already in fleet service in July 1917.[343] Under this program, noncommissioned officers aged lower than twenty-

[343] Kaigun Koku Honbu, *Kaigun kouku enkakushi*, vol. 3, ch, 9, sec. 1, 2.

two were recruited as pilots and given one year of flight training. Under the Pilot Trainee program, observers and maintenance crews were also trained. The program was continued even after the Yokaren system had been established in 1930. However, the program was integrated with the Yokaren system in May 1940 possibly because the massive expansion of the program lowered the quality of trainees.[344] In total, 3,334 pilots and 4,099 observers had been produced from 1921 to 1941 through this program.[345]

The second recruitment system for noncommissioned officers, which became a backbone of aviator recruitment for the Japanese Navy, was the Yokaren program. The Yokaren program intended to train capable noncommissioned officers to complement the shortage of officers in naval aviation. The original idea was proposed at the Provisional Research Committee on Submarines and Aircraft in June 1918. The Committee recognized that all aviators should be officers, but the navy actually needed a lot of junior officers below the rank of commander rather than senior officers. However, recruiting many junior officer aviators would alter a proper balance across the branches and consequently cause administrative issues in promoting and rotating them. Also, recruiting aviators from a common pool of noncommissioned officers, like the Pilot Trainee program, did cause some friction with other branches since they, too, needed capable noncommissioned officers.[346]

In order to avoid those administrative issues, the navy considered a system to directly tap a pool of youngsters to solve this dilemma. Although Japan had developed rapidly since the Meiji Restoration, there were many teenagers, particularly in rural areas, who could not go on to higher education for financial

[344] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 800.
[345] Ibid., 805.
[346] Ibid., 823.

reasons. The committee recommended that the navy recruit them as trainees and make them officers by providing three-year basic education. According to this proposal, they were not considered equivalent to Naval Academy graduates and could only be promoted up to the rank of commander, but no higher than that.[347]

Although the basic idea had been proposed as early as 1918, the Yokaren program was not realized until 1930. The reason for the delay was not certain, but the establishment of the Naval Aviation Department seemed to provide momentum to set up the system. Eisuke Yamamoto later recalled that, after assuming the first chief of the Naval Aviation Department in 1927, he ordered Lieutenant Commander Kikuji Okuda to study a system to recruit students aged between fourteen and sixteen for aviators.[348] It is also believed that Admiral Masataka Ando, successor to Yamamoto as director, also strongly supported this idea.[349] After their urgings, the navy launched the Yokaren system in December 1929, and the first trainees were accepted in June 1930.

The Japanese Navy formally gave three primary reasons for establishing the Yokaren program.[350] First, the navy estimated that, even under the current recruiting system, there would many more officers in naval aviation than other branches. According to its estimate, around the time when early aviators became eligible for promotion from the rank of lieutenant to lieutenant commander, there would be forty-nine percent more officers in naval aviation than other branches even with natural decreases. Second, it was still difficult to fill commanding posts with the existing number of officer-aviators. Third, even if the navy decided to increase the ratio of noncommissioned officers to commissioned officers, the

[347] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 823.
[348] Eisuke Yamamoto, *Nanakorobi yaoki no chi, jin, yu* [The vicissitudes of life: wisdom, goodness, and bravery] (Tokyo: Sanke Shuppan, 1979), 683.
[349] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 828.
[350] Kaigun Koku Honbu, *Kaigun kouku enkakushi*, vol. 3, ch. 9, sec. 1, 12-13.

former had to be trained longer to acquire enough knowledge and skills to operate aircraft, which would inevitably shorten the period of their active duty. In consequence, the Yokaren program was intended to train youngsters as noncommissioned officers capable enough to substitute commissioned officers as a stop-gap measure.

The Yokaren program recruited its candidates directly from civilians aged fifteen to seventeen. The term of training was three years and general academic and military education in addition to flight training was provided for the trainees. Its objective of academic achievement was set to a high school-equivalent level. Yamamoto pointed out that the trainees might be better educated than students of the Naval Academy, therefore its academic training was somewhat reduced when Vice Admiral Shigeru Matsuyama headed the Naval Aviation Department.[351]

As Yamamoto's comment indicates, the Yokaren program was an enormous success in terms of recruiting capable trainees. For the first class of 1930, there were 5,807 applicants, and only 79 were accepted as trainees. The following year, 128 trainees were chosen out of 6,858 applicants. Thanks to its success, the number of trainees increased steadily from 79 in 1930 to about 2,500 in 1941. As naval aviation expanded rapidly in order to meet the demand of war in China, the Yokaren program was further expanded in 1937 by adding another training course for civilians aged from sixteen to nineteen. This course was called the Koshu (A type) Yokaren, juxtaposed with the original Yokaren, later called Otsushu (B type) to set it apart. The term of training under the Koshu Yokaren program was eighteen months since the trainees were deemed better educated than the ones in the Otsushu Yokaren program. Its first class consisted of 250

[351] Yamamoto, *Nanakorobi yaoki no chi, jin, yu*, 683.

trainees selected out of 2,847 applicants.[352] The Koshu Yokaren program had also been rapidly expanded from 240 trainees in 1937 to 1,312 in 1941.[353] Under the two Yokaren programs, more than 11,000 trainees were accepted throughout the interwar period.

Through these recruitment programs, the majority of Japanese naval pilots were noncommissioned officers. When the Pacific War broke out, approximately ninety percent of Japanese naval aviators were noncommissioned officers while the U.S. Navy maintained an officer pilot corps consisting of more than seventy percent commissioned officers.

There were some who became officers through these programs, but they were very few in number. Those turned from noncommissioned officers to commissioned officers were called Tokumu Shikan (special appointment officer), and they served junior commanding positions in the increasing number of air groups and carrier air wings, which could not be filled by regular commissioned officers. However, they were treated differently in terms of command authority. Similar to engineering officers, special appointment officers did not have the right to command over other commissioned officers even with lower ranks than theirs, thus they occupied a lower caste in the military hierarchy.

In addition, special appointment officers were possibly commissioned as regular lieutenant commander, but each year, only four noncommissioned officers at the very end of their careers were actually promoted. At the start of the Pacific War, there were 57 lieutenant commanders who were former special appointment officers among 740 of the equal rank, but most of them were non-aviators.[354] In fact, from the promotion of the first special appointment officer to the rank of

[352] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 848.
[353] Ibid., 836.
[354] Kaigunsho, Jinji Kyoku, *Geneki kaigun shikan meibo, showa 16 nen 12 gatsu 1 nichi shirabe*, 147-219.

lieutenant commander in November 1939, only twenty-five aviators reached the same rank by the war's end.[355] As the war went on, the navy allowed aviators who had finished the Yokaren program to be commissioned as regular line officers. Under this policy, the first pilot, Yukio Endo, who finished the Otsushu Yokaren program, achieved the rank of lieutenant as late as in December 1944.[356] This peculiar arrangement in effect offered less incentive for noncommissioned officer aviators to get themselves promoted by developing their skills and abilities.[357]

The navy's decision to make naval aviators predominantly noncommissioned officers had a critical effect on the development of naval aviation, given the political clout those officers would eventually have in the navy. Unless senior leaders, who had critical influence and authority over any significant change of policy in the navy, recognized the potential of naval aviation, it was up to the junior officers to change the existing organization.[358] Therefore, the small number of commissioned officers in the Japanese case had a negative impact on expanding the influence of naval aviation.

Carrier Aviators

Since the construction of the first aircraft carrier *Hosho*, training of carrier aviators, particularly pilots, had been one of the most difficult tasks for the Japanese Navy. The first pilot to land on the flight deck of *Hosho* was William Jordan, a former British military pilot and test pilot for the Mitsubishi Aircraft Corporation. In February 1923, Jordan, under contract with the Japanese Navy,

[355] Kaikukai, *Kaigun kuchu kinmusha (shikan) meibo*, 100-102.
[356] Endo was posthumously promoted to the rank of commander in January 1945. Ibid., 101.
[357] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 857-858.
[358] For this point, see Rosen, *Winning the Next War*, 76-80.

successfully conducted nine landings on the flight deck under three different wind conditions. Considering the narrow flight deck and fixed island structure of *Hosho*, the Japanese Navy took a cautionary approach and employed Jordan who had previous deck landing experience to play safe.[359] In the following month, Shunichi Kira, who had undergone intensive field carrier landing practice, made three successful landings in front of the navy's top brass after falling off the deck on his first attempt. Through these test landings, it was confirmed that landing on and taking off from an aircraft carrier was not impossible but required extraordinary skills. As a result, the Japanese Navy assigned the best pilots for the carrier air groups.

This is one of the primary reasons why carrier pilots were so few and selective during the interwar period. Generally speaking, training new aviators required a significant amount of time. As for training new pilots, after completing basic education, one year of flight training and another year of on-the-job training were required to acquire satisfactory flight skills. However, when it comes to carrier pilots, they required additional one or even two years of additional training, which exacerbated the problem of manning aircraft carriers. Until the beginning of 1929, landing practice had been considered as an extraordinary technique that required special training, thus it became a prerequisite for pilots without any experience of landing on aircraft carriers to undertake four to six months of preparatory training on land.[360]

Some senior officers were concerned about this tendency and tried to change the practice. As discussed, Isoroku Yamamoto, when he served as deputy commander of the Kasumigaura Air Group, advocated expanding the potential

[359] Torao Kuwabara, *Kaigun koku kaisoroku, soso hen* [Recollections of naval aviation, formative years] (Tokyo: Koku Shimbunsha, 1964), 192-193.
[360] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 195.

personnel pool of carrier aviators. Yamamoto declared that the navy did not need aircraft carriers if only pilots with extraordinary talent could land on them. He believed improved training methods had to be devised so that the majority of pilots could operate from carriers. As a result, Yamamoto negotiated to assign his two subordinates, who had not been originally selected as carrier pilots to *Hosho*, in order to demonstrate that necessary skills for carrier operations could be attained through training.[361] Both of them completed one year of ship duty without major accidents, which was unprecedented.

Also, Muneo Sakamaki, commander of the carrier air groups aboard the aircraft carrier *Kaga*, also believed that landing on a flight deck should not be considered special and made efforts to simplify it. In April 1930, in order to show landing was not difficult, Sakamaki flew a carrier-borne bomber by himself and successfully landed on the flight deck only after a couple of mock deck-landing practices on an airfield ashore. Based on his own belief, Sakamaki later submitted to his seniors a proposal on training guidance for initial landing practices.[362]

Another motivator to make the deck landing practice more common was the fact that Japanese carrier force had been engaged in actual combat since the early 1930s. In January 1932, the Japanese Navy sent its seaplane carrier to Shanghai in order to support the Naval Landing Force stationed there. As the fighting became more intense, two aircraft carriers, *Kaga* and *Hosho*, were also deployed to support ground operations. While the air operations themselves were not significant, they were the first combat operations launched by carriers for the Japanese Navy. During the air campaign, the navy built a makeshift airfield in a

[361] Yoshitake Miwa, "Yamamoto gensui no omoide [Reflections on Fleet Marshal Yamamoto]," *Suikosha kiji* [Naval club magazine] 41, no. 3 (September 1943): 122-124.
[362] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 196.

suburb of Shanghai and stationed part of the carrier air groups there. Accordingly, the navy had to start training additional carrier pilots as early as possible in order to cover the temporary loss of strength in its carrier air groups. Most of the new pilots assigned to the carriers did not have any previous experience of landing on a flight deck, thus short-term landing practices using the anchored carrier *Akagi* were conducted. In total, forty-seven pilots took part in the practices held from March 1st to 26th, 1932.[363]

Despite these conscious efforts to simplify and standardize landing practice, the small number of operational aircraft carriers during the 1920s and the early 1930s limited the output of carrier pilots. During the time when *Hosho* was the only operational carrier, its aviators needed to spend the bulk of their time on tactical training and experimentation and consequently did not have much time for new pilots to conduct landing practices. Only after *Akagi* was commissioned in 1928, landing practices were conducted on a regular basis. However, even after *Kaga* was commissioned in 1930, carrier pilots were not dramatically increased. Not until 1935 did the total number of carrier pilots exceed 500.[364]

Another reason for the small number of carrier aviators was that it treated carrier-borne aircraft in the same way as gunnery and torpedoes. Following the system created for surface ships, carrier aviator training fell under the responsibility of each carrier captain and was conducted with their operating carriers.[365] Combined with its focus on a single decisive battle, the Japanese Navy did not give serious thought to a separate system to produce a large

[363] Kaigun Koku Honbu, *Kaigun koku enkakushi*, vol. 3, ch. 11, sec. 3, 180-182.
[364] NIDS, *Senshisosho: Kaigun gunsenbi 1, showa 16 nen 11 gatsu made* [War history series: Naval armaments and war preparations until November 1941, vol. 1] (Tokyo: Asagumo Shimbunsha, 1969), 675-676.
[365] NIDS, *Kaigun koku gaishi*, 12.

number of carrier aviators in a quick and efficient manner before the Pacific War. As a result, no specialized unit for training carrier aviators existed until January 1943. Only after the Battle of Midway did the Japanese Navy recognize the need for such a unit and create it with its dedicated carriers in order to quickly cover the huge loss of carrier aviators.[366]

At the time of the Pearl Harbor attack, the navy maintained approximately 600 carrier aircraft pilots with an average experience of 800 flying hours. They were arguably the best-trained pilots in the world at that point. However, when the Combined Fleet prepared for the Pearl Harbor attack, the navy had to transfer most of the highly trained aviators from other small carriers in order to man the four fleet carriers of the First Air Fleet. The manning problem was much worse for the newly built carriers, *Shokaku* and *Zuikaku*, which were commissioned a few months before the Pearl Harbor attack. There was no available aviator pool left within the Combined Fleet; therefore, they sought aviators ashore. However, those who had enough experience and skills to become carrier aviators were mostly instructors for new pilots and observers. If the fleet drew those seasoned pilots out of the air stations, it was clear that the lack of instructors would hamper training of new aviators who were desperately needed once the war started. In the end, the navy had no choice but to transfer those flight instructors to the carriers to conduct the attack.

The shortage of carrier aviators was not alleviated after the Pearl Harbor attack. At the beginning of 1942, shortly before the Battle of Midway, the navy maintained twelve operational aircraft carriers, but could not fully load carriers up to their maximum capacity due to the lack of carrier-borne aircraft and aviators. After the Pearl Harbor attack, the First Air Fleet had to reduce the

[366] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 736.

number of aircraft each carrier operated in order to divert some pilots to newly commissioned carriers and for training new aviators. These episodes clearly show that the Japanese Navy did not have a large pool of carrier pilots at the start of the Pacific War.

The low ratio of commissioned officers among aviators was also clearly seen in the carrier force. The small number of officer aviators also reflected the composition of carrier-borne aviators. Among 720 pilots, observers, and radio operators who participated in the Pearl Harbor attack and can be identified by names, only seventy-seven were commissioned officers, of which fifty-two were pilots.[367] Because carrier aviators were very small in number due to their highly selective nature, their organizational representation was inevitably smaller compared even to their land-based counterpart. At the start of the Pacific War, out of the captains of twelve aircraft carriers, there were only three aviators.[368] Two of them, Ushie Sugimoto and Kaoru Umetani, commanded *Ryujo* and *Hosho*, respectively, which had small hanger capacity and did not take part in the Pearl Harbor attack. The only aviator who commanded one of the large fleet carriers was Tomeo Kaku. Kaku was not a carrier aviator and spent a decade of his career outside of naval aviation right after finishing his flight training. After coming back to naval aviation later in his career, Kaku held both staff and command assignments in the air groups and fleets and had experience in commanding a seaplane carrier before serving as captain of *Hiryu*. However, Kaku was an exception rather than the rule. Most of the captains experienced aviation-related staff and command assignments in their career, but they were not aviators by training.

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[367] Actually, three of them were tokumu shikan whose status was not equivalent to regular commissioned officers. NIDS, *Senshisoho: Hawai sakusen* [War history series: The Hawaii operation] (Tokyo: Asagumo Shimbunsha, 1967), 596-616.
[368] Nakamura, *Nichibei ryokaigun no teitoku ni manabu*, 480.

Even after the Pacific War started, this situation did not improve but worsened. After the four fleet carriers, including *Hiryu*, were lost in the Battle of Midway, only two large carriers, *Shokaku* and *Zuikaku*, were left in the Combined Fleet, whose six captains until their eventual demise were all non-aviators, except Tomozo Kikuchi, who was a carrier pilot and later served as the captain of another fleet carrier built during the war, *Taiho*. Even the last fleet carrier, *Shinano*, completed in November 1944, was commanded by Captain Toshio Abe, who was a surface ship officer specialized in torpedoing throughout his career. The same was still true of the higher commands of aircraft carriers. Out of ten commanders of the five carrier divisions, each of which was usually formed with more than two carriers, there were only two carrier pilots, Munetaka Sakamaki and Torao Kuwabara, whose terms were less than one year. In addition, carrier aviators never took command of three major fleets (the First Air Fleet, the Third Fleet, and the First Mobile Fleet) containing two or more carrier divisions. In consequence, carrier aviators rarely had a chance to command aircraft carriers, let alone carrier divisions or fleets, during the Pacific War.

Reserve Aviators

Since the establishment of its air arm, the Japanese Navy did understand that more aviators would be killed in training and operations than surface ship operators, accordingly many more pilots were needed in peacetime. As naval aviation had been duly expanded throughout the interwar period, the need to increase the number of aviators became more pressing. While the Yokaren program helped to improve the situation by supplying a number of

noncommissioned officers, officer aviators were still badly needed to fill expanding junior command positions.

As discussed, the U.S. Navy with an almost all officer aviator corps faced the same problem. It, too, needed a lot of officer pilots, which could have threatened a balance of power between aviators and non-aviators within the navy. In order to solve this dilemma, Rosen pointed out that the U.S. Navy sent aviators to the Navy Reserve in peacetime.[369] The U.S. Navy established the Naval Reserve Flying Corps in 1916 and relied heavily on reservists during the First World War. After the U.S. entry into the war, the corps was duly expanded and eventually made up eighty-two percent of 37,404 personnel in naval aviation.[370] However, due to the postwar demobilization, the reservists were reduced to a degree that the reserve aviation force became virtually nonexistent by 1922.

Recognizing the need for more aviators in both peace and war, Moffett thought it necessary to reestablish reserve force and lobbied for the budget to expand it. Also, the Aviation Cadet program established in 1935 provided another source of officer pilots. Under this program, the cadets had an obligation to serve on active duty for three years after one year of flight instruction. After four years, they were to be commissioned as reserve officers. However, the program did not work as intended since cadets were not released from active duty to strengthen the Naval Reserve. From 1935 to 1940, 1,800 aviation cadets were trained, which contributed to expand a pool of officer pilots.[371]

Despite these efforts, the U.S. Navy had only 600 reserves immediately available at the start of the Pacific War. However, the reserve system provided a

[369] Rosen, *Winning the Next War*, 77.
[370] Peter Mersky, ed., *U.S. Naval Air Reserve* (Washington: U.S. Government Printing Office, 1987), 4.
[371] Ibid., 16.

breathing space in dealing with the rapid expansion of naval aviation during the interwar period. Chisholm stated that these reserve officers who served only in the junior grades supplied a large number of officers for naval aviation. As a result, naval aviation thus would "…have enough regular officers to provide organizational continuity and greater levels of expertise *and* to compete for promotion to the higher grades and positions of greatest responsibility in the Navy with non-aviator regular line officers" (emphasis added in the original text).[372]

The British Navy also recognized the importance of reserves. Under the Dual Control, the air force was supposed to supply reserves for the Fleet Air Arm. Recognizing losses suffered during the First World War, the air force planned to provide a 200 percent reserve for the Fleet Air Arm. However, the navy underestimated losses and prioritized first-line aircraft in exchange for reserves. Consequently, there was only a 20 percent officer reserve by 1935.[373] The British Navy made some efforts to improve the situation by introducing a two-week elementary course on aeronautics for reserve officers belonging to the Royal Naval Reserve, but it did not fundamentally resolve the issue by any means and remained a make-shift measure.[374] After the Second World War broke out, the Fleet Air Arm had duly expanded and the great majority of new recruits came from the air component of the Royal Navy Volunteer Reserve. Its critical importance in wartime notwithstanding, the British Navy could not utilize the reserve system to gain some flexibility in its promotional pathway in peacetime because the Dual Control did not give the British Navy primary responsibility of its personnel under the Fleet Air Arm.

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[372] Chisholm, "Big Guns versus Wooden Decks," 72.
[373] Till, *Air Power and the Royal Navy,* 46.
[374] Stephen Roskill, *Naval Policy between the Wars,* vol. 2*, The Period of Reluctant Rearmament, 1930-1939* (London: St. James's Place, 1976), 202.

The Japanese Navy was no exception. Unlike the U.S. and British Navies, the external environment in the interwar period, particularly that of the 1930s, made the need for reserve aviators more pressing for Japan. However, given the limited number of commissioned officers, coupled with the lesser upward mobility of noncommissioned officers, the Japanese Navy had to address the shortage of officer pilots by means other than recruiting new commissioned officers through the cadet schools. For this sake, the Japanese Navy also tried to introduce various reserve officer systems. In particular, there were three primary systems the Japanese Navy introduced in order to recruit reserve officers.

The navy first established the Reserve Aviators Training system in 1921. Under this system, only noncommissioned officers were trained, not officer reserve pilots. With the rapid expansion of naval aviation during the 1920s, it was required to swiftly increase the number of aviators. However, there were very few reserve officer pilots and most of them were retired from the active roster due to their age. As a result, there was virtually no real reserve officer corps in the navy's hand. Against this backdrop, Vice Admiral Shigeru Matsuyama, director of the Naval Aviation Department, pointed out that, among all the branches within the Japanese Navy, only naval aviation lacked a reserve force. He argued for creating a wartime reserve force and ordered both the general affairs and education and training sections to consider new reserve systems.[375]

The Japanese Navy then tried to address this problem by recruiting graduates of the nautical colleges for reserve officers. Those students were originally recruited as reserve officers for the merchant marine, but the navy thought it convenient to select some of them to give flight training. Under this

[375] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 901.

system, students were given six-month flight training and commissioned for three years. It turned out that they were very capable, and some of them were commissioned as active duty officers after three years of mandatory service. This reserve system was discontinued shortly after its inception due to high demands of crewmen for merchant ships. From June 1933 to August 1935, only forty-two students completed the training course ,and twenty-nine aviators were commissioned as active duty officers within one year after completion.[376] Given its small number of trainees, this reserve system did not fundamentally rectify the shortage of both reserve and active-duty officers.

In order to address the shortage of reserve officer aviators, the navy then introduced the Kaigun Yobi Gakusei (Navy Student Aviation Reserve) program. This program was intended to recruit college students across the country as reserve aviators. However, in order to keep step with the equivalent army reserve system, the term of formal training was limited to one year, including flight training. The navy thought the term insufficient and planned to provide additional flight training during their college years. For this sake, the Japanese Navy promoted civil aviation among college students and encouraged each college to establish an aviation club. The navy provided old naval aircraft for the clubs, whose members had an obligation to serve as reserve officers upon graduation. In order to support the aviation clubs, the navy set up the Maritime Bureau under the Japan Student Aviation League in June 1934 and the Naval Aviation Department oversaw its overall operation.

Meanwhile, the Navy Student Aviation Reserve program was formally started in November 1934. Most of the trainees were adopted from the flying clubs and they were given two-month basic training in Yokosuka to learn

[376] Ibid., 915-916.

requisite skills as naval officers. They were then moved to Kasumigaura to receive ten-month basic flight training to complete the course. Before the Pacific War, a total of 179 students were accepted and 168 were commissioned as reserve officers.[377] Initially, their status was regarded higher than noncommissioned officers, but lower than warrant officers. In addition, for the first three classes, they were initially put into reserve and called up later. However, from December 1941, all the students were considered equal to cadets.

Also, after 1937, they were recalled right after completing the training course and some of them voluntarily became active-duty officers. That means they were actually trained not as reserve officers but as active-duty officers. After the Pacific War broke out, the system quickly expanded so as to train more than 4,700 aviators in 1944.[378] In total, 10,847 students trained under the system by the end of the Pacific War, and 2,121 were killed in action or training during the war.[379] Given the high quality of officers produced under the Aviation Student Reserve program, *Senshisosho*, Japan's official war history, states that it would have been better to increase the number of the Aviation Student Reserves instead of the Yokaren trainees from the beginning.[380] However, those junior officers who entered the navy in the late 1930s did not have enough influence and authority to change overall attitude of the navy toward naval aviation.

Although the Japanese Navy tried to increase reserve officers, who could have provided flexibility in absorbing a large number of junior officers in a short period of time, none of the systems described above functioned as intended during the interwar period. Rather than producing reserve aviators, these systems were used to recruit active duty officers in peacetime. As the U.S. Navy

[377] Ibid., 910.
[378] Ibid.
[379] Ibid., 909.
[380] NIDS, *Kaigun koku gaishi*, 66.

demonstrated, the reserve system could have ameliorated the friction caused by inserting too many junior officer aviators in the existing personnel hierarchy. However, the Japanese Navy introduced it too late under the pressure of the ongoing war in China and recruited very few reserve aviators before the Pacific War. Also, even those actually recruited were made active officers right after finishing the training course. In consequence, the reserve system did not contribute to either give flexibility in personnel management or secure necessary manpower in wartime. Rather, it was used to compensate for the lack of active duty officer pilots.

Conclusion

The Japanese Navy maintained eight fleet carriers before the Pacific War and built additional five carriers during the war.[381] Also, the navy alone had about 3,300 operational aircraft at the start of the war.[382] The sheer number of carriers and airframes clearly shows Japan's impressive war efforts given its limited industrial and technological base compared with that of the United States and Britain. Still, the disparity in material resources was so great that Osamu Tagaya points out as follows:

> Certainly, by any measure of economic activity, the disparity in industrial strength between Japan and its Allied opponents, particularly the United States, was of such magnitude that, in retrospect, it is difficult to envision how Japan ever hoped to attain victory in that global conflict.[383]

One of the clear indicators of the disparity directly related to naval aviation is the domestic aircraft manufacturing capability. According to one estimate, Japan

[381] The Japanese Navy also built twelve small carriers converted from submarine or seaplane tenders and merchant ships. Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 362-364.
[382] Ibid., 128.
[383] Osamu Tagaya, "The Imperial Japanese Air Forces," in *Why Air Forces Fail: The Anatomy of Defeat,* ed. Robin Higham and Stephen J. Harris (Lexington: University Press of Kentucky, 2006), 177.

had the industrial capacity to produce only about 550 aircraft per month at the start of the Pacific War, while the U.S. monthly output was around 2,500. The gap between the two countries widened as the war went on. In December 1942, one year after the start of hostilities, the United States came to have the capacity to produce 5,400 aircraft monthly, but Japan could manufacture 1,040 aircraft, less than twice of what it had produced at the start of the war.[384]

Given this great disparity in industrial strength, manpower might have been one area Japan could have done better through foresighted personnel management, both in terms of recruitment and training. However, the Japanese Navy also lagged behind the U.S. Navy in terms of personnel, even though there was less discrepancy in population than other areas of national power. The population of Japan in 1940 was about 72 million whereas the United States had about 150 million.[385] The disparity seemed not so great compared with other areas, particularly industrial capacities, but this was not the case. The Japanese Navy initially tried to build an all officer aviator corps but failed to do so because of the limited number of new officers flowing in from the Naval Academy. As the number of air groups and carriers grew, the navy faced a serious shortage of aviators. In order to improve this situation, the navy tried to tap a pool of youth population. However, aviator recruitment was another area where interservice rivalry worked against innovation in Japan, particularly a rivalry over drafting. While the navy traditionally relied on volunteers due to its skill-intensive and technical nature, the army based its vast manpower mostly on draftees. Because of the heavier reliance on draftees, the authority to draft youngsters was long

[384] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 2, 575.
[385] Statistics Bureau, Ministry of Internal Affairs and Communications, *Dai 64 kai nihon tokei nenkan heisei 27 nen* [Japan statistical yearbook 2015] (Tokyo: Nihon Tokei Kyokai, 2014), 34; Bureau of the Census, U.S. Department of Commerce, *Historical Statistics of the United States, 1789-1945: A Supplement to the Statistical Abstract of the United States* (Washington: U.S. Government Printing Office, 1949), 25.

held by the army. In order to deal with the increasing demand for more manpower, the Japanese Navy had to find ways to recruit capable youngsters for aviators but not infringe the army's strong grip over the draft system. The interservice rivalry brought about a number of different recruitment schemes devised by the navy.

Instead, the intraservice model clearly explains how the Japanese Navy succeeded and failed in expanding its aviator corps. The Japanese Navy was successful in producing a small, but capable aviator corps by the start of the Pacific War. In particular, as for its carrier aviators, David Evans and Mark Peattie pointed out that they were "undoubtedly the best" among the three navies in training and experience by 1941.[386] But, in so doing, it clearly took a different path from that of the U.S. Navy. The U.S. Navy, on one hand, did not increase officer aviators, who were in need to lead expanding air squadrons, by increasing the number of cadets. On the other hand, the Japanese Navy introduced the Yokaren program and relied predominantly on noncommissioned officers to make up the shortage of officer aviators particularly for junior commanding positions. The low ratio of commissioned officers among aviators did have a negative influence on the organizational development of Japanese naval aviation. Aviators were relatively new and a minority within the navy, and their organizational representation was destined to be low lest any conscious measures were taken. It was thus natural that aviators could not occupy even most of the commanding posts of air fleets and air groups throughout the interwar period.

The difference is clearly seen in terms of bridging the leadership gap when aviators were not senior enough to occupy commanding positions. Both the Japanese and U.S. navies transferred seasoned senior officers from other

[386] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941* (Annapolis: Naval Institute Press, 1997), 325.

branches to fill the commanding positions until junior aviators got senior enough to eventually replace them. However, the Japanese Navy transferred them without any proper flight training or qualification. This lack of systematic training deprived them of precious opportunities to better understand air operations, which had negative impact in expanding the cadre of senior officers who appreciated the nature of naval aviation.

The Japanese Navy was also slow to introduce reserve officers to provide some breathing space to ease the tension caused by recruiting too many aviators in a short period of time. Even when the reserve systems were introduced as the outbreak of the Pacific War drew close, they did not function as intended because of the chronic shortage of active duty officer aviators. It was actually used as a stopgap measure to meet the rapidly increasing demands from the massive buildup plans in response to the United States and the ongoing war in China.

Another critical problem in terms of personnel management was that the Japanese Navy could not predict a radical change in the nature of warfare and consequently did not prepare itself for a protracted war.[387] The Japanese Navy fixated on a decisive battle against the U.S. fleet and did not pay much attention to a possible protracted war and attritional air warfare. Under this operational concept, the navy top brass focused more on quality than quantity for the single decisive battle and did not recognize any pressing need for a lot of aviators for a long series of campaigns. In particular, as for its carrier air groups, the Japanese Navy chose to create a small, but highly trained elite cadre of aviators, which could be lost in a single battle.

In consequence, when the Japanese Navy began massive quantitative expansion during the Pacific War, it lacked instructors necessary for training

[387] Kaigun Rekishi Hozonkai, *Nihon kaigunshi* [A history of the Japanese Navy], vol. 3 (Tokyo: Daiichi Hoki Shuppan, 1995), 515.

new aviators. Worse still, some of them were converted into front-line carrier aviators for the initial operations, including the Pearl Harbor attack, which exacerbated the shortage of aviators even further.[388] In addition, although uniformed officers typically underwent a long process of training, the navy did not count trainees and students at military educational institutions into the budgetary quota of its personnel. According to the Navy Personnel Regulation, the Japanese Navy had an additional thirty percent of the quota for reserve personnel. However, this were not enough to accommodate the increasing number of students and trainees in order to meet the demand of war, and the navy managed to make room for them by extracting personnel from surface ships in reserve.[389] As a result of this policy, in times of war, those schools were to be closed and students had to be recalled for the front-line duties. This policy was not changed until the outbreak of the Pacific War, which was a part of reason why the Japanese Navy failed to quickly produce a large number of aviators during the war.[390]

Compared with the U.S. and British cases, one thing the Japanese case uniquely demonstrates is that the Japanese Navy was able to form a formidable carrier force with a very small cadre of elite aviators. Despite the skewed officer composition, it eventually created a new combat arm almost from scratch that was strong enough to conduct initial campaigns successfully in a matter of three decades. Japan could have won a short decisive battle with the air force it developed, but the war never followed the course the navy had envisaged. In consequence, the Japanese Navy, which did not prepare for a long attritional air

[388] NIDS, *Kaigun koku gaishi*, 10-11.
[389] Kaigun Rekishi Hozonkai, ed., *Nihon kaigunshi*, vol. 3, 521.
[390] The apparent lack of recognition for long attritional warfare was also clearly seen in the area of combat search and rescue. There was no specialized team to rescue downed aviators. The lack of rescue system often caused unnecessary loss of skilled pilots during the Pacific War. Ibid., 498.

war, could not build on its initial success and exhausted its core of experienced aviators in a short period of time. There were neither sufficient reservists nor new recruits readily available to cover the war loss. Finally, with the limited number of aviators in senior positions, they failed to win the political struggle to transform itself from a navy built around battleships to one centered on aircraft carriers, even after the potential of aircraft was clearly demonstrated by the Pearl Harbor attack. By the time the Japanese Navy recognized aircraft carriers as new capital ships, its main force of fleet carriers had been lost in the Battle of Midway, thus aviators never had a real chance to validate the true potential of aircraft carriers under their command throughout the Pacific War.

Chapter 6

Culture for Innovation

This chapter discusses how organizational culture promoted the process of military innovation. In so doing, it focuses on how the unique organizational culture that developed within the Japanese Navy and among naval aviators drove the aircraft carrier revolution. In particular, it demonstrates a plausible explanation as to why naval aviation was developed more successfully than other platforms which were also emphasized throughout the interwar period.

Among many drivers of innovation, Williamson Murray considers military culture as a primary driving force of the development of carrier aviation by the U.S. Navy. The organizational culture, Murray terms it as "military culture," of the U.S. Navy encouraged serious exercises, simulations, and war games, which enabled it to test new concepts in a realistic manner. He concludes that "…the greatest interwar contribution which military culture made to innovation was in allowing officers to use their imaginations."[391] Conversely, organizational culture prevented military organizations from innovating in other cases. Stephen Roskill looks to the predominant military culture within the British Navy in his effort to explain the delay in realizing the potential of aircraft carriers. He describes the British fixation on battleships and contrasts it with the organizational climate of the U.S. Navy as follows: "…whereas the disputes and disagreements of the early 1920s over naval aviation had the result of projecting the thinking of many American naval men into the future, the British Admiralty's thinking was directed more to the causes of the Royal Navy's lack of success at Jutland than to

[391] Williamson Murray, "Innovation: Past and Future," *Joint Force Quarterly*, no. 12 (Summer 1996): 55.

the question whether such lessons had any validity for the future."[392] As this statement indicates, the organizational culture of the British Navy precluded critical thinking about the role of battleships, which eventually discouraged innovation centered on aircraft carriers.

These studies suggest that cultural factors, particularly the organizational culture of military organizations, have the potential to explain the process of innovation centered on aircraft carriers. Were there any comparable cultural factors at work within the Japanese Navy? Did they promote or retard the development of naval aviation centered on aircraft carriers? Borrowing from Kier's definition of organizational culture, military culture in this chapter refers to "…the set of basic assumptions, values, norms, beliefs, and formal knowledge shared by members of the military."[393] This chapter analyzes how military culture affected the process of RMA within the Japanese Navy.

While previous case studies are certainly useful in explaining why particular services were more innovative than others, they do not necessarily explain as to the different degree of innovation achieved by each branch in a single service. Even within the same service, whose members are supposed to share largely the same tradition and value, some branches are more innovative than others branches, which cannot be explained by focusing on a single culture of the particular service. Consequently, in focusing on military culture, there are two types of organizational culture that command attention in the process of Japan's carrier development. First, a distinctive military culture existed in the Japanese navy that was different from that of the army. It is not surprising that the navy had a different military culture because it had different historical

[392] Stephen Roskill, *Naval Policy between the Wars,* vol. 1, *Anglo-American Antagonism, 1919-1929* (London: St James's Place, 1968), 249.
[393] Elizabeth Kier, *Imagining War: French and British Military Doctrine between the Wars* (Princeton: Princeton University Press, 1997), 28.

origins and operated in different geographical settings from those of the army. Second, naval aviation, one of the major branches of the navy, could have a distinctive culture different from other branches. The first naval aircraft flew in 1909, and afterwards, the naval aviation group developed fairly rapidly. In that process, aviators developed a unique military culture, different from other traditional line officers because of the nature of its equipment and techniques. This chapter discusses if there were two distinctive cultures and how these cultures affected the way the Japanese Navy adopted carrier aviation.

While recent studies demonstrate that organizational culture has great potential to explain the differences among states or military organizations in adopting an RMA, culture has been understudied, despite its importance. As a result, there are not enough case studies accumulated in the literature of RMA, not to mention the case of aircraft carrier development, to warrant a full-fledged comparative case study. Therefore, this study tries to fill the void by offering a detailed case study on the Japanese Navy and focuses on why naval aviation was more innovative than other branches within the same service through the lens of organizational culture.

Service Culture

Not all the services within the same country share identical culture. Carl Builder argues, similar to individuals and durable groups, "…the military services have acquired personalities of their own that are shaped by their experiences and that, in turn, shape their behavior."[394] Don Snider also acknowledges that there is an identifiable set of subcultures within a single

[394] Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore: Johns Hopkins University Press, 1989), 7.

military organization, and individual services have clearly different cultures.[395] Thomas Mahnken echoes Builder's observation and states that each service has its own unique culture, which he terms as "service culture."[396]

In terms of what shapes service culture, Mahnken points out that service culture is shaped by each service's history and it is "…the product of the acculturation of millions of service members over decades" supported by a network of social and professional incentives.[397] Based also on the reasoning offered by Builder, Snider argues that service cultures have been derived over time from their assigned domain of war.[398] In particular, the nature of environment each service operates does affect service culture. Ground forces tend to be personnel intensive and less dependable on technology than air forces or navies.[399] In contrast, navies are more platform-centric, centered on relatively high-value assets, than armies since they need to operate at sea, which is an unforgiving environment for humans.[400] Murray also suggests that the operational environments are particularly important to understand the peculiar cultures of respective services.[401] Due to the highly technical nature of surface, submarine, and aviation combat, he argues that the U.S. Navy embraced a "technological, engineering approach to warfare."[402]

This general observation on the navy's organizational culture emphasizing technology actually coincided with the Japanese Navy's self-image. During the Pacific War, the Research Department of the Naval Staff College

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[395] Don M. Snider, "An Uniformed Debate on Military Culture," *Orbis* 43, no. 1 (Winter 1999): 19.
[396] Thomas G. Mahnken, *Technology and the American Way of War since 1945* (New York: Columbia University Press, 2008), 6-7.
[397] Ibid., 7.
[398] Snider, "An Uniformed Debate on Military Culture," 19.
[399] Christopher Tuck, "Land Warfare," in *Understanding Modern Warfare*, David Jordan, James D. Kiras, David J. Lonsdale, Ian Speller, Christopher Tuck, and C. Dale Walton (Cambridge: Cambridge University Press, 2008), 70.
[400] Ian Speller, "Naval Warfare," in Jordan, Kiras, Lonsdale, Speller, Tuck, and Walton, 128-129.
[401] Williamson Murray, "Does Military Culture Matter? The Future of American Military Culture," *Orbis* 43, no. 1 (Winter 1999): 36.
[402] Ibid.

convened a study group and produced a study on differences in nature between navy and army officers in May 1944. In conducting the study, the Naval Staff College asked to join outside experts including such notable scholars as Teiji Yabe, professor of political science at the Tokyo Imperial University, in order to make it more objective. While focusing on political power and influence each service had over domestic politics, this study also sheds light on organizational culture of the respective services.

This study concludes that major differences in terms of political influence and strategic thinking between the two services came from their different origins and traditions. As for organizational culture, it concludes that fundamental differences emerged due to their respective ways of warfare. While the army depended on people, particularly infantry, the navy by necessity had to focus on ships and other mechanized weapons since naval battles could not be fought without warships that were inherently mechanized. The study went on to state that the differences in attitude toward technology were tantamount to the difference between "tools" and "machines." On one hand, the army mostly relied on simple weapons, thus focused on developing command and leadership skills through officer education. The navy, on the other hand, employed highly advanced weapons, which required officers to attain sophisticated understanding on technology to operate them. As a result, training naval officers needed significantly more time than their army counterparts since the navy indoctrinated technology into its officer corps to operate "machines" rather than "tools."[403]

Based on these observations, the study offered policy recommendations,

[403] Kaigun Daigakko Kenkyubu [Research Department, Naval Staff College], *Rikukai gunjin kishitsu no soi: Shuto shite seijiryoku no kansatsu* [Differences in the mindset between army and naval officers: An observation focusing on their political power], May 10, 1944, 28-30, Japan Center for Asian Historical Records, Ref. C13071349100.

one of which was to urge the army to emphasize aircraft and mechanized weapons in order to conduct modern warfare effectively by learning from the navy's proactive attitude toward technology. While the study conducted by the Naval Staff College inevitably portrayed the navy's service culture better than that of the army, the navy's emphasis on technology was more or less shared both within and without the navy.

Kiyoshi Ikeda, a former naval officer turned historian, also quoted the above study and stated that the navy historically emphasized technology more than the army. Naval vessels were mechanically more sophisticated than army equipment and required much training and education to operate them. Therefore, both commissioned and non-commissioned officers in the navy needed longer training and more technological education than army personnel. This meant that the Naval Academy emphasized technological education rather than education on leadership and tactical matters. In particular, at the Naval Academy, mathematics and English were emphasized as the basis of military education and those subjects largely determined class standing at the naval academy in the 1920s. Almost all military education at the academy contained natural science; consequently, those who were good at natural science could get better positions upon graduation. In contrast, the army cadet schools emphasized more tactical and operational issues rather than technical education and army officers received promotion in accordance with their experience in each regiment. Naval officers' promotions largely rested on class standing at the naval academy, and this basic policy remained unchanged throughout the interwar period. Therefore, Ikeda concluded that this different approach toward military education created a separate military culture between the commissioned officers of the army and

navy.[404]

Based on the differences, Ikeda also argues that the Japanese Navy came to have a unique and distinct service culture in contrast to its army counterpart. He identified two factors that shaped the navy's service culture. First, British influence over the Japanese Navy had been significant since its foundation.[405] The Japanese Navy took as its model the Royal Navy and invited British military advisers. Moreover, the navy sent junior naval officers to British military educational institutions to acquire first-rate skills and knowledge. By 1907, the navy had sent seventy-one officers to Britain alone, while eighty-nine officers had traveled to the United States, France, Germany and other European countries combined.[406] As this figure suggests, British influence was far greater than any other countries and remained dominant throughout the navy's early development.

Through British training and education, Ikeda claims that the Japanese Navy transplanted a "class society" from the British navy. The degree of stratification is clearly different from that of the army, which treated its members more equally based on rank. As Chie Nakane argues, the army maintained a sophisticated hierarchy, which represented a model of "vertical society" in Japan. She goes on to state that "…among commissioned officers in the former Japanese army the differences between ranks were very great and it is said that even among second lieutenants distinct ranking was made on the basis of the order of appointment."[407] However, there was no distinction in the social life between commissioned and noncommissioned officers. Moreover, once drafted into the army, everyone was treated equally according to ranks, regardless of their social backgrounds or personal wealth. On the other hand, the

[404] Kiyoshi Ikeda, *Kaigun to nihon* [The navy and Japan] (Tokyo: Chuokoronsha, 1981), 167-180.
[405] Ibid., 146.
[406] Saburo Toyama, *Nihon kaigunshi* [Japanese naval history] (Tokyo: Kyoikusha, 1980), 31.
[407] Chie Nakane, *Japanese Society* (Berkeley: University of California Press, 1970), 25-26.

navy was much more like a "class" society compared with the "democratic" army in terms of the division between commissioned and noncommissioned officers. The distinction is also clearly seen in the respective education systems, where naval cadet students were given the rank of warrant officer from the beginning, while army counterparts started from the lowest rank. Also, commissioned officers used different restaurants, and lived and operated in separate compartments of the ships.[408]

Notwithstanding the aristocratic nature, the *Senshisosho*, Japanese official war history series acknowledges that the progressive naval service culture emphasizing technology contributed to the overall development of naval aviation.[409] However, at the same time, there coexisted the organizational culture centered on battleships, born out of the dominant operational concept of the navy, a decisive fleet engagement. As Roskill's earlier statement indicates, this was not peculiar to the Japanese Navy. The British Navy and the U.S. Navy shared the same battleship culture, which was not particularly conducive to the development of naval aviation.

The battleship-centered service culture was harder to change because of the organizational arrangement in the interwar period. Since naval aviation was a new combat arm, junior officers, both commissioned and noncommissioned, were dominant in its aviator corps without any senior officers who received flight training. As discussed in Chapter 4, the Japanese Navy adopted a conservative personnel policy emphasizing stability. In addition, in a society where the seniority rule was highly respected, the navy also promoted its officers based more on age than other factors. Given the aristocratic and hierarchical nature of

[408] Ikeda, *Kaigun to nihon*, 141-146.
[409] Boeicho, Boei Kenshusho, Senshishitsu [Office of Military History, National Institute for Defense Studies, Japan Defense Agency] (hereafter NIDS), *Senshisosho: Kaigun koku gaishi* [War history series: A historical overview of Japanese naval aviation] (Tokyo: Asagumo Shimbunsha, 1976), 464.

the navy, how young aviators could make their voices heard by senior officers requires more detailed analysis in explaining the rapid development of naval aviation in the interwar period.

Organizational Culture of Naval Aviation

Not all combat arms under a single service share the same organizational culture. As with service culture, each combat arm operates in different environments and employs different platforms, which contributes to creating a unique organizational culture. Stephen Rosen points out that "[e]ach branch has its own culture and distinct way of thinking about the way war should be conducted, not only by its own branch, but by the other branches and services with which it would have to interact in combat."[410] In the same manner, James Wilson also suggests that there are multiple cultures within the same service. He points out that the culture of the U.S. Navy is very different among submarines, aircraft carriers, or battleships.[411] Kier also states that different branches have different cultures. In particular, she goes on to argue that these differences matter since they create different responses to the same stimuli. For example, as discussed earlier, the British Army failed to adopt mechanized warfare in the interwar period because of the gentlemen-officer culture and the regimental system dominated by infantry and cavalry. However, through comparing the professional journals published within the army during the same period, she demonstrates that technical branches showed better understanding of

[410] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), 19.
[411] James Q Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York Basic Books, 1989), 92.

mechanized warfare than traditional branches.[412] It thus indicates that different branches with different organizational cultures exhibit different degrees of receptivity to technology.

Did an organizational culture distinct from the navy's service culture develop among aviators? Some former naval officers, namely aviators, argue that organizational culture in naval aviation was certainly different. Chikao Yamamoto, who was a former officer pilot and achieved the rank of rear admiral by the end of the Pacific War, argues that naval aviation as a part of the navy certainly formed its organizational culture within the good old naval tradition, but it was distinctively unique compared to those of other branches developed even within the same cultural creed.[413]

Kyuji Tsunoda, a former naval pilot turned military historian, also identified two characteristics formed among aviators: an atmosphere promoting research and development and naval aviators' risk-taking mindset.[414] The atmosphere encouraging research was cultivated primarily due to the fact that naval aviation was rapidly developing throughout the interwar period. The navy top brass, mostly composed of non-aviators, had a hard time grasping rapidly changing technology and predicting its future direction. As a result, naval aviators were often given less demanding missions than what they could have achieved if the state of their development had been properly understood by senior leaders.[415]

Although aviators had a hard time convincing senior leaders of the potential of aircraft, there was a unique organizational atmosphere where junior

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[412] Kier, *Imaging War*, 134.
[413] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi* [The history of Japanese Naval Aviation], vol. 1 (Tokyo; Jiji Tsushinsha, 1969), 964.
[414] NIDS, *Kaigun koku gaishi*, 15-17.
[415] Ibid., 15.

officers had disproportionate political influence in devising tactical and operational concepts. Chikao Yamamoto states that, whereas gunnery and torpedo officers already established their tactical and operational concepts by the late 1920s, aviators did not have any such shared concepts throughout the interwar period. Rather, there were so many suggestions proposed by aviators that created a constant state of confusion in search of new concepts for breakthroughs.[416] Under this circumstance, junior aviators with first-hand experience were in the best position to realize the potential of aircraft, and it is they who had to explore new ways of air operations. In particular, junior officers who piloted aircraft accumulated operational experience by commanding units regardless of their size. Minoru Genda, one of the most influential aviator officers in naval aviation, described the difference in characteristics between surface ship officers and aviators. In other branches of the navy, commissioned officers could perform their duties as commanding officers using their general tactical decision making and leadership skills even though their individual techniques and skills were inferior to those of non-commissioned officers. This was mainly because their assigned tasks were inherently different between the two officers. However, aviators had to play many different roles in a single aircraft and there was less distinction among them. As for fighter pilots, a single pilot had to perform many different duties all by himself. The nature of aircraft operation made the distinction between military leaders and subordinates less clear among aviators.[417]

Genda also points out that naval aviators themselves largely formed

[416] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 967.
[417] Minoru Genda, *Kaigun kokutai, hassin* [Naval aviation groups, take off] (Tokyo: Bungei Shunjusha, 1997), 61-62.

policies regarding naval aviation.[418] As a result, junior aviator officers had much greater influence because senior leaders did not have sufficient knowledge and experience in the area.[419] This factor determined that senior naval officers largely from surface ships were less influential on the development of naval aviation than on other branches. Aviators were the chief military commanders in the air and accumulated experience as military leaders unlike surface ship officers who worked on staffs long before they became captains. In response, senior leaders in naval aviation were more inclined to listen to their opinions. As discussed in the previous chapter, this environment actually explained the relative autonomy Genda enjoyed in planning air operations for the Pearl Harbor attack and the initial phase of air campaign. Given the inherent hierarchical nature of military organization, this situation was rather unusual. However, this work environment allowed junior aviator officers like Genda to exert more influence than those with the same ranks to get around conservative non-aviator commanders.

Those opinions to senior leaders came even from noncommissioned officers, and some of them were actually accepted despite the navy's aristocratic nature. Even among low-ranking officers, there existed an atmosphere which encouraged them to express novel ideas.[420] At the same time, it is also certain that, same as other branches within the navy, there was an institutional gulf between commissioned and noncommissioned aviators. As discussed in the previous chapter, a clear and strict distinction in terms of promotion between the two aviator groups existed. As Osamu Tagaya points out, the elitist attitudes of the Naval Academy graduates "raised an impenetrable barrier" for

[418] Ibid., 139.
[419] NIDS, *Kaigun koku gaishi*, 15.
[420] Ibid.

noncommissioned officers to enter the higher echelons of the naval fraternity.[421] However, mainly due to the fact that most aviators were noncommissioned officers and sometimes much better in terms of flying skills than commissioned officers, they earned more respect from their superiors than those of other branches because such skills were more clearly demonstrated in the case of operating aircraft than surface ships.

The risk-taking mindsets were also nurtured among aviators because of the performance of early aircraft. When the Japanese Navy first introduced aircraft, they were fragile, dangerous to operate, and susceptible to weather changes. Furthermore, weather forecasting techniques were primitive and both onboard and ground equipment to overcome inadvertent weather was virtually nonexistent. However, in order to appeal the potential of aircraft to senior officers who did not understand air operations, aviators had to take risks to achieve desired missions, which naturally forged the risk-taking mindsets among them.[422] Moreover, as air squadrons were always led their way by commanding officers, it was commissioned officers who took the risk of conducting dangerous experimentations in order to improve air tactics. In general, aviators believed that they could not conduct sufficient combat training without running some risks and commissioned officers had to set the example in doing so, which comprised another characteristic of the organizational culture among naval aviators.[423]

These cultural traits helped to promote the development of tactics and operations of aircraft. However, the organizational cultures developed among aviators were not always conducive to innovation. There were some

[421] Osamu Tagaya, *Imperial Japanese Naval Aviator, 1937-45* (Oxford: Osprey, 2003), 25.
[422] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 965.
[423] NIDS, *Kaigun koku gaishi*, 16.

organizational traits which contributed to forge negative images and reputations toward aviators within the navy, which was counterproductive in expanding their political influence according the intraservice model. Chikao Yamamoto points out that one such negative cultural trait was overconfidence cultivated among aviators. This tendency was further exacerbated by the fact that pilots could operate their aircraft by their own decision without any direct interference from outside after taking off.[424] This sense of privilege developed among aviators surely gave a negative impression within the navy as a whole that honored order and stability in its daily operation. In addition, aviators viewed themselves differently from sailors and officers in other branches and vice versa. Even in terms of appearance, aviators looked different from surface ship officers. For example, not only commissioned officers, but also noncommissioned officers wore longer hair than customarily allowed. Seeing this practice as a sign of lax discipline, Isoroku Yamamoto, then deputy commander of the Kasumigaura Air Group, once ordered them to cut their hair short.[425] However, this negative aspect of the organizational culture never led aviators to argue for an independent air force, unlike the British and U.S. Navies. As discussed in Chapter 3, while aviators constantly asked the navy's top brass to appreciate the true value of aircraft, they also believed that naval aviation had to be a part of the main fleet in order to exploit its full potential. In this sense, it was fortunate for Japanese naval aviators not to be seen as a threat to the navy's organizational interest by having a separate identity originated from their peculiar organizational culture.

[424] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 1, 969.
[425] Yoshitake Miwa, "Yamamoto gensui no omoide [Reflections on Fleet Marshal Yamamoto]," *Suikosha kiji* [Naval club magazine] 41, no. 3 (September 1943): 115-116.

Shaping Technological Options

While the navy's service culture was more technology-oriented largely due to its operational environment, the organizational culture nurtured in the naval aviation branch also had positive impacts on promoting cutting-edge research. One of the glimpses of the cultural traits is clearly seen when compared with the army in their aircraft design processes. Richard Samuels claims that army officers, on one hand, were a bit aloof and active only in ordering, inspection and repair, and rarely consigned research and design work to civilian firms. Navy officers, on the other hand, closely cooperated with private firms in designing aircraft and engines.[426]

The unique cultural traits in naval aviation are also seen in aviation research and development institutions. For the sake of promoting aircraft development, the Japanese Navy established Kaigun Koku Sho (the Naval Air Arsenal) in 1932. The Naval Air Arsenal was reorganized and renamed into Kaigun Koku Gijutsusho (the Naval Air Technical Arsenal), Kugisho in short. The Kugisho was known to be a home of talented engineers and functioned as the center for aeronautical research for the navy working closely with private firms. Samuels quoted Ryoichi Nakagawa, the chief designer of several aircraft engines at the Nakajima Aircraft Company, saying that working with the Kugisho was very productive since the navy engineers there knew aircraft and engines much better than the army engineers.[427]

The Kugisho shared the service culture emphasizing science as a matter of course, but, at the same time, it had a clearly different organizational culture

[426] Richard Samuels, *"Rich Nation, Strong Army": National Security and the Technological Transformation of Japan* (Ithaca: Cornel University Press, 1994), 118-119.
[427] Ibid., 119.

from that of other naval research institutions. Yoshiro Ikari, a former aviation engineer, points out that, at the joint research conference with the Naval Technical Department, which was in charge of shipbuilding, junior officers from the Kugisho received more opportunities to make presentations on their research and expressed opinions more freely to senior officers. This instance shows that seniority and hierarchy mattered less in the Kugisho because its officers were relatively free from the traditions of the navy due to its shorter history than that of surface ships.[428]

The navy's service culture was well known to young engineers and there was a general consensus that the navy was more receptive to science. In contrast, the army, mainly due to its service culture, considered every civilian newcomer equally without paying due attention to their backgrounds. As a result, there was a perception formed among college students that the army treated engineers in a completely inhumane fashion.[429] In consequence, those who majored in natural science, preferred to work for the navy, if drafted. Since there were fewer scientists and engineers in the prewar Japan that those in the United States, the good reputation the navy garnered actually helped to attract very best engineers.

This reputation gave the navy a great advantage in recruiting talented engineers, particularly in the field of aeronautical engineering. Since aeronautical technology was a burgeoning scientific field in the interwar period, there were many problems to be solved only through technological advancement, which was a great appeal to young talented engineers.[430] However, only a few engineers were trained over the two decades of the interwar period. For example,

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[428] Yoshiro Ikari, *Koku technology no tatakai: "Kaigun kugisho" gijutsusha to sono shuhen no hitobito no monogatari* [War of aviation technology: Stories of engineers and people at the Naval Air Arsenal] (Tokyo: Kobunsha, 1996), 366-367.
[429] Ibid., 372. Ikari also points out the fact that Yuzuru Hiraga, vice engineering admiral, became the president of the Tokyo Imperial University after retiring from the navy, which enhanced this view.
[430] NIDS, *Kaigun koku gaishi*, 465.

Tokyo Imperial University set up the Department of Aeronautics, the first of its kind in Japan, in 1920, and the first three students graduated in 1923. The department was duly expanded, but only twenty-eight students graduated from the department as late as in 1944. Kyushu, Tohoku and Kyoto Imperial Universities also established aeronautical engineering departments in 1937, 1938, and 1942 respectively, but these departments came too late to train engineers in time for the Pacific War.[431] With fewer and younger engineers compared with other established fields, the liberal organizational culture attracted talented young engineers and created a work environment conducive to technological innovation by empowering them.

The organizational culture not only worked to promote technological development, but also shaped particular options in accordance with preference of aviators. Timothy Moy points out that the U.S. Army Air Corps' high-tech, futuristic organizational culture led the service to pursue strategic bombing as a technological alternative to horrifying trench warfare in the First World War. In its pursuit of strategic bombing, the corps favored daylight precision bombing to terror bombing against population, and thus developed heavy bombers and advanced technologies, such as the Norden bombsight, some of which were beyond their technological reach but clearly fitted its own high-tech image.[432] This is also the case with the Japanese Navy, particularly in designing its aircraft. Until the early 1930s, the Japanese Navy mostly relied on foreign technologies for developing aircraft for its own use. In most cases, Japanese

[431] By comparison, in the United States, the Massachusetts Institute Technology (MIT) offered the first course on aeronautical engineering in 1914. According to one estimate, by 1939, the number of students who majored in aeronautical engineering grew to 3,000 in the United States and Canada. Aerospace Engineering and Mechanics, College of Science and Engineering, University of Minnesota, "Early Faculty Contributes a Great Deal," last modified July 24, 2007, accessed August 24, 2015, http://www.aem.umn.edu/info/history/early-faculty.shtml.

[432] Timothy Moy, *War Machines: Transforming Technologies in the U.S. Military, 1920-1940* (College Station: Texas A&M Press, 2001), 17-97.

aircraft manufactures imported foreign aircraft and produced them under license for the navy. However, once the Japanese aircraft industry became more sophisticated by accumulating experience, the navy planned to develop indigenous aircraft from the mid-1930s. In so doing, there were notable differences in performance requirements between army and navy aircraft due to the different service cultures. For example, in developing fighter aircraft, the army, on one hand, emphasized speed and rate of climb for its fighters. The navy, on the other hand, traditionally required not only high speed but also long range since its main theater of operation was the Pacific Ocean, where only small islands scattered across the vast area served as air bases. However, high speed and long range usually cannot be achieved simultaneously, which led the navy to reduce the weight of aircraft as much as possible. Consequently, Japanese naval aircraft were put under strict design limitations and were rather fragile or difficult to manufacture.[433]

One of the most obvious manifestations of such organizational culture was seen in the development of fighter aircraft, particularly the Type Zero Carrier Fighter, which is arguably the most famed Japanese naval aircraft during the Pacific War. In developing the Zero, the navy set extremely ambitious performance requirements emphasizing speed, endurance, firepower, and maneuverability. However, those requirements were mutually incompatible and its chief designer from the Mitsubishi Internal Combustion Engine Company, Jiro Horikoshi, had to make difficult technological trade-offs between range and firepower on one hand, which made aircraft large and heavy, and speed and

[433] Jun Okamura, "Koku gijutsu sosetsu [A general outline of aviation technology]," in *Koku gijutsu no zembo, jo* [Complete outline of aviation technology, vol. 1], ed. Jun Okamura (Tokyo: Hara Shobo, 1976), 41-42.

maneuverability on the other that required small and light aircraft.[434] What made these trade-offs more severe was the fact that none of the domestically-produced engines then available to the Zero had enough power to achieve the required performance goals, particularly high speed.[435]

Against this backdrop, when four engineers from Mitsubishi led by Horikoshi and members from the Naval Aviation Department, the Naval Air Arsenal, and the Yokosuka Air Group met to discuss the development plan in April 1938, Horikoshi explained to the navy side, particularly aviators, in charge of aircraft development that, given the technical limitations, not all of the requirements could be fully satisfied simultaneously. He then asked them if endurance, speed, and maneuverability could be prioritized. However, the aviators could not agree on which took precedence, which forced Horikoshi to satisfy all the three critical performance criteria at all costs.[436] As a result, he went to great length to reduce the weight and air drag of the Zero as much as possible, which was his only viable option to achieve the specified performance targets. In so doing, Horikoshi later criticized Japanese fighter pilots for ignoring another critical technical trend emphasizing high speed and heavy armament and put a break on the development such fighter aircraft.

The emphasis on maneuverability also stemmed from a unique organizational culture cultivated among fighter pilots. It was manifested even before designing the Zero. When Horikoshi was tasked with designing the Type 96 Carrier Fighter, the direct predecessor of the Zero, he encountered this peculiar organizational trait. The Type 96, an all-metal monoplane with record-

[434] Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2001), 90.
[435] Horikoshi later told that Japanese aviation engines at that time were underpowered by twenty to thirty percent compared with those developed by other major powers. Jiro Horikoshi, *Reisen: Sono tanjo to eiko no kiroku* [Zero fighter: A record of its birth and glory] (Tokyo: Kobunsha, 1970), 225.
[436] Jiro Horikoshi and Masatake Okumiya, *Reisen: Nihon kaigun kouku shoshi* [Zero fighter: A brief history of Japanese naval aviation] (Tokyo: Nihon Shuppan Kyodo, 1953), 94-97.

breaking performance, was not initially popular among fighter pilots since slower biplanes were considered superior in terms of maneuverability. They emphasized maneuverability so much that the Type 96 was asked to reduce its weight by the gram in order to increase maneuverability. Horikoshi was even told that reducing aircraft weight by 40-50 kilograms (about 88-110 pounds) made an enormous difference equal to that of flight skills between new and seasoned pilots, which shows the organizational climate emphasizing maneuverability among fighter pilots.[437]

Because of this intensive focus on details, Horikoshi compared the attitude of Japanese fighter pilots to that of old samurais who cared so much about the quality of their swords. They honed individual air combat skills, but those skills were cultivated exclusively by operating light, fast, and nimble aircraft. Accordingly, they developed unique skills leveraging high speed and maneuverability. There was a heated debate among aviators as to whether speed or maneuverability was more important for fighter aircraft. This debate resulted in a formal experimentation conducted by the Yokosuka Air Group by employing four types of aircraft, both foreign and domestically manufactured, with different characteristics. The lessons learned from the experimentation dictated that, although the two factors had to be balanced out, maneuverability should be more emphasized.[438] Maneuverability was further underscored by aviators who had real combat experience in China, which gave added impetus to the dominance of the organizational culture among fighter pilots.

Horikoshi and his team overcame these technical incompatibilities and completed the first prototype of the Zero in March 1939. According to Mark Peattie, the Zero was "…undoubtedly one of the most ingeniously designed

[437] Ibid., 38.
[438] Genda, *Kaigun kokutai, hassin*, 138-143.

fighter planes in aviation history."[439] The performance of the Zero was clearly contrasted with the U.S. contemporary carrier-based fighter aircraft, F4F Wildcat. While the A6M2, the first operational model of the Zero, was powered by a 950 horsepower Sakae 12 engine, the F4F-3, its first model, was equipped with a 1,200 horsepower Pratt & Whitney R-1830-86 Twin Wasp engine. In spite of the discrepancy in engine power, the A6M2 had a maximum speed of 331.5 miles per hour (mph) at 14,930 feet, which was comparable to 318 mph at 19,400 feet of the F4F-4.[440] The Zero also had a maximum combat range of 1,165 miles, more than nearly 400 miles than that of the F4F-4.[441] The outstanding performance was made possible by a much lighter airframe for the Zero, whose empty weight was only 3,704lb, whereas the F4F weighed 5,785lb.[442]

The Zero proved to be one of the most capable fighter aircraft in the initial phase of the Pacific War. Eric Bergerud described the aircraft as follows:

> In some respects the Zero was the greatest fighting aircraft of World War II. Because of its clean design, low weight relative to engine power, and high lift, the Zero was extremely nimble. At low speeds it could perform complicated maneuvers in a split second. The plane's maneuverability was so exceptional that at the end of the war, long after its brief period of ascendancy, the Zero remained a deadly adversary if combat conditions were favorable.[443]

The Zero was a clear reflection of the organizational culture emphasizing speed, endurance, and maneuverability; however, it was not flawless. One of the most serious shortfalls resulting from this design was that the Zero lacked effective protection against enemy fire for the sake of saving weight. Horikoshi later testified that there was no initial requirement of any protection for pilot and fuel

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[439] Peattie, *Sunburst,* 91.
[440] René J. Francillon, *Japanese Aircraft of the Pacific War*, new ed. (Annapolis: Naval Institute Press, 1979), 377 and Gordon Swanborough and Peter M. Bowers, *United States Navy Aircraft since 1911* (London: Putnam, 1968), 209.
[441] John W. R. Taylor, ed., *Combat Aircraft of the World from 1909 to the Present* (New York: G. P. Putnam's Sons, 1969), 253 and 501.
[442] Francillon, *Japanese Aircraft of the Pacific War*, 376 and Swanborough and Bowers, *United States Navy Aircraft since 1911*, 209.
[443] Eric M. Bergerud, *Fire in the Sky: The Air War in the South Pacific* (Boulder: Westview Press, 2001), 201.

tanks from the navy. He stated that there were two factors behind the decision not to add any protection to the Zero. First, as mentioned earlier, since fighter pilots emphasized dogfight tactics by a single aircraft, they valued maneuverability so much that there was no justification for having more weight resulting from added protection. Second, aviators did not feel any urgent need for protection since Japanese air power was generally much superior to that of China in the Second Sino-Japanese War as their most recent war experience.[444]

These characteristics were shared with other carrier aircraft that were developed around the same time. There were three types of carrier aircraft that participated in the Pearl Harbor attack including the Zero. The other two aircraft were the Type 97 Carrier Attack Bomber and the Type 99 Carrier Bomber. The B5N2, the dominant model of the Type 97 at the start of the war, was powered by a 1,000 horsepower Sakae 11 engine, had a maximum speed of 229 mph at 6,560 feet, and had a combat range of more than 600 miles while carrying a torpedo or 800 kg bomb.[445] The Type 99, on the other hand, was developed as a dive bomber whose bomb load was a 250 kg bomb. Its first production model received by the navy, D3A1, was equipped with a 1000 horsepower Kinsei 43 engine with a maximum speed of 240 mph at about 10,000 feet and a range of 915 miles.[446] The Type 99 was highly maneuverable and even used occasionally as a fighter despite its light armament.[447] However, the Type 97 and the Type 99 shared the same shortfall as the Zero: the lack of protection for aviators and fuel tanks. As these characteristics clearly demonstrate, they were developed under the influence from the same cultural traits as the Zero. Thomas Hone, Norman Friedman, and Mark Mandeles point out that the Type 97 was lighter and faster with a longer

[444] Horikoshi and Okumiya, *Reisen*, 70-71.
[445] Francillon, *Japanese Aircraft of the Pacific War*, 416.
[446] Ibid., 273, 276.
[447] The Type 99 carried only two 7.7 mm machineguns. Ibid., 273.

range than its American counterpart, the TBD Devastator, and the differences actually exhibit the different design philosophies of the two navies. They state that the Japanese "…squeezed the maximum performance (especially range from engines of one thousand horsepower," while the Americans "…put their faith in the larger, two-thousand-horsepower engine and its advantages in terms of lift and performance."[448]

The influence is also seen in the development of land-based aircraft. The Type 1 Attack Bomber, which played a key role in sinking the British battleships, *Prince of Wales* and *Repulse*, and remained the mainstay of the navy's bomber force throughout the Pacific War, clearly fits this pattern. When the Japanese Navy ordered a prototype of the Type 1 in 1937, it requested a higher speed and longer endurance in addition to heavier armament than its predecessor, the Type 96 Attack Bomber.[449] The first production model of the twin-engine bomber, G4M1, had a maximum speed of 266 mph at 13,780 feet and an enormous range of more than 3,700 miles.[450] However, in order to fulfill these requirements, its designers had to sacrifice ruggedness, armor, and armament under navy pressure, and the aircraft lacked protection for aviators and fuel tanks.[451] Due to the vulnerability of the aircraft, particularly unprotected huge fuel tanks, it came to earn such infamous nicknames as the "One-Shot Lighter" or "Flying Lighter" during the Pacific War.

After the war, Genda justified the decision prioritizing speed, maneuverability, and endurance by saying that the initial success achieved by the Zero and other aircraft developed under the same concept clearly

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[448] Thomas C. Hone, Norman Friedman, and Mark D. Mandeles, *American and British Aircraft Carrier Development, 1919-1941* (Annapolis: Naval Institute Press, 1999), 203.
[449] Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 479.
[450] Francillon, *Japanese Aircraft of the Pacific War*, 386.
[451] Peattie, *Sunburst*, 96. Horikoshi and Masatake Okumiya, former naval pilot, later criticized the design of the Type 1 for its narrow focus on endurance since bombers needed better protection because of its slower speed and less maneuverability than fighter aircraft. Jiro Horikoshi and Okumiya Masatake, *Reisen*, 332.

demonstrates its validity.[452] However, his statement is only half true. In the initial phase of the Pacific War, there were still many skilled pilots with real combat experience in China to offset the vulnerability of naval aircraft. As the war went on, those skilled pilots wore down in a series of air campaigns and newly substituted aviators could not compensate for the lack of protection with their immature skills. Given the great disparity in terms of pilot training between the two countries, the Japanese Navy should have paid more serious attention to defensive equipment of its aircraft. Despite the limited engine power, the navy planners could have added protective measures by accepting some performance trade-offs. Actually, faced with the staggering loss suffered during the war, the navy later decided to install such protective equipment as bulletproof glass, automatic fire extinguishers, and armor plate into the later models of the Zero, without a drastic increase in engine power, which could have compensated the inevitable weight increase.[453] Such consideration was ignored before the war and they deliberately chose a light and agile airframe in favor of a quick decisive battle the navy envisaged.

It is certainly true that the organizational culture formed among aviators helped to develop unique aircraft with some unparalleled advantages particularly in terms of speed, maneuverability, and endurance as the result of severe performance trade-offs, despite Japan's technological backwardness. As Murray points out, "Japanese aircraft, especially the Zero fighter, were far superior to those of their opponents – a nasty surprise to Allied pilots when their intelligence had led them to believe the Japanese were flying obsolete aircraft."[454]

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[452] Genda, *Kaigun kokutai, hassin*, 141-142.
[453] The navy did the same thing for the Type 1 Attack Bomber. One of the later models developed during the war was intended to beef up protection by sacrificing the range by one third. Nihon Kaigun Kokushi Hensan Iinkai, ed., *Nihon kaigun kokushi*, vol. 3, 480.
[454] Williamson Murray, *War in the Air 1914-45* (London: Cassel, 1999), 180-181.

It is also true that the Japanese Navy clearly recognized the lack of ruggedness and protection and the urgent need for developing new aircraft to rectify it. In fact, shortly after the Pearl Harbor attack, the navy initiated the development of nine different aircraft, including the Reppu, the successor to the Zero, along with eight other prototype projects already started before the war.[455] However, almost all the newer aircraft came too late and did not substantially contribute to change the tide of war.[456] The fact that the navy had to rely on the Zero and its contemporaries up to the war's end demonstrates how the cultural traits casted a long shadow over the effectiveness of Japanese air power.

Failed Innovation: Submarine

As discussed in Chapter 1, the Japanese Navy did not focus solely on aircraft carriers in order to cope with the superior U.S. naval power. Recognizing the disparity posed by the naval limitation treaties, the navy emphasized asymmetrical warfare by employing platforms outside of the treaty limitations, and the submarine was clearly one of the most promising platforms. Eisuke Yamamoto, the earliest air advocates within the navy, acknowledged the potential of submarines as much as aircraft.[457] The navy possessed sixty-four submarines at the start of hostilities and planned to build an additional twenty-nine submarines in various sizes during the war.[458] They were considered as an

[455] NIDS, *Kaigun koku gaishi*, 284-286.
[456] Okumiya and Horikoshi point out that, among those, the development of four aircraft, including the Reppu, were completed by the end of the war. However, three of them came too late and made no substantial contribution to the war. They conclude that only Saiun, carrier-based reconnaissance aircraft, came in time and accomplished some important reconnaissance missions during the war. Horikoshi and Okumiya, *Reisen*, 284.
[457] Eisuke Yamamoto, *Nanakorobi yaoki no chi, jin, yu* [The wisdom, benevolence, and courage of the vicissitudes of life] (Tokyo: Privately published, 1967), 719.
[458] NIDS, *Senshisosho: Kaigun gunsenbi 1, showa 16 nen 11 gatsu made* [War history series: Naval armaments and war preparations until November 1941, vol. 1] (Tokyo: Asagumo Shimbunsha, 1969), 839-843.

auxiliary force to the main fleet in a possible decisive engagement with the U.S. fleet in the South Pacific. In particular, they were to be used for reconnaissance and, wherever possible, attacking enemy warships, especially battleships. In the Pearl Harbor attack, the Japanese Navy deployed twenty-seven submarines around Hawaii in order to conduct surveillance on the U.S. fleet and intercept U.S. warships sallying out after the aerial attack. Moreover, it is also symbolic that the first shot was actually fired not by carrier aircraft, but by five midget submarines launched from fleet submarines.

Despite the navy's heavy investment and high expectation before the war, Japanese submarines could not demonstrate their strategic value during the Pacific War. It is certain that some of the most valued targets were sunk by submarines, including sinking of the fleet carriers *Yorktown* and *Wasp* and the heavy cruiser *Indianapolis*. However, they targeted mainly U.S. warships, but not merchant ships, which Germany and the United States mainly targeted during the Second World War. Shigeru Fukutome, former chief of staff of the Combined Fleet, later admitted that the Japanese Navy made a serious miscalculation in terms of submarine operations before the war.[459] The apparent failure begs a question as to why the submarine did not meet prewar expectations, contrary to the aircraft carrier. Similar to naval aviation, there seemed to be organizational and, more important, cultural factors to explain the causes of failure.

In terms of visionary leaders, there were several influential senior officers who contributed greatly to the development of submarines and their tactics. In particular, it was Nobumasa Suetsugu who could be called as the father of Japanese submarines during the interwar period. Witnessing the effectiveness of

[459] Shigeru Fukutome, *Kaigun no hansei* [Reflections of the navy] (Tokyo: Nihon Shuppan Kyodo, 1951), 195.

German submarines during the First World War as a naval observer in London, Suetsugu took a huge interest in submarines after his return. He then hoped to take command of the First Submarine Division and gave its submarine rigorous training. Suetsugu was considered as a prominent strategist and served several critical tours in the war planning sections within the Navy General Staff. He eventually became commander of the Combined Fleet in 1933 and focused his energy to devise new tactics in order to fill the perceived gap in force strength between Japan and the United States. In so doing, Japanese submarines were firmly integrated with the interception strategy against the U.S. fleet, the formation of which he played a critical role in. In this sense, Suetsugu was a primary driving force to give Japanese submariners exclusive focus on the anti-warship role in a possible decisive fleet engagement rather than the anti-commerce role. Whereas the United States started employing its submarines for commerce raiding immediately after the start of the war, the Japanese Navy did not pay much attention to that role and continued using them for anti-warship operations.

This inattention to the anti-commerce role was not unique to the Japanese Navy. The British Navy, which had greatly suffered from German submarines during the First World War, equally neglected the potential of submarines for that role. Jeffrey Legro attributed this failure to an organizational culture dominated by the battleship. He argues that the organizational culture of the battleship was stronger than other sea powers, which led the British Navy to underestimate the strategic value of the German submarine and overestimate the effectiveness of its own antisubmarine measures. Even when ample opportunities for its submarines to conduct antishipping operations arose during the Second World War, the British navy stood idly

without actually employing them to interdict German and Italian shipping.[460] Because the battleship was highly valued by the British Navy, the main objective of British submarines remained the enemy's warships well after the start of hostilities.

Exactly in the same manner as the British Navy, Legro suggested that the Japanese Navy was also governed by the battleship culture and largely ignored the anti-commerce role.[461] Although Japanese submarines suffered huge losses without notable effect, the Japanese Navy was slow to change its submarine tactics and stuck to anti-ship operations, particularly against warships. The *Senshisosho* attributes one of the reasons why the submarine force learned less wartime lessons than other branches within the navy, including naval aviation, to the location of military schools. The Submarine School was tasked to analyze operational lessons submitted from each submarine and squadron, and its policy recommendations should have been transmitted to the navy's top brass for implementation. However, the submarine school was located in Kure, about 400 miles from the central authority, whose location was inadequate to reflect lessons learned from experiments and operations in a timely manner.

The situation surrounding the submarine was contrasted with that of the naval aviation. In the early 1900s when the submarine was first introduced, administrative control over the submarine force was the same as other surface ships. However, as submarines were developed and expanded rapidly, it became difficult for the navy dominated by surface ship officers to give appropriate guidance to the new force. In July 1918, the Japanese Navy created the Tentative

[460] Jeffrey W. Legro, *Cooperation under Fire: Anglo-German Restraint during World War II* (Ithaca: Cornell University Press, 1995), 78.
[461] Ibid., 92n174.

Department of Submarines within the Naval Affairs Bureau of the Navy Ministry, and two officers were assigned to be in charge of submarines and their facilities. In October 1919, the Tentative Department was abolished and replaced with the Seventh Department of the Navy Technical Department. The Seventh Department was different from other departments in that its director and his subordinate were both submariners, but technical officers were shared with other branches. This means the Seventh Department did not have an organic technical planning institution to construct submarines. While the Sixth Department, in charge of aerial weapons with the identical objectives of the Seventh Department, later became independent from the Naval Technical Department and expanded in to the Naval Aviation Department, the Seventh Department had not been substantially changed in terms of organizational arrangements and functions until the start of the Pacific War. In contrast, in naval aviation, the navy established the Naval Aviation Department and the Yokosuka Air Group, both of which were located near the central authority. This combination along with the Naval Staff College formed the "Naval Trinity," which created a positive feedback loop. Policy recommendations submitted from the trinity were readily reflected in general policy of naval aviation. Only after May 1943 did the Japanese Navy establish the Naval Submarine Department within the Navy Ministry with Vice Admiral Shigeyoshi Miwa, an experienced submarine commander, as its first head. On paper, the department was in charge of planning and coordination on all matters related to the submarine. In reality, most of the officers assigned to the department concurrently held other positions at the Navy Technical Department or the Naval Ministry, which made it difficult to play the same role as the Naval Aviation Department.[462]

[462] NIDS, *Senshisosho: Sensuikanshi* [War history series: A history of submarines] (Tokyo: Asagumo

Aside from the fact that the department was hastily created in wartime, in establishing an independent department, the Japanese Navy apparently failed to establish the Naval Submarine Department in time. Shojiro Iura, a former submarine captain and strong advocate for an independent submarine department, attributed the cause to the navy's organizational culture centered on the notion that the submarine needed no special treatment separate from surface ships since they were a kind of ship. Submariners were frustrated by this organizational culture and believed that there were fundamental differences in nature between ships floating and fighting on the sea surface and those conducting undersea operations. They argued instead for an independent department for the submarine in order to exploit the full potential of them.[463]

These organizational traits were further enhanced by the navy's emphasis on a decisive fleet engagement centered on battleships, which posed serious limitations on submarine operations. As discussed earlier, the Japanese Navy planned to use its submarines as an auxiliary force to the main fleet comprising battleships. The submarines were assigned to conduct reconnaissance, tracking, and intercepting operations against the enemy fleet. For the sake of expanding their coverage of reconnaissance, many Japanese submarines were even equipped with reconnaissance aircraft launched from them, which only the Japanese Navy adopted in earnest in the Second World War.[464] However, as clearly demonstrated in the successful operations by the German and U.S. Navies, submarines could be better employed for commerce raiding independent from other naval operations. While the Japanese submarines conducted limited

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Shimbunsha, 1979), 254.
[463] Shojiro Iura, *Sensui kantai* [The submarine fleet] (Tokyo: Gakushu Kenkyusha, 2001), 129.
[464] NIDS, *Sensuikanshi*, 448. Although a number of aerial reconnaissance operations launched from submarines were conducted during the Pacific War, their effectiveness was questioned even among submariners themselves.

anti-commerce operations in such areas as the West Coast of the United States and the Indian Ocean in the early stage of the Pacific War, the navy stuck to the idea to use submarines chiefly in support of the main fleet.

In addition, Japanese submariners themselves had acknowledged the impracticality of the roles expected for their boats in the interception strategy even before the war. During exercises conducted as late as June 1941, some submarine officers identified problems in the use of submarines in the decisive fleet engagement. Even the Pearl Harbor attack demonstrated that one of their critical missions was extremely difficult to carry out. Nine submarines belonging to the Third Submarine Division took part in the attack with the mission to reconnoiter the Pearl Harbor to monitor ships in and out of the port. However, they could not obtain the critical information, especially the movement of U.S. aircraft carriers, and one of the submarines was lost without notable success. The apparent failure was starkly contrasted with what the aircraft carriers achieved in the attack. Upon return to their headquarters on Kwajalein Island, all the submariners reported that their boats had great difficulty to accomplish the expected mission against the well-guarded naval port.[465] At the same time, they even claimed that submarines should be mainly employed for antitrade warfare.[466] However, the reality perceived by the submariners did not bring about a fundamental change among the navy's top brass in the use of submarines during the Pacific War.

The fact that not only the U.S. Navy, but also the British Navy, shared the same creed of anti-fleet emphasis throughout the interwar period made it all the more difficult for the Japanese Navy to shift its focus on antishipping even after confirming the potential of submarines for the anti-commerce role. While

[465] Ibid., 104.
[466] Ibid., 105.

the effect of the battleship creed was evident in naval aviation, but it was more so among submariners since they were trained closely with surface ship officers. One of the examples clearly shows the closer connection between surface ship officers and submariners was Suetsugu. Although he was considered as the father of Japanese submarine strategy, Suetsugu himself was not a submariner, but a gunnery officer. Thus, Evans and Peattie conclude that "the essential strategies and tactics that he had devised for Japanese submarines were, in practice, unworkable."[467]

However, while the U.S. Navy quickly adopted unrestricted submarine warfare against shipping after the Pearl Harbor attack, the Japanese Navy stuck to the concept centered on a decisive fleet engagement and failed to employ its submarines for the antishipping role. On one hand, this was partly because the United States was less dependent on maritime trade for its industrial outputs than Japan. On the other hand, according to the *Senshisosho*, the Japanese Navy could have employed its submarines more effectively against the Allies' sea lanes of communication since the United States required vast supplies for its operations in the Pacific. In particular, the authors acknowledge that Japanese submarines should have focused on antishipping in rear areas after mid-1943 when the U.S. antisubmarine warfare capabilities were drastically improved. They attribute this apparent failure and delay in changing submarine employment to the dominant operational concept centered on battleships within the Japanese Navy. [468]

Until the end of the Pacific War, the Japanese Navy maintained a total of

[467] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887-1941* (Annapolis: Naval Institute Press, 1997), 434.
[468] NIDS, *Sensuikanshi*, 449.

187 submarines, of which 127 were lost.[469] More than seventy percent of them were lost due to enemy attacks and countermeasures. Although Japanese submarines had a greater speed on surface than U.S. submarines, they were too slow to chase high-value targets like battleships and aircraft carriers and did not encounter many chances to attack them during the war. After losing freedom of action at sea and in the air in the South Pacific, some of the submarines were used for carrying food, materials, and personnel to isolated garrisons in the Pacific.[470] Finally, even small and fast submarines exclusively for suicide attacks against U.S. vessels were developed and built toward the end of the war.

Against this apparent ineffectiveness of Japanese submarines, U.S. naval experts including Admiral Chester Nimitz, who was a leading authority on submarines in the U.S. Navy, admitted that some of the Japanese submarines were comparable to the U.S. boats, and Japanese torpedoes were more dependable and lethal. While there were some serious technological deficiencies in terms of radar and sound gear, which made Japanese submarines more vulnerable to countermeasures, they attribute the main cause of the ineffectiveness not to technology but to "…simply strategic blindness on the part of the Japanese high command."[471] They argue that the Japanese Navy should have used its submarines to attack U.S. tankers and freighters rather than warships, which were well protected. Furthermore, criticizing the desperate use of submarines as cargo carriers, they conclude that "[s]eldom in the long history of warfare has a primary weapon been used with less grasp of its true potential."[472] Their statement clearly indicates that the battleship-centered

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[469] Ibid., 444.
[470] Even specialized tanker and transport submarines for this purpose were built during the war.
[471] E. B. Potter and Chester W. Nimitz, eds., *The Great Sea War: The Story of Naval Action in World War II* (Englewood Cliffs: Prentice-Hall, 1960), 418.
[472] Ibid. On this point, Murray also states that "…the Japanese made the most amazing misuse of submarines despite their 'long lance' torpedo, the finest undersea weapon of the war." Murray, "Innovation," 57.

organizational culture prevalent among the navy's top brass contributed to this tragic outcome. The ineffectiveness of Japanese submarines was even more clearly contrasted with the effectiveness of U.S. submarines. The damage caused by U.S. submarine attacks against Japanese merchant ships was enormous: more than half of the ship tonnage Japan lost during the war was due to U.S. submarines. While the U.S. Navy was able to shift to an antitrade submarine strategy mainly due to the destruction of its battleship fleet, even the damage of this magnitude did not drastically shift Japanese submarine tactics to those centered on antishipping, which shows how deeply the battleship culture was embedded within the Japanese Navy.

While the misuse of Japanese submarine force can be largely attributed to the strong battleship culture, submariners were less fortunate than aviators in terms of discrepancy between their pre-assigned missions and potentially more useful roles. The intended use of submarines in a possible decisive fleet engagement was hopelessly incompatible with their more effective anti-commerce role demonstrated first by the Germans and later by the Americans during the Second World War. To be sure, in the same way as submariners, aviators were also under the heavy influence of the battleship culture and aircraft carriers developed as an auxiliary force to the main fleet centered on battleships. As the offensive potential of aircraft grew, carriers came to be seen as independent strike platforms, which was totally in line with the development of submarines.

However, the carriers on one hand remained effective throughout the Pacific War by simply following its natural course of development as strike platforms whose aircraft basically functioned as "extensions of ship weapons and

sensors."[473] The submarines, on the other hand, had to completely abandon their preassigned role by detaching themselves away from the main fleet in order to be strategically relevant. To do so was more difficult since it would have needed extraordinary efforts to not only change the organizational traits emphasizing their supporting roles to battleships, but also create an organizational climate to encourage more independent operations among submariners. Furthermore, under the strong influence of the battleship culture, the anti-commerce mission was unpopular even among submariners themselves, which also formed another barrier to the more effective employment of the submarines.

Conclusion

Like any other organizations, the Japanese Navy developed several distinctive organizational cultures. First, the Japanese Navy shared the naval service culture emphasizing technology because of its operational environment and platforms. The service culture actually created an environment where cutting-edge research and development was encouraged, which was particularly conducive to the development of aviation technology that underwent rapid changes throughout the interwar period. Second, the unique organizational culture developed among aviators helps to explain why naval aviation, one of the major branches within the navy, could achieve greater success compared to other branches in the same service. Because of the different nature of platforms and operations from those of surface ships, naval aviators forged a more egalitarian and proactive organizational culture distinct from other branches in the navy. This organizational culture helped to bypass many of the obstacles posed by the

[473] Robert C. Rubel, "A Theory of Air Power," *Naval War College Review* 67, no. 3 (Summer 2014): 64.

seniority rule within the navy and, in effect, enabled junior aviators to exert more influence than their actual ranks.

The organizational culture also shaped or even limited technological options in designing aircraft. The Japanese Navy, whose main area of operation was the Pacific Ocean, had to emphasize speed and endurance in developing aircraft. As a result, most naval aircraft had a longer range and higher speed than their foreign contemporaries. In addition, naval aviators emphasized high maneuverability in light of air-to-air operations and favored heavier armament and higher maneuverability for their fighter aircraft. However, aircraft designers could not fulfill all the desirable requirements simultaneously due to Japan's limited engine technology and, under strong navy pressure, had to sacrifice some of the critical capabilities to satisfy speed, range, and maneuverability requirements. In particular, Japanese aircraft did not have appropriate protective measures from enemy fire for the sake of saving weight. The lack of effective protection for aviators put heavy pressure on the comparatively small aviator corps, which consequently invited a serious shortage of aviators in the long attritional air war with the United States. Had a conscious decision to prioritize protection at the expense of other performance requirements been made, the navy could have added such protective measures as bulletproof glass, armor plates and self-sealing tanks earlier than it actually did in the latter half of the Pacific War. But, the organizational culture precluded such choice.

The naval aviation's organizational climate was contrasted with that of submariners, where strong influence of the battleship culture was prevalent. Submarines could have brought decisive impacts on the course of war by interdicting Allied shipping, but the Japanese Navy kept focusing on anti-warship roles for its underwater boats. Even after the navy came to realize that

the submarines were unable to cope with improved U.S. countermeasures, its senior leaders did not drastically change the role of submarines. This was mainly because submariners were more closely integrated with surface ship officers, and top leaders did not grant semi-independent status like aviators enjoyed throughout the interwar period. As a result, the battleship culture more directly affected the operational thought of submariners, which eventually precluded the antitrade mission, which was at least technologically open to them. Naval aviation was put under the same battleship culture, but what was fortunate for aviators was the fact that their intended operations proved effective during the war. In consequence, unlike the submarine, there was no need to fundamentally change their operational thought.

Due to the few detailed studies on Japanese submarines, which warrant more in-depth comparative analysis, particularly through the lens of organizational culture, these observations on the two branches remain preliminary. Certainly, intraservice politics was also accountable for the misuse of submarines, thus further focused studies are required to fully explain the difference. However, given the state of scholarship, this study at least made the first attempt to offer a plausible explanation by consulting reliable Japanese sources currently available.

In conclusion, the Japanese Navy was successful in building its carrier force during the interwar period with the help of the cultures conducive to innovation. They help to explain why naval aviators overcame some of the barriers to innovation predicted by the intraservice model while other branches, particularly submarines, could not. However, the service and organizational cultures alone cannot explain the whole process. The unique organizational culture developed among naval aviators did not bring about a radical change in

the dominant battleship culture among the navy's top brass. The battleship cultural traits were more difficult to change not only because naval aviation was a minority branch, but also because the navy's senior leadership was dominated by surface ship officers much older than desired. Tasuku Nakazawa, former Director of the Personnel Bureau of the Navy Ministry, later concluded that, at the time of the Pacific War, flag officers were on average from five to eight years older than those in the time of the Russo-Japanese War.[474] The resulting slow turnover made it more difficult to get junior aviators promoted quickly enough to transform the navy's general attitude in a timely manner. The innovative service and organizational cultures were certainly conducive to innovation, at least by promoting technological development and empowering outnumbered officer aviators, but did not fundamentally transform the natural state of the military organization where "the absence of innovation is the rule."[475]

[474] Nakazawa Tasuku Kankokai, ed., *Kaigun chujo Nakazawa Tasuku: Sakusen bucho, jinji kyokucho no kaiso* [Vice Admiral Tasuku Nakazawa: His recollections as chief of operations and director of the Personnel Bureau] (Tokyo: Hara Shobo, 1979), 218-219.
[475] Rosen, *Winning the Next War*, 5.

Conclusion

The Japanese Navy was one of the three major navies that developed large fleet carriers during the interwar years. Its air raids on Pearl Harbor launched by six fleet carriers heralded a new way of warfare, which culminated into the revolution in military affairs (RMA) centered on aircraft carriers. Despite the landmark achievement, the Japanese case has not been given sufficient attention in the previous studies particularly conducted in English. Against this backdrop, this study fills the void in the literature of RMA by focusing on the process of Japanese aircraft carrier development.

While many argue that technology is the primary driver for RMA, the Japanese case demonstrates that technology may be a necessary but not sufficient condition for innovation. Prewar Japan lagged far behind from other major powers in terms of both industrial and technological capacities. The Japanese Navy introduced its first aircraft in 1909, but it depended totally on foreign aircraft and technologies for the first decade of the interwar period due to Japan's technological backwardness. Not until the mid-1930s could the Japanese Navy design and develop indigenous naval aircraft.

Doing so was not easy. In terms of overall economic power, Japan's gross domestic product (GDP) in 1940 was 192 billion dollars (in international dollars and 1990 price), which made it the fifth largest economy in the world. However, the U.S. and British GDPs were 934 billion and 316 billion dollars respectively in the same year.[476] Andrew Krepinevich underscores this point by stating that "…the Imperial Japanese Navy developed a first-rate naval aviation capability

[476] Mark Harrison, ed., *The Economics of World War II: Six Great Powers in International Comparison* (Cambridge: Cambridge University Press, 2000), 10.

and modern amphibious forces, which they employed to devastating effect in the early months of their war with the United States. The Japanese accomplished this with a gross national product that was less than 20 percent (and perhaps closer to 10 percent) of that of the United States, its major naval competitor in the Pacific."[477]

Furthermore, Japan's industrial capacity was not large enough to solely drive the RMA. For example, Japan's automobile industry which provided basic technology for aircraft engines was far smaller than that of Britain and the United States. The number of automobiles registered in Japan in 1940 was about 200,000 whereas there were more than 2 million passenger and commercial cars in Britain and 32 million cars registered in the United States.[478] The annual output of automobile in 1935 was about 17,000 in Japan and over 430,000 and 2.6 million in Britain and the United States respectively.[479] As for civilian aircraft industry which had more direct linkage with the military counterpart, Japanese commercial airlines were almost non-existent except for a small number of flights between Japan and China operated under government subsidies. The U.S. civilian aircraft industry, on the other hand, far surpassed not only Japan but also other major powers including Britain. Eliot Cohen points out that "…the Americans possessed approximately five times as many civil

[477] Andrew Krepinevich, "Cavalry to Computer: The Pattern of Military Revolution," *National Interest*, no. 37 (Fall 1994): 39.
[478] Japan Statistical Association, ed., *Historical Statistics of Japan*, vol. 2 (Tokyo: Japan Statistical Association, 1988), 249; B. R. Mitchell, *British Historical Statistics* (Cambridge: Cambridge University Press, 1988), 557; U.S. Department of Transportation, *Highway Statistics Summary to 1995* (Washington: U.S. Government Printing Office, 1997), II-4, accessed September 25, 2015, http://isddc.dot.gov/OLPFiles/FHWA/006654.pdf. The Japanese and U.S. numbers include trucks, buses, and passenger cars.
[479] Japan Transport Economics Research Center, ed., *Kindai nihon yusoshi: Ronko, nenpyo, tokei* [A history of modern Japanese transport: Articles, chronological tables, and statistics] (Tokyo: Seizando Shoten, 1979), 454-455; Mitchell, *British Historical Statistics*, 418; U.S. Department of Commerce, Bureau of Census, *Historical Survey of the United States, 1789-1945: A Supplement to the Statistical Abstract of the United States* (Washington: U.S. Government Printing Office, 1949), 223, accessed on September 25, 2015, http://www2.census.gov/prod2/statcomp/documents/HistoricalStatisticsoftheUnitedStates1789-1945.pdf.

aircraft as Germany, despite Lufthansa's phenomenal success as an airline."[480] In addition, the military led Japanese automobile and aircraft industry and their technology development depended almost exclusively on so-called "spin-off" rather than "spin-on."

Even in terms of human resources, the gap between Japan on one hand and the United States and Britain on the other was greater than the respective sizes of population. In particular, the United States was not only quantitatively but also qualitatively much superior in human resources to Japan. As a simple indicator, the total number of Japanese college students in 1930 was less than 70,000.[481] However, over one million students enrolled in the academic year of 1929-1930 alone in the United States.[482] Accordingly, Japan had no more than 6,000 university instructors in total, but there were more than 80,000 instructional staff in the United States.[483] There is no detailed information as to the total number of engineers and scientists in prewar Japan, but judging from the scale of higher educational institutions in both countries, there seemed to be much fewer of them operating in Japan in the interwar years.

Given the large disparity in fundamental economic and industrial capacities, it is difficult to assume that Japan could have taken a substantial lead in research and development of naval aircraft and carriers among the three countries. While technology alone did not primarily motivate the Japanese Navy to build carrier force, the competitive strategic environment surrounding Japan

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[480] Eliot A. Cohen, "Strategy of Innocence? The United States, 1920-1945," in *The Making of Strategy: Rulers, States and War*, ed. Williamson Murray, MacGregor Knox, and Alvin Bernstein (Cambridge: Cambridge University Press, 1994), 447.
[481] Japan Statistical Association, ed., *Historical Statistics of Japan*, vol. 5 (Tokyo: Japan Statistical Association, 1987), 249.
[482] National Center for Education Statistics, *120 Years of American Education: A Statistical Portrait*, edited by Thomas D. Snyder, (Washington: Department of Education, 1993), 76, accessed September 14, 2015, http://nces.ed.gov/pubs93/93442.pdf.
[483] Japan Statistical Association, ed., *Historical Statistics of Japan*, vol. 5, 231 and National Center for Education Statistics, *120 Years of American Education*, 75.

obviously gave the first impetus to spur innovation within the navy. The Japanese identified the United States as a primary threat immediately after the Russo-Japanese War. In a possible war with the United States, the Japanese Navy envisioned a decisive fleet engagement in the South Pacific and planned to build the "eight-eight" fleet comprising eight battleships and eight battle-cruisers to defeat the U.S. fleet. However, the Washington Naval Treaty limited the number of battleships to ten for Japan, which led to the navy to seek alternatives to battleships. In so doing, the Japanese Navy tested many different platforms such as heavy and light cruisers, destroyers, submarines, land-based bombers, and aircraft carriers. While the navy explored a wide range of alternatives during the interwar years, the competitive strategic environment did not naturally lead it to develop the carrier force to the extent that carriers would eventually replace battleships as capital ships. As discussed, Eisuke Yamamoto, the earliest visionary of naval air power, also emphasized the importance of submarines as much as aircraft, which shows that aircraft carriers were just one of the platforms to fill the perceived gap in the number of battleships between the United States and Japan.

Both the technological possibilities and the competitive strategic environment gave a strong push for innovation, but they alone did not explain as to why the Japanese Navy was more successful in developing the carrier force than other platforms. In explaining how the Japanese Navy achieved the RMA, this study tested the validity of the existing models, particularly the four schools of thought on RMA: 1) civil-military relations, 2) interservice rivalry, 3) intraservice politics, and 4) organizational culture.

As for civil-military relations, Barry Posen argues that civilian intervention is a necessary condition to force the reluctant military to innovate.

However, the civil-military relations in prewar Japan were not particularly in favor of civilians and there were no clear instances where civilian intervention promoted the development of aircraft carriers. While the civilian-intervention model fits European and U.S. cases, there was no effective civilian control over the military in prewar Japan.[484] The army generals and navy admirals were more influential than civilian policy makers. All the navy ministers, and even some of the prime ministers, were uniformed officers throughout the interwar period. In addition to the fact that no strong civilian leader existed during the interwar period, even if civilians had taken an initiative for innovation, frequent political turnovers would have made it extremely difficult for them to overcome the organizational resistance from the military and exercise influence over a long period of time: there were nineteen different prime ministers and sixteen navy ministers from 1919 to 1941.[485] The legislative branch, the Diet, also did not have strong power and authority to control the military. As discussed, the issue of creating an independent air force was raised and discussed as the Diet several times, but the navy could reject such proposals singlehandedly. Taken together, civilian intervention seemed not to play a critical role in promoting innovation in the Japanese case.

Interservice competition also does not seem to spur the Japanese RMA. It is certain that fierce competition and turf battles between the army and navy were prevalent throughout the interwar period. However, the rivalry itself did not drive the development of naval aviation, particularly aircraft carriers. Although both services needed aircraft for their use, aircraft they required were

[484] Peter Katzenstein points out that of the thirty prime ministers between 1885 and 1945, nine came from the army and six from the navy. Peter J. Katzenstein, *Cultural Norms and National Security: Police and Military in Postwar Japan* (Ithaca: Cornell University Press, 1996), 54.
[485] Ikuhiko Hata, ed., *Nihon riku kaigun sogo jiten* [A comprehensive encyclopedia on the Japanese Army and Navy], 2nd ed. (Tokyo: Tokyo Daigaku Shuppankai, 2005), 291, 433.

completely different because of their respective operational environments and perceived enemies. The army made some efforts to subsume naval aviation to create an independent air force. But, unlike other major powers, the Japanese naval air service was much more advanced than its army counterpart in both qualitative and quantitative terms, thus the navy could easily fend off such demand.

There were a few instances where the interservice rivalry promoted innovation. For example, the navy's decision to purchase land in Kasumigaura which later served as an important base for aviator training was primarily motivated by the Army's initial move to procure the land. However, compared with the U.S. Navy and, particularly, the British Navy, the Japanese Navy had more freedom to develop its aviation without serious interference from its rival service. In addition, there was no effective civilian control to reconcile the rivalry, much less take advantage of it in order to promote innovation. However, considering the fierce competition over allocation of scarce resources, particularly capable manpower, interservice rivalry was rather counterproductive in developing naval aviation.

Compared with the civilian intervention and interservice rivalry models, the intraservice politics model actually provides a much more accurate picture depicting the process of aircraft carrier development by the Japanese Navy. In creating a new combat arm, the military needs to have a new theory of victory articulated by foresighted senior officers. As Stephen Rosen demonstrated in his case study on the U.S. aircraft carrier development, Rear Admiral William Moffett played a critical role in offering the new theory of victory centered on aircraft carriers. He became director of the Bureau of Aeronautics and stayed there for more than a decade. With his capacity as bureau chief, Moffett lobbied

to the navy top brass and created a new career path to attract junior officers, which contributed to expanding the influence of aviators. As this study clearly shows, a parallel development took place within the Japanese Navy as well.

First of all, same as the U.S. Navy, there were some leading individuals who offered a new theory of victory centered on aircraft carriers. In particular, Eisuke Yamamoto was the first officer who advocated the importance of aircraft for naval operations and promoted his cause through his political connections within the navy. Isoroku Yamamoto was another important senior officer who was considered as the "father of naval aviation" within the navy. In addition to his own efforts to expand naval aviation, Isoroku Yamamoto envisioned that aircraft would be able to sink battleships and eventually decided to employ six fleet carriers to strike the U.S. fleet anchored at Pearl Harbor. Both admirals were non-aviators, but they had a keen interest in aircraft and contributed to expand naval aviation within the navy. Despite their foresighted vision, they alone could not make this happen. Leading officer aviators like Yozo Kaneko, Takijiro Onishi and Minoru Genda who had first-hand experience and knowledge in air operations helped to translate the vision proposed by Eisuke and Isoroku Yamamoto into operational reality. Although their contributions were indispensable in promoting innovation, their individual influence brought fewer impacts than their U.S. counterparts. There was no one like William Moffett who exercised long-term leadership at the Bureau of Aeronautics. Isoroku Yamamoto, arguably the most influential air-minded admiral, served only two tours for four years at the Naval Aviation Department including nineteen months as its head. If both Yamamotos had served at the Naval Aviation Department longer, they could have provided more stability and consistency for the navy's aviation policy, as demonstrated by Eisuke Yamamoto's early interest in the Yokaren system and

Isoroku Yamamoto's achievement as head of the Technical Bureau for three years.

In terms of administration of naval aviation, the Japanese Navy scored a considerable success especially by creating a centralized organization for aviation, the Naval Aviation Department. The department gave aviators an "institutional home" and firmly established their organizational footing within the navy. The Naval Aviation Department was also instrumental in creating a positive feedback loop conducive to the development of naval aviation. In the same manner as the Bureau of Aeronautics, the Naval War College, and the Fleet within the U.S. Navy, the Naval Aviation Department consisted of the "Naval Trinity" along with the Naval Staff College and the Air Battle Group. The Naval Staff College, on one hand, conducted war-games and simulations which contributed to create and test new operational concepts, including the Pearl Harbor attack operations. The Air Battle Group, on the other, tested the new concept with actual aircraft operated by seasoned aviators and provided valuable feedback to the central authority including the Naval Aviation Department. Along with the Trinity, the establishment of the Naval Air Arsenal also encouraged aircraft development by centralizing relevant research institutions scattered within the navy.

What made the Japanese Navy distinct from the two other navies was the way it recruited naval aviators. The Japanese Navy faced serious organizational and administrative challenges to train a large number of aviators in a short period of time. The navy initially trained officer aviators only, but soon found it difficult to continue to do so since a lot more aviators were needed. The navy could have increased commissioned officers to produce more officer aviators, but did not do so for fear of destabilizing the existing hierarchy. Instead, the navy chose to expand its aviator corps by recruiting noncommissioned officers. As the war in China escalated and the international situation worsened for Japan, more

aircraft were procured, thus more junior aviator officers were in need to command them. For this sake, the Yokaren program which directly recruited youngsters in civilian life for aviators enabled the navy to train capable noncommissioned officers to fill the expanding junior command billets without increasing the number of commissioned officers.

As a result, the navy created a relatively small, but highly capable pilot corps largely consisting of non-commissioned officers, which contributed to the success of the initial offensive campaign including the Pearl Harbor attack. However, by limiting the number of commissioned officers, there were not enough aviator officers to fill junior command posts. In order to fill the command posts in naval aviation, the navy transferred senior officers from other branches. But, the navy did not have a system to give formal flight training to those transferred to naval aviation. In consequence, surface-ship officers dominated critical command posts in air fleets and aircraft carriers while aviators served as their staff. These recruitment and promotion policies had significant impacts on the long-term development of naval aviation because of power and influence commissioned officers had within the navy.

Among the outnumbered aviators, carrier aviators formed an even smaller minority. In particular, taking off and landing on a short and narrow flight deck at sea required extraordinary skills, thus carrier pilots were selected primarily based on flight skills. As a result, those who took part in the Pearl Harbor attack were predominantly noncommissioned officers. There were certainly a small number of officer carrier pilots, but most of them were also selected based on individual skills, not necessarily on their class standing at the Naval Academy which was a dominant factor in promotion considerations. Combined with the navy's policy not to require any flight qualification to

command carriers and air groups, outnumbered carrier officer aviators had to fight an uphill battle against officers from other branches, particularly those of surface ships to occupy higher positions.

The intraservice politics model also explains the short-lived success of Japan's naval air power. Due to Japan's limited aircraft production capability and the elitist nature of aviator training program, the Japanese Navy was never able to make up the aviator and aircraft losses suffered during the first two years. Once skilled aviators were lost in battle, the navy could never replace them by new substitutes in both qualitative and quantitative terms. The Japanese Navy trained enough aviators only to fight a single decisive battle, but not prepared for attritional air warfare which actually took place during the Pacific War. This explains why a small number of reserve aviators were trained before the war and most of them were commissioned right after their training to alleviate the shortage of active-duty officers. The navy hastily increased reserve officers during the war, but they did not reach a satisfactory level due to the lack of both time and resources.

Lastly, organizational culture is helpful in explaining why naval aviation was more successful than other platforms the Japanese Navy had equally emphasized during the interwar period. There existed distinctive military cultures inside the navy and naval aviation respectively, which seemed to play a critical role in developing naval aviation by encouraging technological development. Due to its operational environment and mechanized platforms, the Japanese Navy cultivated a service culture emphasizing technology. In contrast to the army's emphasis on people, the technology-minded service culture created a good reputation among college students that contributed to attract talented engineers. In addition, under the liberal organizational atmosphere, junior

engineers to play more active role in naval technological development.

The organizational culture developed among aviators also contributed to keep pace with the rapid development of aviation technology. In designing naval aircraft, Japanese aviators emphasized speed and endurance due to the nature of naval operations. However, due to the inherent weakness in overall industrial capacity, Japan could only produce less powerful engines than other major powers, particularly the United States. The navy could not achieve all the desired performance, but the cultural traits of aviators made it possible to squeeze maximum endurance and speed out of the underpowered engines by reducing aircraft weight. At the same time, this emphasis on endurance and speed deprived protection for pilots and fuel tanks as a result of performance trade-offs. Despite these downsides, the organizational culture was instrumental in developing naval aircraft with significant advantages over Allied aircraft at least in the initial phase of the Pacific War.

The organizational culture among aviators also helped to overcome some of the organizational barriers resulted from the hierarchical and aristocratic nature of the Japanese Navy. Thanks in part to the British influence, the Japanese Navy transplanted a "class society" where clear distinction between commissioned and noncommissioned officers existed. However, aviators cultivated a more egalitarian organizational atmosphere because of the nature of operating aircraft. Aircraft were operated by a small number of aviators and even by a single pilot in the case of fighter aircraft. Consequently, there was less distinction between commissioned and noncommissioned officers once in the air. This egalitarian organizational culture encouraged both junior commissioned and noncommissioned officers to express their opinions freely in promoting new ideas. In addition, while the navy's top brass was dominated by senior surface ship

officers, junior aviator officers could exert more influence than their actual rank should have allowed. This was primarily because only aviators knew air operations and commanders had to follow their advice. Operational planning for the Pearl Harbor attack was largely done by Genda without any serious oversight or intervention from his immediate superiors including Chuichi Nagumo, commander of the First Air Fleet.

The success of naval aviation was clearly contrasted with the complete failure of Japanese submarines that were also under the heavy influence of the dominant organizational culture centered on battleships. The Japanese Navy believed that the submarine could be a formidable offensive weapon against the battleship, thus built more submarines than the United States in order to offset the inferior force ratio. However, as Germany and the United States demonstrated, the submarine would have been better employed for attacking merchant shipping rather than intercepting warships. In contrast, Japanese submarines were closely tied with surface-ship operations and not employed independently for commerce raiding during the war. This situation stemmed from the attitude of mainstream officers who considered the submarine as a kind of surface ship and did not believe separate treatment was necessary. As a result, Japanese submariners did not obtain independent organizational status as aviators did until 1944 when the Naval Submarine Department was finally set up under the Navy Ministry. The organizational subordination made it harder for submariners to change their predetermined role into a completely new mission detached from the decisive battle concept.

The innovative organizational culture, notwithstanding, did not change the general attitude of the Japanese Navy. Even after the Pearl Harbor attack, the navy top brass were slow and reactive to change its dominant operational

concept. As Masataka Chihaya, a former naval officer turned critics, argued that, even after the successful air operations at the initial phase of war, the navy's war planners stuck to the traditional operational concept centered on battleships. The navy neither changed the formation of the fleet by shifting its focus to aircraft carriers, nor took measures to strengthen its air power, such as constructing aircraft carriers, increasing aircraft production, and expanding the pilot pool. Only after the battle of Midway did the navy truly realize the strategic value of aircraft carriers.[486] However, at that point, it was too late to reconstruct the carrier force with Japan's limited industrial and human resources. Other than those under construction before the war, any new aircraft carriers planned after the start of hostilities came too late to make meaningful contribution during the war.

It is ironic that the Japanese Navy wholeheartedly adopted aircraft carriers as its primary naval weapons for the first time after losing four fleet carriers. In this sense, the navy did not necessarily realize the full potential of aircraft carriers before the war. Rather, it was the U.S. Navy that quickly adopted aircraft carriers to the fullest extent after it lost most of its battleships in the Pearl Harbor attack. As an American historian has pointed out:

> By 1944, the US Navy had formulated a very specific doctrine for the highly effective employment of air power and demonstrated flexibility firstly adopting the carrier as the capital ship in 1942 and then developing the use of the weapon to a new level in 1943 and 1944. Such recognition of the primacy of air power greatly overshadowed the Japanese Navy's initial tactical superiority which failed to develop effectively or respond to the environment of the unfolding Pacific War.[487]

If the Japanese Navy were to fight the fleet battle with the U.S. fleet in the Pacific only once, it could have won the battle. It had prepared for such a decisive

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[486] Masataka Chihaya, *Nihon kaigun no senryaku hasso* [The Japanese Navy's strategic thinking] (Tokyo: Chuokoronsha, 1995), 98-99.
[487] John Buckley, "Maritime Air Power and the Second World War: Britain, the USA and Japan," in *Air Power History: Turning Points from Kitty Hawk to Kosovo*, ed. Sebastian Cox and Peter Gray (London: Frank Cass, 2002), 139.

battle throughout the interwar period, and one can even interpret the Pearl Harbor attack as an extension of this strategic thinking. However, the navy never thought through the possibility of an attritional air war with the United States. It was the pursuit of a short decisive battle with the inferior battleship fleet that enabled the Japanese Navy to herald a new way of warfare in its Pearl Harbor attack. At the same time, it was such thinking that hindered it from fully exploiting the potential of military innovation made possible by aircraft carriers.

This study concludes that the intraservice politics model portrays the rise and fall of Japanese naval aviation centered on aircraft carriers more accurately than other models. Not only the U.S., British, and Japanese Navies faced the same organizational challenges in creating a new combat arm within the existing force structure. However, how to deal with the challenges differed considerably among the three cases discussed here (see Chart 1 for a summary of the findings). According to this model, one of the most important caveats to address the organizational challenges is to find any possible measures to expand an officer corps from below in order to sustain the momentum of innovation in the long run. Although the Japanese Navy did not follow the ideal path to promote innovation, the case suggests that even a technologically-backward country with a skewed officer corps can achieve military innovation in two decades.

At the same time, there are some important areas left for further research in order to enrich the literature of RMA. First, this study does not direct sufficient attention to other major naval powers than Britain, the United States and Japan. Of the five major naval powers which signed the Washington Naval Treaty, Italy ignored the aircraft carrier and did not have a single operational carrier before the Second World War. France, the other major naval power which operated an aircraft carrier before the Second World War, lagged behind from

Japan, Britain, and the United States despite its keen interest in carrier aviation.[488] Same as the U.S. and Japanese Navies, the French Navy converted an unfinished battleship into its first aircraft carrier, *Béarn* under the Washington Treaty. Despite fiscal austerity, France even authorized a plan to build two additional carriers in 1937. However, the construction of the carriers was abandoned due to the German invasion and the *Béarn*, did not make any meaningful contribution in the war. Other than the five naval powers, Germany also planned to build aircraft carriers before the war. The German Navy got authorization to build its first aircraft carrier, *Graff Zeppelin* in 1936. In constructing the carrier, the Japanese Navy provided technical data of the aircraft carrier, *Akagi*, at the German Navy's request and even received a German military delegation to show the ship.[489] Despite these efforts, the *Graff Zeppelin* was never completed during the war and the German Navy failed to develop a single aircraft carrier by the end of war. There were certainly different reasons accountable for the failure in adapting aircraft carriers in each case.[490] However, in order to fully explore the factors which affect the success and failure of aircraft carrier development, a full-fledged comparative case study including the failed cases is indispensable.

Second, this study does not conduct detailed analysis on the influence of wartime experience on Japanese carrier aviation. Japan was officially in war with China since July 1937. Unlike the British and U.S. Navies, the Japanese Navy had precious opportunities to test both land-based and carrier-borne

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[488] Norman Polmar, *Aircraft Carriers: A History of Carrier Aviation and Its Influence on World Events*, vol. 1, *1909-1945* (Washington: Potomac Books, 2006), 86.
[489] Jun Aizawa, *Kaigun no sentaku: Saiko hinjuwan eno michi* [The navy's choice: Rethinking the road to Pearl Harbor] (Tokyo: Chuokoron Shinsha, 2002), 69-73.
[490] For example, Emily Goldman states that the Italian case "…reflected an overly ambitious strategy that the country could not support financially or materially, an intellectual conservatism that paralyzed innovation, lack of a supportive leadership, and rampant bureaucratic disputes among the services." Emily O. Goldman, "Receptivity to Revolution: Carrier Air Power in Peace and War," in *The Diffusion of Military Technology and Ideas*, ed. Emily O. Goldman and Leslie C. Eliason (Stanford: Stanford University Press, 2003), 289.

aircraft and even deploy carriers to support the land operations. These operations gave valuable wartime lessons to promote the development of naval aviation. For example, the navy lost a lot of aviators and aircraft against enemy fighters in conducting strategic bombing and recognized the need to set up a system in order to train new aviators quickly to cover the loss. Also, the development of the long-range Zero Carrier Fighter was partly motivated by the need to escort the bombers for deep strikes against Chinese cities. Above all, aviators accumulated hard-earned real combat experience before the Pacific War, which directly contributed to improve their skills and tactics. On the other hand, wartime experience in China could have been little use for naval air operations at sea. In fact, the war in China took away valuable time from aviators for studying on and training for naval operations, particularly in coordination with the fleet.[491] Given these conflictual evidences, further research focusing on this aspect would be required to assess how much direct linkage existed between the wartime experience and the development of naval aviation centered on aircraft carriers.

Lastly, this study does not focus on the influence of foreign intelligence on innovation. As Rosen suggests, foreign intelligence may not be the primary source of technological innovation.[492] However, the Japanese Navy closely monitored the British and American aircraft carrier development. In building its first aircraft carrier, *Hosho*, the navy sent officers to Britain to gather technical information on the existing platforms already operational during the First World War. One of the major carrier-borne aircraft in the initial phase of the Pacific War, the Type 99 Carrier Bomber, was clearly inspired by the German aircraft such as

[491] Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2001), 126.
[492] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991), ch. 7.

the Hinkel He-70 and the Junkers Ju-87.[493] Considering the critical importance of dive bombing demonstrated during the war, the information obtained from the German aircraft could be essential in enhancing the offensive capability of carrier aircraft. Not only technological innovation, but also organizational innovation might have been spurred by foreign intelligence. The establishment of the Naval Aviation Department in 1927 might have been triggered by the U.S. precedence to establish the Bureau of Aeronautics in 1921. Finally, even the Pearl Harbor operation might have been inspired by the British carrier air strike against the Italian fleet at Taranto. Although the Japanese Navy was well aware of these foreign developments, there is no strong evidence available at this moment to suggest how indispensable the information provided through foreign intelligence was for those cases. Unfortunately, due to the destruction of most official documents concerning foreign intelligence immediately after the Pacific War, it is certainly not impossible, but extremely difficult to clarify the role of foreign intelligence in the process of Japanese innovation.

These shortcomings notwithstanding, I believe this study can offer some policy implications relevant for the current security environment. Whenever the military tries to transform itself, it inevitably faces intellectual, organizational, and administrative challenges demonstrated by the intraservice politics model. In particular, the military organizations today tackle with enormous challenges in response to the rapidly changing security environment. However, none of the countries faced more daunting challenges than China. China is rapidly modernizing its military capability by keeping pace with the booming economy. The People's Liberation Army (PLA) is said to focus on building "anti-access and area-denial (A2AD)" capabilities with an aim to prevent other powers from

[493] René J. Francillon, *Japanese Aircraft of the Pacific War*, new ed. (Annapolis: Naval Institute Press, 1979), 271-272.

intervening into its sphere of influence. In so doing, China is taking the same strategic approach as the Japanese Navy by developing panoply of military platforms to intercept U.S. naval forces in the Western Pacific. Against this backdrop, Toshi Yoshihara points out that U.S. policy makers and scholars even draw some analogies between the Japanese experience and the current Chinese efforts.[494]

As China extends its military reach beyond the immediate vicinity, the Chinese also have emphasized the importance of sea power even in official documents. China's defense whitepaper asserts that the land-centered traditional mentality has to be abandoned and goes on to state as follows:

> It is necessary for China to develop a modern maritime military force structure commensurate with its national security and development interests, safeguard its national sovereignty and maritime rights and interests, protect the security of strategic SLOCs and overseas interests, and participate in international maritime cooperation, so as to provide strategic support for building itself into a maritime power.[495]

While China aims to construct a blue-water navy, the Chinese Navy is developing sophisticated surface and underwater forces whose cornerstone seems to be aircraft carriers. China already commissioned one fleet carrier, *Liaoning*, converted from the ex-Russian Navy aircraft carrier, *Varyag*, in 2012. Additional carriers are reportedly being built in China. U.S. Department of Defense estimates that China "…continues to pursue an indigenous aircraft carrier program and could build multiple aircraft carriers over the next 15 years."[496] Although there will be a long and difficult path ahead to be fully capable of

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[494] Toshi Yoshihara, "Anti-Access in Comparative Perspective: Imperial Japan, the Soviet Union, and 21st-Century China," NIDS International Forum on War History: Proceedings, History of the Joint and Combined Operations (March 2015): 121-136.
[495] State Council Information Office of the People's Republic of China, "IV. Building and Development of China's Armed Forces," in "China's Military Strategy," May 2015, accessed December 13, 2015, http://eng.mod.gov.cn/Database/WhitePapers/2015-05/26/content_4586713.htm.
[496] U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2015*, April 2015, 11, accessed December 13, 2015, http://www.defense.gov/Portals/1/Documents/pubs/2015_China_Military_Power_Report.pdf.

employing multiple aircraft carriers, China might be able to do so much earlier than estimated for several reasons. Compared with prewar Japan, China today is in a much better position in pursuing an RMA in several accounts. In economic terms, China already became the second largest economy in the world and its industrial base is also rapidly growing. Unlike the interwar period, the potential of aircraft carriers is widely recognized and there are some countries, namely Russia and Ukraine, which are ready to transfer necessary technology and skills for money. It is probably too soon to tell how much strategic utility the aircraft carriers would have in the future, but the Chinese Navy will face some organizational and bureaucratic challenges in adding the new combat arm to its force structure. The Japanese case offers a cautious tale in thinking about the development of China's carrier force.

First, in terms of the interservice relations, China might have to take more drastic measures to change its personnel management system and budget allocation in order to promote military innovation further. As discussed, China is making efforts to build a blue-water navy, but the army has been the dominant service since the establishment of the PLA. Army generals keep dominating the highest military decision making organ, the Central Military Commission: seven out of the present eleven members, including one of the two vice chairmen, from the army. Given the glacial change of the officer corps by taking new blood only from below, it may take significant amount of time to transform the army dominant force structure into a more balanced one.

Second, China is most likely to face long-term challenges at the intraservice level. If China is planning to build additional aircraft carriers, it is necessary to train new aviators and insert them into the navy. Recruiting and training a large number of commissioned and noncommissioned officers without

destabilizing the established hierarchy would be an enormous task. Furthermore, the Chinese Navy will have to transfer senior officers from other branches to fill the command posts of naval aviation until junior aviators get senior enough to eventually replace them. These manning problems might be addressed quickly by sheer improvisation in the same manner as the Japanese Navy did in the interwar period. Also, the fact that the Chinese Navy has a relatively large land-based aviation component would help alleviate the lack of senior carrier aviators.[497] However, as the intraservice politics model predicts, China's long-term challenges for military innovation might be more concerned with organizational and administrative issues which would be critical for future military competition. Yoshihara and James Holmes conclude that people are the true determinants of victory and the Chinese Navy "…still has a long way to go in 'software' areas such as training, education, seamanship, and the myriad of other skills that comprise battle readiness."[498]

Having all said, the Chinese Navy may be able to create an effective carrier force without taking the ideal path for innovation. If China seeks to fight a short decisive war, it will not be necessary to maintain a large pool of carrier aviators. In that case, Chinese military success would be short-lived, but a short decisive air campaign might suffice to secure its political objectives in a future conflict unlike the Pacific War. It is for this reason why further accumulation of comparative case studies is critical in thinking about the future RMA and this study, I believe, offers a modest step forward to this end.

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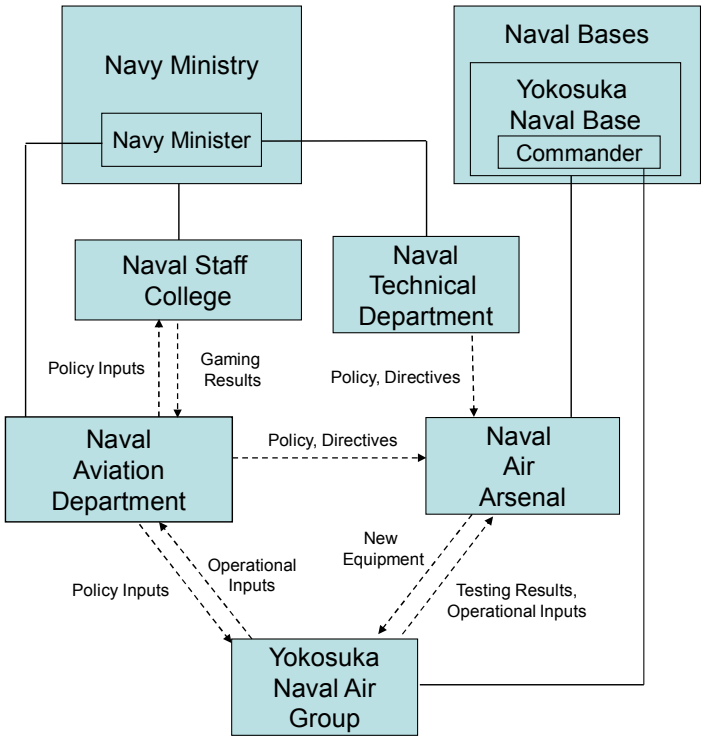
[497] According to the International Institute for Strategic Studies, the Chinese Navy is estimated to have about 26,000 naval aviation personnel and over 300 operational aircraft. International Institute for Strategic Studies, *The Military Balance 2015: The Annual Assessment of Global Military Capabilities and Defence Economics* (Abingdon: Routledge, 2015), 241.

[498] Toshi Yoshihara and James R. Holmes, *Rea Star over the Pacific: China's Rise and the Challenges to U.S. Maritime Strategy* (Annapolis: Naval Institute Press, 2010), 216.

Appendix

Figure 1. Administrative organization of Japanese naval aviation in the 1930s



Source: Based on Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909-1941* (Annapolis: Naval Institute Press, 2001), 26, modified by the author.

Table 1. Naval Academy graduates and aviators

Class Number	Entering Year	Graduating Year	A. Total Graduates	B. Aviators	B/A
25	1895	1897	32	0	0.0%
26	1896	1898	59	0	0.0%
27	1896	1899	113	0	0.0%
28	1898 (January)	1900	105	0	0.0%
29	1898 (December)	1901	125	2	1.6%
30	1899	1902	187	1	0.5%
31	1900	1903	188	1	0.5%
32	1901	1904	192	0	0.0%
33	1902	1905	171	2	1.2%
34	1903	1906	175	1	0.6%
35	1904	1907	172	0	0.0%
36	1905	1908	191	5	2.6%
37	1906	1909	179	6	3.4%
38	1907	1910	149	5	3.4%
39	1908	1911	148	7	4.7%
40	1909	1912	144	15	10.4%
41	1910	1913	118	14	11.9%
42	1911	1914	117	9	7.7%
43	1912	1915	95	6	6.3%
44	1913	1916	95	7	7.4%
45	1914	1917	89	5	5.6%
46	1915	1918	124	12	9.7%
47	1916	1919	115	11	9.6%
48	1917	1920	171	18	10.5%
49	1918	1921	176	23	13.1%
50	1919	1922	272	23	8.5%
51	1920	1923	255	54	21.2%
52	1921	1924	236	55	23.3%
53	1922	1925	62	11	17.7%
54	1923	1926	68	14	20.6%
55	1924	1927	120	28	23.3%
56	1925	1928	111	24	21.6%
57	1926	1929	122	31	25.4%
58	1927	1930	113	34	30.1%
59	1928	1931	123	35	28.5%
60	1929	1932	127	35	27.6%
61	1930	1933	116	33	28.4%
62	1931	1934	125	39	31.2%
63	1932	1936	124	43	34.7%
64	1933	1937	160	59	36.9%
65	1934	1938	187	68	36.4%

66	1935	1938	220	79	35.9%
67	1936	1939	248	81	32.7%
68	1937	1940	288	107	37.2%
69	1938 (April)	1941	343	150	43.7%
70	1938 (December)	1941	433	177	40.9%
71	1939	1942	581	265	45.6%
72	1940	1943	625	301	48.2%
73	1941	1944	898	462	51.4%
74	1942	1945	1024	—	
Total			10411	2358	

Sources: Kanya Miyauchi, Koichi Hayashi, Nobukiyo Nanbu, and Hideaki Fukata, *Kaigun heigakko, kaigun kikan gakko, kaigun keiri gakko* [The Naval Academy, the Naval Engineering School, and the Naval Accounting School] (Tokyo: Akimoto Shobo, 1971), 236-237; Kaikukai, ed., *Kaigun kuchu kinmusha (shikan) meibo* [The list of naval aviators (officers)] (Tokyo: Kaikukai, 1959).

Chart 1. Factors affecting the carrier revolution

	Visionaries	Organizational Development	Aviator Recruitment	Organizational Culture
U.S.	William Moffett John Towers *Neither were initially aviators, but they later took basic flight training.	Political maneuver to resist the army's call for a unified air force. Early identification of independent offensive power of carriers. "Naval Trinity" consisting of the Bureau of Aeronautics, the Naval War College, and the Air Battle Group created a positive feedback loop.	Creating attractive promotional pathways to recruit capable naval officers for aviators. Reserve officers serving as a buffer not to recruit too many active officers at once. Greatest organizational representation by senior officer aviators among the three navies.	Encouraging serious exercises, simulations, and war games.
Britain	Murray Suter R. G. H. Henderson *Neither were aviators by training nor received formal flight training in their career.	Naval aviation subsumed by the air force. No organizational home for aviators. Weak motivation to seriously invest on naval aviation.	Less attractive career path for naval officers due to the "Dual Control" of the Fleet Air Arm. Very few active and reserve officer aviators. Least organizational representation by senior officer aviators among the three navies.	Less critical thinking.
Japan	Eisuke Yamamoto Isoroku Yamamoto *Neither were aviators by training nor received formal flight training in their career.	Freedom to develop naval aviation without serious challenges from the army. Naval aviation employed to fill the perceived gap in the number of capital ships. "Naval Trinity" centered on the Naval Aviation Department along with the Naval Staff College and the Air Battle Group created a positive feedback loop.	Recruiting a small number of officer aviators and a large number of noncommissioned officers not to disturb the existing officer hierarchy. No serious efforts to drastically increase reserve officers before the Pacific War. Medium organizational representation by senior officer aviators.	Encouraging research and development. Overcoming seniority rule. Offense-dominant culture leading to virtually no preparation for protracted air warfare.

Chart 2. Summary of findings

External Environment	Vision	Organizational Development	Personnel Management	Organizational Culture
➢ Japan identified the United States as a strategic competitor immediately after the First World War. ➢ The naval arms control treaties forced the Japanese Navy to look for alternatives to battleships. ➢ Weak civilian control over the military gave the navy freedom to pursue its own aviation program without serious challenge from its political masters.	➢ Non-aviator admirals including Eisuke Yamamoto and Isoroku Yamamoto identified aircraft as a potential platform to fill the perceived force gap with the United States. ➢ Pioneering and leading officer aviators translated their visions into operational reality. ➢ The Pearl Harbor attack was envisioned by Isoroku Yamamoto, but aviators, namely Takijiro Onishi and Minoru Genda, played a critical role in planning the attack.	➢ Total independence from the army helped the navy to become the dominant air service in Japan. ➢ The Establishment of the Naval Aviation Department gave aviators an organizational home to enhance their organizational standing. ➢ The "Naval Trinity" fostered technological and operational development of carrier aviation.	➢ The Yokaren system enabled the navy to recruit talented youth as aviators while alleviating administrative challenges in recruiting many aviators in a short period of time. ➢ Due to the lack of flight experience among senior officers, junior aviators exercised more influence than that of their actual ranks in operational planning. ➢ A small, but elite cadre of aviators enabled the navy to conduct initial naval air campaigns successfully with limited human resources.	➢ The navy's service culture encouraged research and development of aircraft. ➢ Unique organizational culture developed among aviators helping them to overcome the seniority rule within the navy. ➢ Japan's offense-dominant culture squeezed speed, endurance and firepower out of limited aeronautical technology.

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