NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

INTERNATIONAL RELATIONS, NEW TECHNOLOGY, AND ADAPTATION OF THE MILITARY INNOVATION: FOCUSING ON THE CASE OF THE AIRCRAFT CARRIER INNOVATION OF THE IMPERIAL JAPANESE NAVY DURING THE INTERWAR PERIOD

by

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December 2017

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704–0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** December 2017	**3. REPORT TYPE AND DATES COVERED** Master's thesis	
4. TITLE AND SUBTITLE INTERNATIONAL RELATIONS, NEW TECHNOLOGY, AND ADAPTATION OF THE MILITARY INNOVATION: FOCUSING ON THE CASE OF THE AIRCRAFT CARRIER INNOVATION OF THE IMPERIAL JAPANESE NAVY DURING THE INTERWAR PERIOD			**5. FUNDING NUMBERS**
6. AUTHOR(S) Yanghwan Cho			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB number ____N/A____.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.			**12b. DISTRIBUTION CODE**

13. ABSTRACT (maximum 200 words)

The purpose of this study is to examine the factors that could best explain the initial superiority the Imperial Japanese Navy (IJN) achieved during World War II through military innovation. For this purpose, the thesis analyzes the factors that most significantly impacted the Japanese aircraft carrier and aircraft innovation during the interwar period. The study found that technology, international relations, and adaptation positively influenced military innovation in the IJN in various ways. With the newly developed aviation technology, the IJN laid the groundwork for military innovation, which aided response to the two naval disarmament treaties; through the Second Sino–Japanese War, the IJN elaborated its aircraft and aircraft carrier doctrine. In other words, the IJN's military innovation in the interwar period was enabled by technology, driven by the realist/international relations theory, and enhanced by adaptation. This study strengthens existing research on military innovation by examining positive factors and suggesting considerations for establishing defense policy.

14. SUBJECT TERMS military innovation, aircraft carriers, aircraft, Imperial Japanese Navy			**15. NUMBER OF PAGES** 79
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540–01-280-5500 Standard Form 298 (Rev. 2–89)
Prescribed by ANSI Std. 239–18

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Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(STRATEGIC STUDIES)**

from the

**NAVAL POSTGRADUATE SCHOOL
December 2017**

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LIST OF ACRONYMS AND ABBREVIATIONS

IJN	Imperial Japanese Navy
JNGS	Japanese Naval General Staff
NSC	Naval Staff College
USN	United States Navy
WWI	World War I
WWII	World War II

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I. INTRODUCTION

A. MAJOR RESEARCH QUESTION

After the Russo-Japanese War, the Imperial Japanese Navy (IJN) appeared as a powerful naval force. It was very surprising that a Japanese combined fleet defeated the Russian navy, which was twice the size of the Japanese Navy at the time.[1] No one expected the Japanese victory. The Japanese commander, Admiral Tōgō Heihachiro, demonstrated the outstanding capability of the fleet in the Tsushima Strait and created a new type of naval battle known as *Taikan kyohōshugo* (the big ships, big guns ideology).[2] Following this battle, Japan became an acknowledged naval. Almost four decades later, they attempted to reenact the glorious victory of the Battle of Tsushima using aircraft carriers. As we have known today, Japan failed in this attempt against the U.S. Navy in World War II (WWII).

In examining the war in the Pacific, it is clear that Japan suffered significant disadvantages that would become steadily more apparent the longer the war went on. The principal disadvantage was Japan's industrial and commercial base to support a long war at sea as compared to the United States. However, Imperial Japanese naval forces during the early Pacific War were ahead of the United States Navy (USN) in some important aspects. When Japan attacked Pearl Harbor in 1941, Japan fielded ten aircraft carriers in the Pacific War as opposed to the U.S. Carrier Pacific Fleet of four carriers. Also, Japan possessed the world's best fighter, the *zero-sen*, and many good pilots who were well-trained through the Sino-Japanese War. Moreover, in the early days of the Pacific War, the relative superiority of Imperial Japan was evident because the difference in industrial power did not significantly affect the outcome of the battle. Then, what can explain the Japanese comparative advantage in carrier operations at the outset of WWII?

This thesis generally examines the Japanese approach to carriers, carrier aviation, and carrier tactics in the interwar period. Also, it analyzes the Japanese case in the context

[1] David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy 1887–1941* (Annapolis, MD: Naval Institute Press, 2012), 95–132.

[2] Evans and Peattie, 129.

of the military innovation literature and determines which aspect of the literature pertains to the Japanese case.

B. SIGNIFICANCE OF THE RESEARCH QUESTION

The analysis of military behavior in war can be attempted through the examination of such things at discovery of new strategies and tactics, strategic and tactical errors and lessons learned, and success or failure of innovation. In this respect, this thesis has important academic and policy implications.

First, this thesis can strengthen existing arguments in the academic field, especially research on military innovation. Military innovation research studies the factors affecting change of operational concept, force structure, and organization structure such as technology, civil-military relations, bureaucratic politics, culture, and adaptation.[3] The Japanese Navy developed the aircraft carrier structure well and evaluated a unique operational concept based on it. Therefore, an analysis of the factors that affected the establishment of the new operational concept could strengthen the study of military innovation in this instance. Moreover, the significance is even greater because there is no concrete research on the military innovation of the Japanese Navy during the interwar period.

Second, this study will provide useful data for the policy maker about military innovation. The success and failure of military innovation often influences the destiny of a nation. The accumulation of research data on military innovation can reduce the risk of policy making and increases the possibility of innovation success. Therefore, this study is important in that it can be used as influential data for policy making process.

[3] Adam R. Grissom, Caitlin Lee, and Karl P. Mueller, *Innovation in the United States Air Force* (Santa Monica, CA: RAND, 2016), 2.

C. LITERATURE REVIEW

1. Military Innovation

Grissom defined military innovation as "a change in operational praxis that produces a significant increase in military effectiveness."[4] At this time, military innovation should not be simply referred to minor reform but administrative or bureaucratic measures, and their corresponding operational practices should be clearly linked.[5] Accordingly, changes in the way military organizations function in operational environments include not only operational concepts, but also technology, systems, and force structures. This is more evident through the definition of Farrell and Terriff. They define that the military innovation is "developing new military technologies, tactics, strategies, and structures."[6]

Military innovation studies, a subfield of strategic studies, appeared in 1984 as a discipline by Barry Posen.[7] The field of military innovation studies tries to explain "how, why, and under what circumstances military innovation occurs."[8] Various schools of thought developed to illustrate this for the past 30 years:

- **Technological Model**: The introduction of new technologies has the opportunity to be equipped with new capabilities, leading to military innovation.[9]

- **Civil-Military Relations Model**: Posen first described this model.[10] He explained that when national political leaders intervene in service

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4 Grissom, Lee, and Mueller, *Innovation in the United States Air Force*, 1.

5 Adam R. Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5 (October 2006): 907, http://dx.doi.org/10.1080/01402390600901067.

6 Theo Farrell and Terry Terriff, "The Source s of Military Change," in *The sources of Military Change : Culture, Politics, and Technology,* ed. Theo Farrell and Terry Terriff (Boulder, CO: Lynne Rienner, 2002), 2.

7 Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca, NY: Cornell University Press, 1984).

8 Grissom, "The Future of Military Innovation Studies," 906.

9 Grissom, Lee, and Mueller, *Innovation in the United States Air Force*, 2.

10 Posen, *The Sources of Military Doctrine.*

doctrinal development, military innovation occurs.[11] In other words, military innovations were driven by external factors rather than elements within the service.

- **Bureaucratic Politics Model** (inter- and intra-service competition): This model differs from the civil-military relation model in that military innovation drivers are within the military. James A. Russell explained that military innovation is affected by the intervention of various "organizational and bureaucratic behaviors."[12] The impact of organizational and bureaucratic behavior is divided into two categories. First, military innovation is affected by the inter- military services.[13] The inter-service model's center argument is that the lack of resources stimulates innovation.[14] Second, military innovation is influenced by the rivalry between the branches of the military service.[15]

- **Cultural Model** (Strategic and Organizational Culture): This model shows that each organization has its own unique culture. This unique culture determines how each military organization approaches and resolves the challenges it faces.[16] The organizational model is divided into the strategic culture approach and organizational culture approach.[17] First, the strategic cultural approach illustrated that traditionally, the tendency to perceive the problems of the state impacts military innovation, as Dima Adamsky said, "affecting the course and outcome of military

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11 Posen, *The Sources of Military Doctrine*, 232–5.

12 James A. Russell, *Innovation, Transformation, and War: Counterinsurgency Operations in Anbar and Ninewa Provinces, Iraq, 2005~2007* (Palo Alto, CA: Stanford University Press, 2011), 24.

13 Grissom, "The Future of Military Innovation Studies," 910.

14 Grissom, 910.

15 Grissom, 913.

16 Grissom, Lee, and Mueller, *Innovation in the United States Air Force*, 2.

17 Hassan M. Kamara, "The Influence of Strategic and Organizational cultures on the Revolution in Military Affairs within the U.S. Army" (master's thesis, Naval Postgraduate School, 2015), 3–11, https://calhoun.nps.edu/handle/10945/45205.

change."[18] Second, the organizational culture approach suggests that the unique culture of each organization has an impact on military innovation. This will be discussed in more detail in the next section.

- **Adaptation Model**: This model is a field of research the has emerged in recent years. It explains that innovation takes place in the process of adapting gradually to the environment and enemy characteristics of a military organization.[19] Therefore, this adaptation can happen more clearly in the exhibition, of a down-to-top innovation rather than top-down occurs.

2. Culture and Military Innovation

Theo Farrell argued that culture is a very important component of military innovation. He said that culture determines the context for military innovation and the attitude of responding to opportunities based on many case studies.[20] Accordingly, the cultural factors that influence military innovation are somewhat different from the impact of other factors on it. Technology, civil-military relations and bureaucratic factors play a role in inducing and accelerating military innovation. On the other hand, the cultural factor mainly constrains military innovation, but of course it induces and accelerates

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[18] Dima Adamsky, *The Culture of Military Innovation, The Impact of Cutural Factors in the Revolution in Military Affairs in Russia, the US, and Israel* (Palo Alto, CA: Stanford University Press, 2010), 10.

[19] Russell, *Innovation, Transformation, and War*; Theo Farrell, "Improving in War: Military Adaptation and the British in Helmand Province, Afghanistan, 2006~2009," *Journal of Strategic Studies* 33, no. 4 (August, 2010): 567–94, http://dx.doi.org/10.1080/01402390.2010.489712.

[20] Grissom, "The Future of Military Innovation Studies," 916; Theo G. Farrell and Terry Terriff, *The Sources of Military Change: Culture, Politics,Technology* (Boulder, CO: Lynne Rienner, 2002), 7–8; Theo G. Farrell, "Figuring Out Fighting Organizations: The New Organizational Analysis in Strategic Studies," *Journal of Strategic Studies* 19, no. 1 (Spring 1996): 122–35, http://dx.doi.org/10.1080/01402399608437629; Emily O. Goldman, "The Spread of Western Military Models to Ottoman Turkey and Meiji Japan," in *The sources of Military Change : Culture, Politics, and Technology,* ed. Theo Farrell and Terry Terriff (Boulder, CO: Lynne Rienner, 2002).

military innovation as well.[21] Many studies analyzing the impact of culture on military innovation have proved this.[22]

In 2010, Dima Adamsky's *The Culture of Military Innovation* established a framework for strategic culture research.[23] He analyzed how different "national cognitive styles" in the United States, Israel, and Russia work with RMAs for the same goals.[24] Adamsky concluded that different modes of perception have created very different aspects of military innovation. In addition, he explained that "variance in strategic cultures accounts for a variety of military innovations, based on similar technologies, develop in different states."[25] As such, culture at the national strategic level influences the speed and the path of military innovation.

Research on organizational culture explains the impact of culture on military innovation in the similar context of strategic culture research. The conceptual basis for organizational culture was built by Theo Farrell and Terry Terriff. They explained that organizational culture is a main factor limiting the success of military innovation.[26] Just as strategic culture influences the fundamental attitudes of approaching military innovation, organizational culture determines how individuals and organizations have

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21 Grissom, *Innovation in the United States Air Force*, 2.

22 Anthony King, "Understanding the Helmand Campaign: British military operations in Afghanistan," *International Affairs* 86. no. 2 (March 2010): 311–32, http://dx.doi.org/10.1111/j.1468-2346.2010.00884.x; Richard Lock-Pullan, *U.S. Intervention Policy and Army Innovation* (New York: Routledge, 2006); John A. Nagl, *Learning to Eat Soup with a Knife: Counterinsurgency Lessons from Malaya and Vietnam* (Chicago: University of Chicago Press, 2002); Terry Terriff, "US Ideas and Military Change in NATO, 1989–1994," in *The sources of Military Change : Culture, Politics, and Technology,* ed. Farrell and Terriff (Boulder, CO: Lynne Rienner 2002); Terry Terriff, "Innovate or Die: Organizational Culture and the Origins of Maneuver Warfare in the United States Marine Corps," *Journal of Strategic Studies* 29, no. 3 (June 2006), http://dx.doi.org/10.1080/01402390600765892; Thomas McNaugher, *The M16 Controversies: Military Organizations and Weapons Acquisition* (New York: Praeger, 1984); Elizabeth Kier, *Imagining War: French and British Doctrine Between the Wars* (Princeton, NJ: Princeton University Press, 1997).

23 Adamsky, *The Culture of Military Innovation*.

24 Adamsky, 5–10.

25 Adamsky, 131.

26 Theo and Terriff, "The Sources of Military Change," 7–10.

certain values and respond to certain issues. Therefore, organizational culture influences the perception of military problems and the behavior to solve problems.[27]

Organizational culture research produced many empirical work. David E. Johnson explained that the U.S. Army culture formed by the World War I (WWI) victory hindered the U.S. Army's recognition of the need for military innovation.[28] Richard Lock-Pullan argued that the organizational culture of the U.S. Army formed after the Vietnam War prevented them from recognizing that their changes were not appropriate for national security needs.[29] Elizabeth Kier also explained that the organizational culture formed between British and French officers hindered their tactics and doctrine changes.[30]

D. POTENTIAL EXPLANATIONS AND HYPOTHESES

The purpose of this thesis is to identify what factors were important to the military innovation of the IJN during the interwar period. Thus, this thesis verifies the hypotheses focused on the factors of the existing research in order to determine which factor influenced the military innovation of the Japanese Navy the most during the entire period.

a. Hypothesis #1: The IJN's military innovation in the interwar period was a result of the introduction of new technologies.

As mentioned above, the introduction of new technologies provides opportunities for military innovation. Yet, military innovation does not occur only through the introduction of new technologies. John A. Nagl analyzed the military success stories of the British Army during the Malayan Emergency. He estimates that the British Army achieved military innovation by succeeding in their military strategy change to rebels.[31]

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[27] Kamara, "The Influence of Strategic and Organizational cultures on the Revolution in Military Affairs within the U.S. Army," 8; Edgar H. Schein, *Organization Culture and Leadership*, 3rd Edition (San Francisco: Jossey Bass, 2004), 4.

[28] David E. Johnson, *Fast tanks and Heavy Bombers: Innovation in the U.S Army*, 1917–1945 (Ithaca, NY: Cornell University Press, 2003).

[29] Lock-Pullan, *U.S. Intervention Policy and Army Innovation*, 46–7.

[30] Kier, *Imagining War*, 144–5.

[31] Nagl, *Learning to Eat Soup with a knife*, 192–5.

However, this hypothesis expects that the introduction of technology was an important factor in IJN's military innovation, because the operation of the aircraft carrier in naval operations was achieved through the operation of weapon systems that did not exist before.

b. Hypothesis #2: The Naval Disarmament Treaty triggered the IJN's military innovation in the interwar period.

The development of military innovation by external effects are explained through the civil-military relations model described above. There are a variety of external factors that can pressure the military's innovation such as leaders, parliament, public opinion, and changes in the international environment. The most widely researched area is the emergence of military innovation by policy makers (leaders, parliaments).[32] However, due to the nature of the Imperial Japan, their civilian policy makers had to be controlled by the military. Since the 1930s, the military officers, especially Imperial General Headquarters, had the right to decide on the major policies of the state. Thus, military reform pressure by civil policy makers was not great in Imperial Japan. On the other hand, the external factor that pressed the IJN was the Naval Disarmaments Treaty at the time. It mainly focused on limiting the size and scale of battleships.[33] Therefore, the Japanese Navy likely strengthened its naval power by focusing on the development of an aircraft carrier when the achievement of the fleet-based construction target was restricted.[34]

c. Hypothesis #3: The rivalry between the Fleet Faction and the Treaty Faction influenced the IJN's military innovation in the interwar period.

There were various factions in the Japanese Navy during the interwar period. The Fleet Faction and the Treaty Faction divided into the response to London Naval Treaty.

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[32] Gordon N. Lederman, *Reorganizing the Joint Chief of Staff: The Goldwater-Nichols Act of 1986* (Westport, CT: Greenwood Press, 1990); A leading example of military innovation by civil policy makers is the innovation of the U.S. military command structure based on the 'The Goldwater-Nichols Act' in 1982.

[33] Akira Yamada 山田朗, *Gunbi Kakuchō no kindaishi : Nīhongun no bōchō to Hōkai* 軍備拡張の近代史: 日本軍の膨張と崩壊[Modern History of Armament Expansion: Expansion and Collapse of the Japanese Force] (Tōkyō: Yusikawa Kōbunkan, 1997), 88–9.

[34] The Washington Naval Treaty focused on restrictions on battleship competition, so regulations on aircraft carriers and auxiliary vessels were somewhat lax. There was also no aircraft carrier in Japan at the time of effectivization of the treaty.

The Fleet Faction refused the London Treaty and demanded to build a battleship-oriented fleet capable of responding to the United States and Britain. On the other hand, the Treaty Faction tried to strengthen the foundation of the national economy by accepting the standards of the London Naval Treaty and breaking away from the indiscriminate arms race.[35] This hypothesis expected that the competition between the Fleet Faction and the Treaty Faction played an important role in determining the power structure within the IJN.

d. Hypothesis #4: The IJN's organizational culture reinforced the military innovation of the IJN.

As described above, culture determines the attitude of the response to military innovation. Thus, cultural factors can either positively or negatively affect military innovation. The organizational culture of the IJN was influenced by the Battle of Tsushima. As the IJN destroyed a stronger Russian naval force than the Japanese in the Battle of Tsushima, they emphasized the importance of fleet decisive battle and mental power. This formed the organizational culture as well as the military doctrine of the IJN. Therefore, this thesis analyzes whether these organizational cultures had a positive or negative impact on the IJN military innovation.

e. Hypothesis #5: The military innovation of the Japanese Navy was a result of adaptation based on the lessons of the WWI and the Second Sino-Japanese War.

Imperial Japan experienced WWI and the Second Sino-Japanese War after the Russo-Japanese War. Although Imperial Japan did not play an important role in WWI, it had indirect experiences by dispatching military observers to major countries and conducting small operations in coastal areas of China.[36] In the Second Sino-Japanese War, the battle experience was accumulated by operating aircraft directly. Thus, the IJN learned a lot from the WWI and the Second Sino-Japanese War, and these lessons might play an important role in the Japanese naval operations and power structure.

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35 Yamada, *Gunbi Kakuchō no kindaishi,* 120.

36 Evans and Peattie, *Kaigun*, 180.

E. RESEARCH DESIGN

This study is a case study on the military innovation of the Japanese Navy during the interwar period. In this study, a case analysis is performed by applying a 'within-case analysis.' Within-analysis is typically used to demonstrate that one case is more validly explained by several alternative explanatory models. The purpose of this thesis is to identify which model of military innovation is the most appropriate for explaining military innovation in the interwar period. Hence, within-case analysis is appropriate for the purpose of the study.

This thesis reviews the IJN's approach to carriers, carrier aviation, and carrier tactics in the interwar period. More specifically, it will review the process of introducing aircraft and aircraft carriers to the IJN, Japan's own aircraft production, the response to the Naval Disarmaments Treaty, and changes in the military power structure of the Navy. Then, this study will analyze which hypothesis is most appropriate to explain the IJN's military innovation.

F. THESIS OVERVIEW AND DRAFT CHAPTER OUTLINE

The introductory chapter has discussed the research question, importance of this thesis, literature review, and research design. Chapter II is the empirical case study that chronicles how Japan approached aircraft carriers in the interwar period. Chapter III examines the case relative to the theories in the literature review. Chapter IV summarizes the findings and implications of this research for strategy and policy for military innovation.

II. CASE STUDY: IJN'S APPROACH TO AIRCRAFT CARRIER IN THE INTERWAR PERIOD

A. PRIOR TO THE NAVAL TREATY PERIOD (1905–1921)

1. Legacy of the Battle of Tsushima

The Russo-Japanese War for the occupation of Korea and Manchuria occurred in 1904. The Russo-Japanese War began with the Japanese attacks on the Port Arthur and Port Jaemulpo and ended with the annihilation of the Russian Baltic fleet at the Tsushima Strait.[37] Corbett evaluated the Battle of Tsushima as "the most decisive and complete naval victory in history."[38] Among the thirty-eight warships owned by the Baltic fleet, thirty-four were sunk, caught, or missing and 4,830 people killed and 5,917 captured. On the other hand, in the case of the IJN's Combined Fleet, just three torpedo boats sank and 110 people died.[39]

It was a one-sided victory that left a clear footprint in the history of naval warfare. This overwhelming victory of has brought about changes in navy weapons systems and tactics around the world.[40] Through the Battle of Tsushima, each country confirmed that the large size of ships, heavy armor, and large turrets are the most important factors for a naval victory.[41] Accordingly, the *taikan kyohōshugo* (big ships, big guns ideology) became central to naval construction. In Tsushima, the accuracy rate of shells and the number of times cannonballs impacted ships between the Combined Fleet and the Baltic Fleet did not differ greatly.[42] However, the difference was in warships defense ability and the quality of the shell. The ships of the Combined Fleet were newer and thicker than the ships of the Baltic Fleet.[43] A comparison of the defense strengths of the latest

37 Evans and Peattie, *Kaigun*, 95–132.

38 Evans and Peattie, 124.

39 Evans and Peattie, 124

40 Yamada, *Gunbi Kakuchō no kindaishi*, 32.

41 Yamada, *Gunbi Kakuchō no kindaishi*, 32.

42 Evans and Peattie, *Kaigun*, 125; The Baltic fleet's 12-inch shells impacted the Combined fleet warship, and the ratio of hits to the Baltic fleet by the Combined fleet was less than 10%.

43 Evans and Peattie, 125.

battleships between the two sides revealed that "in the case of the Russian battleship *Suvorov*, 17% of armors were over 152mm, 31% had less than 152mm and 52% were without armor; however, in the case of *Mikasa* of the Combined Fleet, the proportions were 29%, 40% and 31%, respectively."[44] In terms of firepower, the Combined Fleet preferred a high-capacity shell (HC), a chemical energy shot, which was four times more powerful than an armor-piercing shell(AP), a kinetic energy shot. On the other hand, there were many unexploded bombs in Russian fires.[45] Consequently, a large ship equipped with large cannons and heavy armor was required, and improving the quality of the cannons and the intensive operation of the firepower became important.[46]

After the Russo-Japanese War, the big ships, big guns ideology caused an intense naval competition. Britain was at the forefront of this competition. In 1906, the British accelerated the naval armament race as they completed the Dreadnought class battleship. This battleship made each country's capital ship 'outdated' and frustrated other countries' existing naval construction plans. However, with the rapid development of technology and the enormous investment in battleship construction, each country developed warships that surpassed the Dreadnought class battleship. This competition lasted until the outbreak of WWI. Between 1905 and 1915, the UK, Germany, France, America, and Imperial Japan began to build 51, 33, 18, 17, and 16 capital ships respectively.[47]

Imperial Japan also plunged into this global naval competition. This became possible as Japan became able to produce warships domestically. Before the Russo-Japanese War, Imperial Japan imported all its warships from the UK, Italy, and France.[48] However, during the Russo-Japanese War, the Kure, Yokosuka, and Kiki navy yards were able to build capital ships.[49] In the Kure navy yards, the IJN laid down the armored cruiser *Tsukuba* in January 1905 and the armored cruiser *Ikoma* in March 1905, and in

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44 Yamada, *Gunbi Kakuchō no kindaishi*, 41.

45 Evans and Peattie, *Kaigun*, 125.

46 Mark E. Stille, *The Imperial Japanese Navy* (Oxford: Osprey Publishing, 2014) 131–3.

47 Yamada, *Gunbi Kakuchō no kindaishi*, 62

48 Yamada, 65–6.

49 Antony Preston, *Battleships* (New York: Gallery Books, 1981), 191, 195.

the Yokosuka navy yard, the IJN laid the keel of the battleship *Satsuma* in May 1905 and the armored cruiser *Kurama* in August 1905. In March 1906, the battleship *Aki* was laid down in the Kiki navy yard.[50] Yet, in 1906 the development of the UK's Dreadnought class battleship outdated the pre-dreadnought class battleships *Satsuma* and *Aki* before they were completed.[51] This vicious cycle continued afterwards because England was building the Super-Dreadnought Class Battleship. To overcome this situation, the IJN ordered the Vickers Company of England to lay down the battle cruiser *Kongō* in January 1911.[52] At the time of launching in August 1913, the *Kongō* was the world's only capital ship with eight 14-inch guns. However, her position as the most powerful capital ship was not long lasting because the U.S. battleship *Texas* with ten 14-inch guns and the British *Queen Elizabeth*-class battleship with eight 15-inch guns were being built in 1912.[53] The vicious circle of the naval armaments competition did not stop.

2. Accelerate Naval Armament Race and New Approach after WWI

The physical collision of this naval competition erupted in the Battle of Jutland which proceeded from May 31 to June 1, 1916.[54] It was the largest battle in naval history, but it had no major impact on the result of WWI.[55] Nevertheless, the Battle of Jutland strengthened the naval armament competition and the existing big ships, big guns ideology.[56] This is because of the need for huge guns and heavy armor after the sinking of the British battle cruisers *Invincible* and *Queen Mary* during the Battle of Jutland.[57] A decade before, during the Battle of Tsushima, the firing range between the IJN's warships and the Russian warships did not exceed 0.5 miles. On the other hand, in the Battle of Jutland, shelling started at a distance of 1 mile to 1.3 miles due to improved cannon

50 Yamada, *Gunbi Kakuchō no kindaishi*, 65–6.

51 Yamada, 67.

52 Evans and Peattie, *Kaigun*, 161.

53 Evans and Peattie, 161.

54 Evans and Peattie, 167.

55 Yamada, *Gunbi Kakuchō no kindaishi*, 71–3.

56 Evans and Peattie, *Kaigun*, 167.

57 Yamada, *Gunbi Kakuchō no kindaishi*, 73–4.

performance and development of fire control devices. Distant cannon shells drew a parabola, penetrated the cupola cover of the *Queen Mary*, and exploded at the shot locker in the bottom of the boat. This was because battle cruisers' armor was made thinner than battleships' for higher speed.[58] Therefore, after WWI, each nation mounted larger guns, and warships, especially capital ships, were made more enormous than ever before by installing additional armor to strengthen defense.[59]

Even after WWI, the naval armaments race continued. The race between Britain and Germany before WWI turned into it between the United States and Imperial Japan. The United States emerged as the strongest player in the international community at the time of WWI, and the USN was the main force to support it. Since the IJN designated the United States as a potential enemy, the naval armaments race with the United States was inevitable. The United States and Imperial Japan began to build 30,000 tons and 40,000 tons of capital ships. However, since Imperial Japan lagged behind the United States in economic and industrial power, it was difficult to build a level of naval power equal to that of the United States. The ratio of the IJN's budget in Imperial Japan's national budget exceeded 20% in 1918 and reached 31.6% in 1921.[60] Given the recession after WWI, it was clear that Japan's sustained expansion of naval power would lead to a collapse in national finances. Nevertheless, the IJN continued to build battleships and battlecruisers.

The construction of the IJN was accomplished through the Navy Construction Act. The Eight-four fleet project in 1917, the Eight-six fleet project in 1918, and the Eight-eight fleet project in 1920 passed through the Diet.[61] Thus, including the four existing battleships and four battlecruisers, the Eight-eight-eight fleet concept could be completed in 1927.[62] During this period, the Japanese Navy's naval construction bill emphasized the construction of capital ships. However, significant changes occurred in 1918. The IJN

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58 Yamada, *Gunbi Kakuchō no kindaishi*, 73–5

59 Evans and Peattie, *Kaigun*, 169–70.

60 Yamada, *Gunbi Kakuchō no kindaishi*, 81

61 Yamada, 81.

62 Evans and Peattie, *Kaigun*, 174.

planned to build an aircraft carrier in the Eight-six fleet project.[63] Through WWI, the potential of aircraft in naval operations began to slowly emerge. In 1917, the Royal Navy created the "prototype of the modern aircraft carrier" by installing a permanent flight deck on the battle cruiser *Furious*.[64] Imperial Japan could not identified its naval effectiveness in practice because WWI ended when this new concept of warship was deployed in the battlefield. However, the IJN developed an aircraft carrier by including it in its naval construction plan. In 1919, the 7,470-ton carrier *Hōshō* was laid down at Yokohama yard, and it launched in 1922.[65] Imperial Japan was able to respond to British aviation immediately because it had begun to focus on aviation development in 1912.

3. Evolution of Initial Air Power

Starting in 1909, the IJN slowly recognized the potential of air power in naval operations. In 1909, Lt. Comdr. Yamamoto Eisuke became interested in developing aircraft in Britain and France. He argued that aviation had great potential and would be an important axis of naval power in the near future in his report "Kōkūjutsu Kenkyū ni Knasure Ikensho" (Statement Concerning the Study of Aeronautics).[66] Subsequently, in 1912, the *Kaigun Kōkūjutsu Kenkyūkai* (Commision on Naval Aeronautical Research) was established in the Technical Department, and the construction of the IJN's air power began.[67] The IJN dispatched five officers, including Lt. Onishi Takijiro, to England and France to learn aeronautics.[68] At the end of 1912, the new naval aviators who returned to Japan made the first flight of the IJN at Yokosuka Bay. The first air operations of the IJN took place at the beginning of WWI. In 1914, the IJN attacked the German naval base at Tsingtao using seaplanes and the seaplane carrier *Wakamiya*.[69]

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63 Guy Robinson, *The Aircraft Carrier Story 1908–1945* (London: Cassell & Co., 2001), 198.

64 Norman Polmar, *Aircraft Carriers: A Graphic History of Carrier Aviation and its Influence on World Events* (New York: Doubleday, 1969), 25–30.

65 Evans and Peattie, *Kaigun*, 178.

66 Mark R. Peattie, *Sunburst: The Rise of Japanese Naval Air Power, 1909–1941* (Annapolis, MD: Naval Institute Press, 2001), 3.

67 Evans and Peattie, *Kaigun*, 178.

68 Onishi Takijiro devised a 'kamikaze attack' during the Pacific War.

69 Polmar, *Aircraft Carriers*, 36–7.

During WWI, the IJN's officers, who recognized the importance of the air power, continued to make efforts to strengthen. In 1916, the IJN dismantled the Commision on Naval Aeronautical Research, instead, establishing a naval air unit under the control of the Naval Affairs Bureau of the Navy Ministry. The first unit was installed in Yokosuka in April 1916. The Yokosuka Air Group trained with the fleet once a year. Also, in 1917, officers belonging to the Yokosuka Naval Arsenal developed the *Ro-Gō Kō-gata*, Japanese first seaplane. It was mass produced in the 1920s and became the main force for the IJN's aviation. The IJN also strengthened its air power by installing a new air group and a naval air base at Sasebo in 1918.[70] Later, by establishing a training center, the Sasebo base became the center of naval flight training. The IJN did not have much aircraft, manpower, or high-quality technology at first, but they gradually recognized the potential of air power and continued efforts to develop it.

After WWI, the IJN recognized that European aviation technology was far ahead of the Japanese and made efforts to overcome it. The IJN sought to acquire aviation skills and techniques from European nations that developed aeronautical power while forming aviation-related organizations and personnel. In 1920, it sent an observer to the United Kingdom to observe *Furious*' air operations.[71] The following year, the IJN asked for the UK technology transfer and aerospace training in order to more actively develop naval aviation capabilities. The British naval forces, which considered a potential war with the United States and Japan at the time, denied the Japanese request because it considered Japan as a secondary threat.[72] However, the UK's Foreign Office and industries were in a different position from its naval forces, and they decided to dispatch an informal civil advisory group through consultations with the British government.[73] In 1921, William Francis-Forbes Sempill of the United Kingdom arrived in Japan with 27 pilots and

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70 Evans and Peattie, *Kaigun*, 180.

71 Evans and Peattie, 181.

72 John Ferris, "Armaments and Allies: the Anglo-Japanese Strategic Relationship, 1911–1921," in *The Anglo-Japanese Alliance, 1902–1922*, ed. Philips Payson O'Brien (London: Routledge Curzon, 2004), 257.

73 Peattie, *Sunburst*, 18.

engineers, who provided technology and information about aircraft to the IJN.[74] They actively supported the IJN and allowed access to most aviation technologies, except for cutting-edge technologies. This support greatly contributed to the development of Japanese Navy aviation during the 1920s and 1930s.

B. THE NAVAL TREATY PERIOD (1922–1936)

1. Washington Naval Treaty and its Influence

Despite widespread international trend of seeking peace and arms reduction after WWI, many nations faced serious financial pressures by engaging in naval armaments races.[75] The IJN's naval competition with the United States and United Kingdom were driving the Japanese economy to ruin. The Eight-eight fleet project was a difficult goal to achieve for the Japanese economy scale.[76] The IJN consumed more than 35% of the national budget for naval warship construction, but it was not enough because the U.S. GNP in 1921 was 9.7 times more than Imperial Japan's.[77] Thus, the naval disarmament conference was a welcome one for Imperial Japan, despite the opposition from the Japanese Naval General Staff (JNGS). As a result, Imperial Japan accepted the U.S. proposal to hold the disarmament conference.

At the Washington conference, the main points of the disarmament treaty were:[78]

(1) Stop the construction of capital ships for decade (the capital ship refers to the battleship, battle cruiser, and cruiser)

(2) The ratio of the capital ships and the aircraft carriers are US: UK: Japan = 5: 5: 3.

(3) Discard all of the capital ships being built or planned, and most of the aging capital ships.

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74 Kaigun and Peattie, 301; and Peattie, *Sunburst*, 17–20.

75 Yamada, *Gunbi Kakuchō no kindaishi*, 86–7.

76 Evans and Peattie, *Kaigun*, 199.

77 Yamada, *Gunbi Kakuchō no kindaishi*, 91

78 "The Washington Treaty," Digital History, accessed September 18, 2017, http://www.digitalhistory.uh.edu/disp_textbook.cfm?smtID=3&psid=3995.

(4) The capital ship shall be not less than 10,000 tons and not more than 35,000 tons, the main gun shall be less than 16 inches, the aircraft carrier should be less than 27,000 tons, and the gun shall be less than 8 inches.

With this treaty, the total tonnage of the capital ships that Imperial Japan could possess was limited to 315,000 tons. This was 60% of the total tonnage of the United States and Britain, which was 525,000 tons.[79] This did not comply with the "70% Ratio against the United States," which consistently claimed by the JNGS.[80] Thus, it opposed the ratification of the treaty. However, Imperial Japan accepted the proposal from the United States and the United Kingdom because the Imperial Japanese economy might have fallen if it continuously competed in the arms race.[81]

With the conclusion of the Washington Naval Treaty, there were cleavages within the IJN around the ratification of the treaty. The officers of the Navy Ministry, mainly Katō Tomosaburō, tried to reduce the armaments and prevent war through appropriate negotiations with the United States. However, the officers of the JNGS, centering on Katō Kanji, rejected the treaty, arguing that 70% of the U.S. must maintained. They succumbed to the internal influence of Katō Tomosaburō, but after the signing of the treaty, the IJN's atmosphere.[82] In 1923, Katō Kanji and Suetsugu Nobumasao of the JNGS led the amendment of the Imperial Defense Policy which defined the United States as Japanese first potential enemy.[83] The IJN thought that a war with the United States had become inevitable, and it set up concrete measures to deal with it.

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79 Yamada, *Gunbi Kakuchō no kindaishi*, 87.

80 Sadao Asada, *From Mahan to Pearl Harbor: The Imperial Japanese Navy and the United States* (Annapolis, MD: Naval Institute Press, 2006), 48; The '70% Ratio of the United States' comes from the assumptions of Satō Tetsutarō and Akiyama Saneyuki, who said that the attacker needs a dominance of more than 50% against the defenders. They insisted that if the power ratio of the attacker (US) and the defender (Japan) is 1.5: 1, defense is possible. Thus, when an attacker is 1, at the same rate, the defender is able to defend if it has a power of 0.67. So, if Imperial Japan has 70% of the power of the United States, it could not lose the war with the United States.

81 Yamada, *Gunbi Kakuchō no kindaishi*, 88–90.

82 Sadao Asada, "From Washington to London: The Imperial Japanese Navy and the Politics of Naval Limitation, 1921–1930," *Diplomacy & Statecraft* 4, no. 3 (1993): 156, http://dx.doi.org/10.1080/09592299308405899; Evans, *Kaigun*, 200.

83 Evans and Peattie, *Kaigun*, 201.

After the Washington Naval Treaty, the IJN's *Zengen-yougeki sakusen* (Interception-Attrition Operation) became clear as the IJN's strategy toward the United States, and they focused on building the auxiliary ship (cruisers, submarines) for the Attrition operation. The IJN regarded that the decisive fleet battle would be against the USN, which had more capital ships than the IJN's, was reckless. Accordingly, they thought about diminishing the USN's power before the decisive battle. The attrition operation concept first appeared in the Imperial Defense Policy in 1918.[84] At the time, however, the top priority of the IJN was to construct the capital ship that could be put into decisive battle as much as possible. Thus, about the attrition operation, they set up only a vague idea that attenuated the enemy through the raid of the cruiser, but there was no specific plan.[85] However, due to the building of the capital ship was limited by the treaty, the relative weakness of the IJN became clear. Thus, diminishing the USN's forces at the attrition operation became more important.[86] In other words, the role of auxiliary ships such as submarines, destroyers, and cruisers became important. In particular, the IJN began to focus on auxiliary ships development since the Washington Naval Treaty did not agree on restrictions on subsidiary vessels. Consequently, the IJN adopted a warship expansion plan and focused on building cruisers, submarines, and destroyers.[87] At this time, Imperial Japan had 40% of the world's auxiliary ship construction and led another naval competition (see Table 1).

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[84] Evans and Peattie, *Kaigun*, 201–5; Yamada, *Gunbi Kakuchō no kindaishi*, 94–6; The scenarios of Interception-Attrition Operation are as follows. A submarine unit deployed around Hawaii in advance sees the enemy's movement and attacks the enemy with the torpedo. And then a large cruiser that has been deployed where the expected route of attack, equilibrates the main forces of the United States and Imperial Japan until it reaches the decisive battlefield (west of the Mariana Islands) by diminishing the USN's capital ship through the night raid. Thereafter, the IJN fleet intercepts the USN fleet through a decisive battle between capital ships on the battlefield.

[85] Yamada, *Gunbi Kakuchō no kindaishi*, 95.

[86] Evans and Peattie, *Kaigun*, 204.

[87] Evans and Peattie, 212–32.

Table 1. Status of Auxiliary Shipbuilding in Each Country after the Washington Naval Treaty (1922–1927)[88]

	Ton	%
United States	26,400	4.07
United Kingdom	154,278	23.79
Imperial Japan	262,200	40.40
France	137,275	21.16
Italy	68,650	10.58
Sum	648,613	100.00

Imperial Japan focused not only on submarines and cruisers but also on aircraft carriers. The Imperial Defense Policy, amended in 1923, stated that the IJN would have three aircraft carriers.[89] This was in accordance with the Washington Treaty's criteria. The Washington Naval Treaty limited displacement tonnage of total the IJN's aircraft carrier to 81,000 tons and the maximum displacement ton per carrier to 27,000 tons. However, each country was able to convert capital ship, already under construction, into an aircraft carrier because the exemption was made to allow the construction of up to two aircraft carriers within the limit of the total displacement of 33,000 tons.[90] Accordingly, the IJN converted the battleship *Kaga* and the battlecruiser *Akagi*, which were under construction, into aircraft carriers.[91] In 1927, as *Akagi* launched, the IJN had three aircraft carriers. Thus, the Washington treaty led to an increase the number of aircraft carriers due to the limited building capacity of capital ships. Therefore, the increase in aircraft carriers was not due to the increase in the strategic value of the aircraft carrier. However, emergence of the two large aircraft carriers was an important turning point in

88 Adapted from Harlow A. Hyde, *Scraps of Paper: The Disarmament Treaties Between the World Wars* (Lincoln, NE: Media Publishing, 1988), 155.

89 Yamada, *Gunbi Kakuchō no kindaishi*, 43.

90 Jung Soo Lee 이정수, *Je 2cha Segyedaegeon Haejeonsha 제 2 차 세계대전 해전사*[Second World War Naval Warfare History] (Seoul: Namyoung Munwhasha, 1981), 15.

91 Yamada, *Gunbi Kakuchō no kindaishi*, 90–1; and Evans, *Kaigun*, 249.

the development and operation of the IJN's aircraft carriers in the future.[92] This is discussed in more detail in the Chapter III, Section B.

2. London Naval Treaty and its Influence

As the naval competition for auxiliary warship heated up, the effects of the Washington Naval Treaty were likely to disappear. In order to overcome this situation, a conference on the limitation of auxiliary shipbuilding was held in Geneva in June 1927, but it failed because of the confrontation between the United States and the United Kingdom.[93] However, U.S. President Herbert Hoover, elected in 1928, stated that the United States would reduce naval forces relative to other nations, insisting on the inevitability of arms reduction. Also, British Prime minister Ramsay MacDonald announced his intention to actively reduce maritime armaments. In particular, he came to the United States and actively responded to naval disarmament by discussing the issue of subsidiary warships with President Hoover. Thus, in October 1929, the British proposed holding a disarmament conference, and the Navy Conference on Disarmament was held in London, attended by the United Kingdom, the United States, Imperial Japan, France, and Italy in January 1930.[94]

The Imperial Japanese Prime minister Osachi Hamaguchi's cabinet decided on the following "three basic principles" as a basic requirement of Japan to attend the London Naval Conference on November 26, 1929: "(1) a 70% ratio with the United States in total auxiliary tonnage; (2) the special importance of the 70% ratio with regard to 10,000-ton, eight-inch-gun cruisers; and (3) the submarine tonnage of 78,000."[95] This principle was strongly asserted by Katō Kanji of the JNGS. Katō argued that the 70% ratio was 'the rock-bottom ratio' and that if that demand was not accepted, Japanese defense would be

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92 Evans and Peattie, *Kaigun*, 249.

93 Hyde, *Scraps of Paper*, 157–64.

94 Hyunki Kim 김현기, "Yangcha Segyedaejeon Ganeui Haegun-gunchuk-joyakgwa gu younghang 양차 세계대전 간의 해군군축조약과 그 영향[Naval Disarmament Treaty and Its Influence in the Interwar Period]," *Strategy 21* 2, no. 1 (Spring-Summer, 1999): 19, http://www.kims.or.kr/strategy21_003.

95 Asada, "From Washington to London," 172.

in danger. Osachi, however, took a flexible attitude to succeed in the naval treaty.[96] The United States and Imperial Japan held several individual negotiations to reach agreement on cruisers and submarines displacement standard, and on March 13, Imperial Japan agreed to the following percentage of ownership: "(1) Japan's total auxiliary warship ratio is 69.75%; (2) a 60% ratio in heavy cruisers, with a proviso that assured Japan of a ratio slightly above 70% (the United States promising not to complete three of its heavy cruisers during the life of the treaty, that in until 1936); and (3) parity in submarine tonnage, which was set at 52,700 tons."[97]

In response to these conclusions, two factions formed within the IJN. Navy Ministry soldiers expressed regret that the 'three basic principles' had not been implemented. However, they thought that the compromise was inevitable because they believed that the non-treaty status would be more dangerous to Imperial Japan. They are called the 'Treaty Faction'. On the other hand, the JNGS, which prioritized the realization of the Interception-Attrition Operation, rejected the compromise and insisted on achieving 70% ratio of the large cruisers with the United States and maintaining the current submarine holding amount. They are called the 'Fleet Faction'.[98] Despite the strong resistance of the Fleet Faction, The Imperial Japanese government ordered the negotiation group to join the treaty, and the London Naval Treaty was signed on April 22, 1930.[99]

The London Naval Treaty had a major impact on changes in the power structure of the IJN. It focused on the limitation of cruisers and submarines. Thus, the IJN lacked auxiliary vessels for an effective attrition operation. The IJN sought to maintain its original operational plan by taking various measures to prevent the collapse of Interception-Attrition Strategy. The expansion of aviation power was one such methods.[100] This is because the aircraft was not subject to the restrictions of the treaty

96 Asada, 172–4.

97 Asada, 178.

98 Yamada, *Gunbi Kakuchō no kindaishi*, 120.

99 Asada, "From Washington to London," 182–3.

100 Yamada, *Gunbi Kakuchō no kindaishi*, 122–4.

and the development of aviation technology made it possible to carry out the attack mission of the aircraft. Accordingly, the aviation-related budget of 1931 increased 9.1% from the former, accounting for 17.9% of the total the IJN's budget, despite the IJN's budget having fallen 23.8% from the previous year. After 1932, the rate of growth increased by more than 30% for the third consecutive year.[101] Moreover, the IJN founded the Naval Aviation Department in 1927, followed by the Naval Air Arsenal in 1932, and began to concentrate on expanding aviation power by operating independent instruments for aircraft experimentation and development.[102]

3. Aircraft Carrier and Aircraft Development

In the 1920s, the IJN was constantly interested in aviation and aircraft carriers, but the scale was not so large. In the early 1920s, the IJN acquired the basic aircraft skills and techniques based on UK technical support. The IJN started to produce the seaplane domestically, and the seaplane was able to identify the target and protect the battleship from enemy aircraft.[103] In addition, the aircraft carrier *Hōshō*, which was included in the eight-six fleet project, was launched in 1923, and the battleship *Kaga* and the battle cruiser *Akagi* remodeled to aircraft carriers according to the results of the Washington Naval Treaty (see Table 2).[104] Moreover, naval officers who began to recognize the importance of aircraft sought to prove the aircraft's attack power in the mid-1920s. On July 9, 1924, the IJN conducted a bombardment experiment on the scrapped battleship *Iwami*.[105] It sank with three hits of 240kg bombs. Despite these efforts, after the Washington Naval Treaty, the IJN focused on auxiliary warships such as submarines and cruisers, and they developed the concept of underwater warfare. Thus, the aviation-

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101 Yamada, 122–4

102 Evans and Peattie, *Kaigun*, 249.

103 Thomas C. Hone and Mark D. Mandeles, "Interwar Innovation in Three Navies: U.S.Navy, Royal Navy, Imperial Japanese Navy," *Naval War College Reivew* 40, no. 2 (Spring, 1987): 69, https://usnwc2.usnwc.edu/Publications/Naval-War-College-Review/Press-Review-Past-Issues.aspx.

104 Jentschura, Hansgeorg, Dieter Jung, and Peter Mickel, *Warships of the Imperial Japanese Navy, 1869–1945* (Annapolis, MD: Naval Institute Press, 1977), 40.

105 Evans and Peattie, *Kaigun*, 327

related investment was relatively inadequate.[106] This atmosphere began to change in 1927, when two large aircraft carriers were launched and the London Naval Treaty included limitations for auxiliary shipbuilding in 1930.[107]

Since the late 1920s, the IJN began to strengthen its aviation capabilities by consolidating aviation-related organizations and strengthening bombing training.[108] In 1927, the IJN established the Navy Aviation Department, which can integrate aviation-related services within the IJN. In 1932, they also founded Naval Air Arsenal, which is responsible for aircraft research and development. Based on these organizations, the IJN reorganized its fleet structure and strengthened aircraft training. In 1928, the IJN formed the First Carrier Division, consisting of three aircraft carriers (*Hōshō, Kaga,* and *Akagi*) and four destroyers. In 1935, they divided the First Carrier Division into two divisions, each placed on the First and Second Fleet.[109] After 1927, the IJN conducted aircraft trafficking exercises, horizontal bombardment exercises, and torpedo bombing exercises on moving targets.[110] In 1933 training, attack accuracy reached 60% in horizontal bombing, and 88.4% in dive bombing (daytime). Also, by 1934, they achieved a 70% accuracy in dive bombing (night time) in training.[111] This not only proved the attack power of the aircraft, but also showed the aircraft training level of the IJN was high.

Meanwhile, the IJN made efforts to create good aircraft at this time. The IJN started to develop aircraft through its own technology, and by the end of the 1930s it produced the world's best aircraft. The 'Aviation Technology Independence' program and the 'Prototypes System,' which took place in conjunction with the Naval Air Arsenal in 1932, became a decisive turning point in the development of Imperial Japan's own

106 Evans and Peattie, 248.

107 Evans and Peattie, 248.

108 Evans and Peattie, 249.

109 Yoichi Hirama, "Japanese Naval Preparation for World War II," *Naval War College Review* 44, no. 22 (Spring, 1991): 69, https://usnwc2.usnwc.edu/Publications/Naval-War-College-Review/Press-Review-Past-Issues.aspx.

110 Hone and Mandeles, "Interwar Innovation in Three Navies," 69.

111 Yamada, *Gunbi Kakuchō no kindaishi*, 142.

aircraft.[112] The 'Prototypes System' was a contract with a company that submitted a design best suited to the requirements of the IJN among the many companies that participated in the IJN bidding, and a non-selected company should produce aircraft with the design of a selected company or provide an engine to selected company as a subcontractor.[113] This navy-driven aircraft development control system enabled a very efficient "design, development, and production process."[114] Yamamoto Isoroku, the proponents of aviation of the IJN, who had would plan and control the Pearl Harbor surprise, led the effort. Afterwards, the IJN produced the type 0, zero-fighter, in 1940, and got the world's best fighter.[115]

In this way, the IJN recognized the importance of air power and made efforts to develop it. However, the IJN could not establish a specific doctrine on how to operate aircraft carriers in the strategic level. The *Kaisen yōmurei*(Battle Instruction), which was revised in 1928, stated that the aircrafts should suppress the enemy aircraft in order to get a head start and the attackers attack the enemy warship, besides the aircraft's reconnaissance mission.[116] In addition, the Battle Instruction, which was amended in 1934, stated that "Naval air units were expected to merely facilitate the main fleet action."[117] These indicate that the operation of the aircraft carrier at that time was tactically aggressive. However, it was basically a means of supporting the main force, or a means of disturbing the enemy fleet. Thus, although the position of the aircraft carrier was not clearly established at the strategic level, the tactical operating procedure such as bombing and torpedo attack tactics emerged. Especially, many senior officers gradually became interested in the aircraft, as the flight distance of the aircraft surpassed the gun-

112 Jirō Horikoshi, *Eagle of Mitsubishi: The Story of the Zero Fighter* (Seattle: University of Washington Press, 1981), 15.

113 Evans and Peattie, *Kaigun*, 304.

114 Evans and Peattie, 303-4.

115 Evans and Peattie, 307.

116 Yamada, *Gunbi Kakuchō no kindaishi*, 140–1.

117 Evans and Peattie, *Kaigun*, 250.

shot or surface torpedo. Hence, the IJN changed the main target of the aircraft carrier from the enemy warships to the enemy aircraft carrier in 1932.[118]

C. THE POST–NAVAL TREATY PERIOD (1937–1941)

1. Opening the Post-treaty Era and Expansion of Naval Power

The Navy disarmament era continued until 1936. The Saitō Makoto cabinet of Imperial Japan decided to depart from the disarmament treaty in December 1934. Therefore, Imperial Japan prepared for the post-treaty era beginning in 1934.[119] However, in the Navy, the perception that the post-treaty era could be strategically more disadvantageous began to spread. If limitations on capital ship construction were eliminated, the gap between Imperial Japan and the United States, which had been superior in terms of industrial and economic power, could rapidly increase. Therefore, the Japanese leadership sought to cope with the United States through quantitative competition, improving the quality of equipment and improving its operational skills.[120] For example, in 1937, the United Kingdom and the United States built a large amount of capital ships based on the main vessel of the early 1920s, but the IJN developed the *Yamato*-class super battleship to surpass the performance of the two countries.'[121] The IJN thought to launch a preemptive strike outside the range of the opponent with a bigger 18-inch gun. If one-sided attack was possible at a distance where the capital ships of the USN could not reach, the numerical inferiority was not a problem.[122] Thus, in the post-treaty era, the IJN concentrated on upgrading warships to enhance their power and developed high-performance super battleships.

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118 Evans and Peattie, *Kaigun*, 332–3.

119 Yamada, *Gunbi Kakuchō no kindaishi*, 186; In September 1934, the IJN began the battleship *Yamato* design in preparation for the post-treaty era, and in 1937 it was ready to be built.

120 Evans and Peattie, *Kaigun*, 357.

121 Yamada, *Gunbi Kakuchō no kindaishi*, 189; From 1937 to 1941, Britain, the United States, and Imperial Japan laid down 6, 10, and 2 battleships respectively.

122 Yamada, *Gunbi Kakuchō no kindaishi*, 189–90.

After the London Naval Treaty, the IJN established the Circle Plan and systematically constructed naval forces. Circle One and Two were planned and executed in 1931 and 1934.[123] In 1937, the IJN promoted the construction of naval forces based on the Circle Three naval construction plan. The plan included building two *Yamato*-class battleships, two *Shōkaku*-class aircraft carriers, and 64 other warships by 1941. The modernization of old-fashioned vessels was proceeded with the construction of new warships.[124] At this time, the IJN remodeled the aircraft carriers *Hōshō* and *Ryūjō* and upgraded various warships.[125] After that, the IJN established the Circle Four plan and tried to implement it from 1940, but they started this plan in 1939 because the influence of the United States' second Vinson plan (1938). This fourth plan included the addition of two *Yamato*-class battleships and one more aircraft carrier.[126]

After the Naval Treaty went into annulment, the number of the IJN's aircraft carriers increased. The IJN launched six aircraft carriers from 1937 to 1941 (See Table 2). Increasing the number of aircraft carriers in the IJN at this time was due to various methods to avoid the regulation of naval treaties. The aircraft carrier *Sōryū* was planned to be constructed in 1931. The IJN designed her to be convertible to any form of cruiser or aircraft carrier to avoid the regulation of disarmament treaties. However, when Imperial Japan departed from the Naval Treaty, the IJN built her as a pure aircraft carrier and she was launched in 1937. The *Hiryū* and her sister ship, *Sōryū*, were designed together with, but she was laid down in 1936 and launched in 1939.[127] The aircraft carriers *Zuihō* and *Shōhō*, launched in 1940 and 1941, were the achievements of the IJN's 'Shadow Fleet' program. The IJN built the commercial vessels and auxiliary warships to be easy to transform into aircraft carriers or battleship in order to increase naval power quickly when needed.[128] For example, the submarine tenders *Takasaki* and *Tsurugizaki*

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123 Peattie, *Sunburst*, 60–2.

124 Evans and Peattie, *Kaigun*, 357.

125 Ikuhiko Hata and Yasuho Izawa, *Japanese Naval Aces and Fighter Unit in World War II* (Annapolis, MD: Naval Institute Press, 1989), 19, 31; and Evans and Peattie, *Kaigun*, 357.

126 Evans and Peattie, *Kaigun*, 358.

127 Evans and Peattie, *Kaigun*, 318, 322.

128 Peattie, *Sunburst*, 62.

were renamed and converted into the aircraft carrier *Zuihō* and *Shōhō*. The IJN converted nine ships to aircraft carriers in the same way during the Pacific War, but these were inadequate to operate as attack aircraft carriers in the fleet due to their low stability and weak defense capabilities.[129] Furthermore, the IJN launched the aircraft carriers *Shōkuku* and *Zuikaku* in 1941 by the aforementioned Circle Three. Both aircraft carriers were rated as the most successful warships made by the IJN.[130] As a result, the IJN had a total of 10 aircraft carriers (see Table 2).

Table 2. The IJN's Aircraft Carrier Development, 1920–41[131]

Name	Launched	Feature
Hōshō	1922	519ft., 25kts., Japanese first carrier, Using for exercise
Akagi	1927	817ft., 31kts., In 1936, modernization at Sasebo Port expanded the flight deck to 855 ft., Maximum aircraft capacity from 60 to 91
Kaga	1928	771ft., 28kts., In 1935, modernization at Sasebo Port expanded the flight deck to 812 ft., Maximum aircraft capacity from 60 to 90
Ryūjō	1933	513t., 29kts., Maximum aircraft capacity : 48, Due to the restrictions of disarmament treaties, the smallest aircraft carrier
Sōryū	1937	746ft., 34kts., Maximum aircraft capacity : 71
Hiryū	1939	745ft., 34kts., Maximum aircraft capacity : 73
Zuihō	1940	674ft., 28kts., Maximum aircraft capacity : 30
Shōhō	1941	
Shōkaku	1941	794ft., 34kts., Maximum aircraft capacity : 72
Zuikaku	1941	794ft., 34kts., Maximum aircraft capacity : 72

The IJN made world-class aircraft in the mid-1930s and developed the world's best fighter aircraft in 1940. Aircraft operated based on aircraft carriers are divided into fighter, torpedo bombers (attack aircraft), and dive bombers (bombing planes). The IJN adopted the Mitsubishi fighter design and succeeded in developing the A5M (type 96, "Claude") carrier fighter in 1935. The A5M did a great job in the Sino-Japanese War, but the IJN needed the development of fighters with overwhelming capabilities. It demanded

129 Hansgeorg, Jung, and Mickel, *Warships of the Imperial Japanese Navy*, 40–51.

130 Peattie, *Sunburst*, 60.

131 Adapted from Jentschura, Hansgeorg, Dieter Jung, and Peter Mickel, *Warships of the Imperial Japanese Navy, 1869–1945* (Annapolis, MD: Naval Institute Press, 1977), 40–51; Evans and Peattie, *Kaigun*, 314–23.

the highest level in all areas of fighter speed, range, firepower, and maneuverability. Mitsubishi's Horikoshi Jisō's team developed a fighter that met the IJN's demands through a series of innovations, including the development of the fuselage that can reduce weight and minimize air resistance.[132] In 1940, the IJN deployed the A6M (type 0, "Zeke") to aircraft carriers. The Zero fighter first appeared in the Sino-Japanese War, and it was hard to find any weakness until the United States developed a more powerful engine during the Pacific War.[133]

The IJN not only had world-class fighters but also dive bomber (attack aircraft) and torpedo bombers with excellent performance. The main dive bomber of the Japanese Navy was the D3A (type 99, "Val") developed by Aichi in the mid-1930s. The D3A had similar performance to dive bombers in the United States and Germany. In the early years of the Pacific War, the D3A sank more Allied war-ships than any bomber in the Axis.[134] Also, the IJN developed an attack aircraft B5N (type 97, "kate"), which was capable of "torpedo attack, high-level bombing and reconnaissance." B5N supported ground forces in the Sino-Japanese War and destroyed many American warships in the Pearl Harbor attack.[135]

In addition, the IJN increased the number of aircraft carriers as well as developing the cutting-edge aircraft in the post-treaty era. In December 1941, Imperial Japan had ten aircraft carriers, but the United States had eight. Because the United States had to face a two-sided war in the Atlantic and Pacific oceans, the only American carriers capable of responding to Imperial Japan were the four aircraft carriers of the Pacific Fleet.[136] The IJN was numerically weaker in the number of capital ships before the Pacific War but had a numerical advantage in the number of aircraft carriers.

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132 Jirō, *Eagle of Mitsubishi*, 26–57.

133 Evans and Peattie, *Kaigun*, 307.

134 Evans and Peattie, 307

135 Renė J. Francillon, *Japanese Aircraft of the Pacific War* (London: Putnam, 1970), 411–6; and Renė J. Francillon, *Imperial Japanese Navy Bombers of World War Two* (Berkshire, England: Hylton Lacy Publishers, 1969), 11–3.

136 Yamada, *Gunbi Kakuchō no kindaishi*, 193.

2. Aircraft Carrier Doctrine and Aircraft Tactics

a. Aircraft Carrier Doctrine

The IJN's concept of aircraft carrier doctrine divided into strategic and tactical levels. At the strategic level, the IJN sought to defeat the USN through a decisive battle. It was due to the theory of victory gained at the Russo-Japanese War. However, with the Washington Naval Treaty limiting the dominance of capital ships, the IJN changed its strategy to the Interception-Attrition Operation. When they were unable to dominate the United States with their capital ships, they sought to defeat the USN in decisive battle with equal or superior power by gradually reducing their combat power.[137] They modified the strategy toward the United States slightly due to the naval disarmament treaty, but the decisive battle of the battleship did not change.[138]

Accordingly, the IJN thought that the role of auxiliary warships in reducing enemy's power in Interception-Attrition Operation is very important for the success of their operations. After the Washington Naval Treaty, the IJN focused on the development of auxiliary warships, such as submarines and cruisers, to realize the changed operational concept. However, as limitations on auxiliary warships were strengthened in the London Naval Treaty, the IJN became interested in aviation to replace the role of auxiliary warships. Thus, until the Pacific War, aviation power and aircraft carriers evolved as auxiliary forces to support fleet decisive battle by battleships.[139]

Consequently, the IJN used aircraft carriers as fleet auxiliaries to create a favorable environment for the decisive battle.[140] In the early stage of the aircraft carriers, the IJN disposed it in the front boundary unit with the cruiser to reconnaissance, or it protected the capital ship from the enemy's aircraft. However, as the aviation technology

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137 Yoichi Hirama, "Interception-Attrition Strategy: The Sun against the Eagle," *Journal of The Pacific Society* 11, no. 4 (January 1989): 10–1.

138 Yura Fujio 由良 富士雄, "Taiheiyōsensō ni okeru kōkū un'yō no jissō: Un'yō riron to jissai no un'yō to no sai ni tsuite 太平洋□□における航空運用の□相：運用理論と□際の運用との差異について[The Real Philosophy of Air Operation in the Pacific War: On the Difference between Operation Theory and Actual Operation]," Japanese National Institute for Defense Studies 防衛□究所: 67, accessed October 2, 2017, http://www.nids.mod.go.jp/publication/senshi/pdf/201203/08.pdf.

139 Hirama, "Interception-Attrition Strategy: The Sun against the Eagle," 14.

140 Hirama, 9–14.

developed and the effect of air power was proved through the Sino-Japanese War, the target of an aircraft carrier changed. In the late 1930s, aircraft carriers began to take an active task of attacking and defeating enemy aircraft carriers, battleships, and other vessels anchored at sea or at base.[141] The individual combat of the aircraft carrier was conceived in a very aggressive manner, but at the strategic level, it played a role in supporting the decisive battle by reducing the enemy's combat power.

On the other hand, the IJN modified the aircraft carrier doctrine at the tactical level to maximize the attack power by concentrating its aircraft carriers. The aircraft carrier presented enormous power when it operated intensively, but at the same time it was very vulnerable to air attack. Therefore, the carrier doctrine established in 1936 emphasized distributed operation for securing survivability. The attack power that could be weakened through being distributed was to be complemented by mass attack and preemptive attack.[142] However, through the Sino-Japanese War, the need for concentrating aircraft carriers was increased to maximize the bombing effect as well as the importance of fighters.[143] This is because it is hard to control coordinated attacks when the aircraft carriers were far apart from each other.[144] The IJN organized the world's first aircraft carrier fleet with a strong attack power by concentrating seven aircraft carriers in the First Air Fleet. The concentrated aircraft carriers caused the IJN to suffer massive damage in the the Battle of Midway, but proved its effectiveness by exerting tremendous offensive power in the Pearl Harbor attack.[145]

b. Aircraft Tactics

The Japanese Navy developed various air attack tactics. During the Sino-Japanese War, they mainly performed the high-altitude bombing mission, but the accuracy was

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141 Fujio, "Taiheiyōsensō ni okeru kōkū un'yō no jissō," 68.

142 Fujio, "Taiheiyōsensō ni okeru kōkū un'yō no jissō," 333.

143 Fujio, 347.

144 Minoru Genda, "Tactical Planning in the Imperial Japanese Navy," *Naval War College Review* 22, no. 2 (October, 1969): 48, https://usnwc2.usnwc.edu/Publications/Naval-War-College-Review/Press-Review-Past-Issues.aspx.

145 Evans and Peattie, *Kaigun*, 347–9.

very low. They tried to increase the accuracy and destructive power of the bombing through the result of lesson learned from Sino-Japanese War.[146] They reduced the high-altitude level bombing altitude to 3,000 meters (9,800 feet) to increase accuracy.[147] In addition, they specified various tactics such as Dive Bombing, Low-Altitude Level Bombing, Skip-Bombing Strafing, and Torpedo Attack. In particular, they developed a shallow water attack tactic to strike against the warships moored in the harbor.[148] As such, the IJN developed various forms of air attack tactics to maximize attack power, as well as developing attack tactics applicable to specific situations, thus completing a robust air attack tactic.

146 Gordon W. Prange, *At Dawn We Slept* (New York: Penguin Books, 1991), 259.

147 Prange, *At Dawn We Slept*, 513.

148 Evans and Peattie, *Kaigun*, 344–6.

III. ANALYSIS OF THE HYPOTHESES

A. INFLUENCE OF NEW TECHNOLOGY

There is controversy as to whether the development or introduction of new technologies is a major cause of military change such as changing military structure and strategy.[149] In other words, when considering the cause-and-effect relationship between military changes and the introduction of new technologies, there is debate over whether changes in military strategy prompt new technologies or vice versa. Hence, this section examines whether the IJN changed its military strategy by introducing new innovations such as aviation and aircraft carriers technology, or whether the IJN developed such technologies due to changes in the IJN's military strategy.

The IJN quickly introduced and adapted new technologies from the UK, France and the United States although it could not develop innovative new technologies related to aircraft. The IJN promoted the adoption of aviation technology in 1909, and it succeeded in the world's first air raid using seaplanes and the seaplane carrier *Wakamiya* in 1914.[150] At the same time, the Royal Navy, the most powerful navy in the world, failed in several attempts at air raids using seaplanes.[151] Hence, Imperial Japan was ahead of Western countries in aeronautical experience and technology at the outset of WWI.[152] However, the gap in aviation technologies between European countries, such as Britain and France, and Japan widened after WWI.[153] Accordingly, the IJN requested the transfer of aviation technology to Britain, an ally. In 1921, the technology transfer from the United Kingdom began, and the IJN's aviation technology began to evolve gradually.[154] The IJN's active move toward new technologies also can be seen through

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149 Theo Farrell, "Military Adapation in Afghanistan, the Editor's Response," *International Political Review* 1, no. 2 (December 2013): 111–3, http://dx.doi.org/10.1057/ipr.2013.19.

150 Peattie, *Sunburst*, 3–9; and R. D. Layman, *Before the Aircraft Carrier: the Development of Aviation Vessels, 1849–1922* (Annapolis: Naval Institute Press, 1989), 86–7.

151 Antony Preston, *Aircraft Carriers* (Minneapolis: Lerner Publications Company, 1985), 6.

152 Peattie, Sunburst, 9.

153 Layman, *Before the Aircraft Carrier*, 200–5.

154 Evans and Peattie, *Kaigun*, 301; and Peattie, *Sunburst*, 17–20.

the adoption of aircraft carriers. The IJN observed the operation of HMS *Furious* and HMS *Argus*, which were British aircraft carriers, converted from other type of warships, and developed and eventually launched the Aircraft Carrier *Hōshō*, which was designed and completed as the world's first aircraft carrier in 1922.[155] As such, the IJN introduced air power very quickly and its technology was also very high.

Yet, the introduction and development of early aviation technology could not change the IJN's faith in its battleship primacy. They did not recognize the importance of aircraft and aircraft carriers despite some officers insisting on its significance. This phenomenon was not unique to Imperial Japan. Even after WWI, all nations emphasized the importance of battleships over aviation power, and naval competition continued.[156] Low-level aviation technology was also the main reason for the lack of attention to aircraft and aircraft carriers. Most countries, including Imperial Japan, believed that it was impossible to use aircraft to neutralize warships.[157] At that time, the aircraft had a short cruising range, and the communication and navigation systems were rudimentary and could not guarantee the accuracy of the bombing.[158] Therefore, the air power of the IJN at this time did not have a great influence on the changing concept of maritime warfare.

In the 1920s, the perception of aircraft and aircraft carriers was still similar as the 1910s despite the increasing technology and number of the aircraft carriers. In the early 1920s, the IJN's aviation technology developed through the active research and development of private companies.[159] Companies such as Mitsubishi, Nakajima, and Aichi, which produced world-class aircraft in the late 1930s, generated aircraft

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155 Kathrin Milanovich, "Hōshō: The First Aircraft Carrier of the Imperial Japanese Navy," in *Warship 2008*, ed. John Jordan (London: Conway, 2008), 10–3; and Evans and Peattie, Kaigun, 180–1; HMS *Furious* changed its cruiser into an aircraft carrier and HMS *Argus* changed its merchant ship into an aircraft carrier. The Royal Navy designed and launched the aircraft carrier Hermes ahead of the Japanese Navy, but the completion was later than *Hōshō*.

156 Peattie, *Sunburst*, 21.

157 Yamada, *Gunbi Kakuchō no kindaishi*, 136–7.

158 Peattie, *Sunburst*, 21–2.

159 Yamada, *Gunbi Kakuchō no kindaishi*, 139–40.

development techniques during this period.[160] Notably, the Mitsubishi, which was the leading company in developing aircraft, produced carrier fighters, reconnaissance aircraft, and attack aircraft with British support. In 1923, its aircraft landed on the aircraft carrier *Hōshō*. At the same time, the IJN began to focus on aircraft reconnaissance, target identification, and support capabilities. This is because the aircraft became an important observation means as the firing range of the capital ships increased up to 2 miles.[161] Moreover, in 1927, launching the two large aircraft carriers, the *Akagi* and *Kaga,* cultivated the development of aircraft and aircraft carriers. In 1928, the IJN organized these aircraft carriers in the First Carrier Division and incorporated this Division into the Combined Fleet.[162] This shows that the IJN started to use aircraft carriers as an auxiliary force to support capital ships in the fleet decisive battle. However, the IJN regarded aircraft carriers as supporters of capital ships, not as offensive weapon.[163] This increase in technology expanded the role of aircraft and aircraft carriers in the battle arena but did not yet change the framework of the IJN's naval strategy.

The IJN's perception of aircraft carriers and aircraft changed after the London Naval Treaty in 1930. As this treaty imposed restrictions on auxiliary warships, aircraft and aircraft carriers became critical to the realization of the Interception-Attrition Strategy.[164] As the IJN lacked of cruisers and submarines in the Attrition Operation, which is the operation to diminish the enemy's main forces, the IJN tried to perform the Attrition Operation using aircraft carriers. This change fueled the development of aviation technology. The budget for aviation relations, which accounted for 0.44% of the IJN budget in 1916, increased to 8.72% in 1923, 14.29% in 1930 and 34.3% in 1937.[165] In particular, the aviation-related budget increased 9.1% even in 1931 when the naval budget fell 23.8% from the previous year due to the London Naval Treaty.[166] Moreover,

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160 Evans and Peattie, *Kaigun*, 302–3.

161 Yamada, *Gunbi Kakuchō no kindaishi*, 141.

162 Evans and Peattie, *Kaigun*, 332.

163 Evans and Peattie, 332.

164 Evans and Peattie, 249.

165 Yamada, *Gunbi Kakuchō no kindaishi*, 133–4, 138–9.

166 Yamada, 133–4.

the IJN established the Naval Air Arsenal at the Yokosuka Naval Base with the aim of integrating and strengthening existing research and training facilities as it began strategic investments in naval and aircraft carriers and integrated management of aircraft production and training.[167] The IJN established the Naval Air Arsenal at the Yokosuka naval base with the aim of integrating and strengthening existing research and training facilities as it began to increase investments in aircraft and aircraft carriers and integrate management of aircraft production and training.[168]

The development of aircraft at this time focused on producing high-performance aircraft to realize the IJN's strategy. Attrition operations require fighters, attackers, and bombers with stronger cruising powers and higher speeds for effective operation. The requirements of the IJN specifically addressed the 'aircraft models and performance standards'. Cruising power was included as the top priority of the 'performance standards' in 1930.[169] The ability to carry out the Interception-Attrition Strategy began to reflect on the 'performance standards' of 1930 that demanded cruising power over 3,800 km (2,375 miles), but Japanese aviation technology could not meet these demands.[170] The 'performance standards' in 1932 emphasized the development of the land based torpedo bomber in addition to carrier based aircrafts.[171] In 1936, the standards emphasized the carrier based dive bomber with long range cruising power.[172] In particular, the IJN disregarded aircraft defense power to achieve a high level of attack power and speed. This shows that the IJN intended to realize the concept of 'outranging' at the time. To 'Outrange' means a preemptive strike outside the range of an enemy's attack, defeating an enemy's aircraft carrier and taking air superiority before a decisive battle. In order to outrange the USN, the IJN acquired the performance table of the USN and succeeded in

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167 Peattie, *Sunburst*, 27.

168 Hirama, "Japanese Naval Preparations for World War II," 70.

169 Japan Navy Aviation History Compilation Committee Edition 日本海軍航空史編纂委員□ 編, *Nipponkaigun kōkū-shi dai 1* 日本海軍航空史 第 1（用兵篇)[Japan Navy Aviation History No. 1 (Troops)](Tokyo: Jijitsūshinsha, 1969), 405–6.

170 Yamada, *Gunbi Kakuchō no kindaishi*, 149.

171 Yamada, 149–50.

172 Yamada, 149–50.

identifying its aircraft capabilities in 1935. Therefore, the IJN tried to secure carrier-based aircraft capable of a preemptive strike outside the battle radius (about 480 km) of the U.S. Navy.[173]

As the IJN changed its naval strategy after the London Naval Treaty in 1930, it emphasized the importance of aircraft and aircraft carriers at the strategic level and began to require specific levels of aviation technology for efficient operation. Thus, by the 1930s, the development of the IJN's aviation technology provided one option when the IJN changed its naval strategy in 1930, but it did not play a driving role in the change of its military strategy. Rather, after the change of its naval strategy in 1930, the IJN called for the development of aviation technology to enable the implementation of naval strategy.

In conclusion, Japan's adoption of aviation technology did not trigger changes in the IJN's naval strategy, and changes in this military strategy promoted the development of aviation technology. However, the development of Japanese aviation technology in the 1920s provided the basis for the JNGS to change its naval strategy. In other words, although the adoption of aviation technology created a favorable environment for military change in the IJN, it did not trigger a military change itself. Therefore, although the introduction of aviation technology may have been a necessary condition for military change in the IJN, it is difficult to say that this was a sufficient condition.

B. IMPACT OF NAVAL DISARMAMENT TREATY

The Washington Naval Treaty in 1922 and the London Naval Treaty in 1930 had a great impact on the military innovation of the IJN in the interwar period. Because the naval disarmament treaty affected the IJN strategy change, and the force reinforcements of the IJN were based on its military strategy. Hence, this section explains how the signing of the naval disarmaments treaty affected the military strategy of the IJN and the development of aircraft carriers.

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[173] Yamada, *Gunbi Kakuchō no kindaishi*, 150–1.

After the Russo-Japanese War, the IJN adopted the "Big Ship, Big Gun" and the Fleet Decisive Battle ideologies as their basic naval warfare concept.[174] As the naval rivalry with the U.S. intensified, the idea became more specific and concrete. This is the 70% ratio idea (see Chapter II). The IJN believed that maintaining 70% of the U.S. Navy's force strength was the key to win a war with the United States. Accordingly, the IJN invested huge budget in the construction of capital ships. In 1921, the IJN's budget accounted for 31.6% of the Japanese national budget as the Diet approved the Eight-eight fleet project.[175] However, continued large-scale military spending was a burden on Imperial Japan. Consequently, Imperial Japan accepted the U.S. disarmament conference proposal.

The Washington Naval Treaty limited the holdings of capital ships in each country, which led to a change in the military strategy of the IJN. It allowed the IJN to own only 60% of the number of U.S. capital ships.[176] This meant the collapse of the 70% ratio idea, which was the basic premise of the IJN's maritime strategy. Hence, the JNGS set up the Interception-Attrition Strategy and tried to compensate the weakness of the main force.[177] They sought to gradually reduce the U.S. Navy's ability to cross the Pacific by using auxiliary warships such as cruisers and submarines. Consequently, the IJN mainly built cruisers and submarines and began the strategic investment in undersea warfare (see Tables 1 and 3).[178]

An interest in aircraft carriers increased because of the Washington Naval Treaty. A special clause of the Treaty allowed the battle cruiser *Akagi* and battleship *Kaga* to convert into aircraft carriers.[179] This increase in aircraft carriers was not due to the long-term strategic plan of the IJN. Because it was advantageous to switch to aircraft carriers rather than to dismantle or scrap capital ships under construction. Although the

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174 Yamada, *Gunbi Kakuchō no kindaishi*, 82–3.

175 Yamada, 82–3.

176 Yamada, *Gunbi Kakuchō no kindaishi*, 87.

177 Evans and Peattie, *Kaigun*, 249.

178 Evans and Peattie, *Kaigun*, 212–21; Stephen Roskill, *Naval Policy Between the Wars* (New York: Walker and Company, 1968), 580–4.

179 Evans and Peattie, *Kaigun*, 249.

construction of two large aircraft carriers was not intended by the strategic plan of the IJN, it was clear that the advent of large aircraft carriers changed the approach of the IJN toward aircraft. As a result, in 1927, the IJN integrated various organizations for aviation and aircraft carrier operations and established the Navy Aviation Department.[180] Moreover, in 1928, the IJN established the Carrier Division with the three aircraft carriers and deployed at the fleet, and the IJN started to consider the aircraft carrier and aircraft as the auxiliary of the main force.[181]

Table 3. Japanese Naval Building Programs as Finally Implemented, 1920–1936[182]

	Battleship	Cruiser	Submarine	Destroyer	Aircraft Carrier
1920	1	1	7	13	-
1921	1	4	8	12	-
1922	-	3	11	10	1
1923	-	3	6	7	-
1924	-	1	7	5	-
1925	-	3	3	5	-
1926	-	2	5	5	-
1927	-	2	7	5	1
1928	-	1	4	6	1
1929	-	3	5	5	-
1930	-	-	3	4	-
1931	-	-	-	4	
1932	-	4	4	4	-
1933	-	-	-	3	1
1934	-	-	1	2	-
1935	-	2	5	2	-
1936	-	-	-	2	-

[180] Evans and Peattie, 249.

[181] Hirama, "Japanese Naval Preparation for World War II," 69.

[182] Adapted from Roskill, *Naval Policy Between the Wars*, 580–4.

The London Naval Treaty was the important point for the IJN's development of aircraft carriers and aviation. When the construction of auxiliary vessels, which conducted the Attrition Operation such as cruisers and submarines, was restricted by the London Naval Treaty, the IJN became difficult to implement the existing Interception-Attrition Strategy.[183] As a result, the JNGS came up with a number of ways to solve the lack of auxiliary warships: (1) performance improvement of each auxiliary warship (additional armored, speed enhance), (2) installing heavy armor to ships less than 600 tons which were excluded from the disarmament treaty. (3) development and production of aircraft, (4) construction of warships and merchant ships consider the conversion (the "Shadow Fleet" program).[184] Among them, the IJN was interested in aircraft development and production, and the "Shadow Fleet" program.[185] The IJN's aviation budget increased dramatically and began to require high-performance aircraft for effective attrition operations. The aircraft carrier and aircraft became the central power of attrition operations. Table 4 shows the changes in strategic value of aircraft carriers and aircraft. According to the required military force of the Imperial Defense Policy, revised in 1923, 40 cruisers were needed for attrition operations. However, the Third Amendment of the Imperial Defense Policy shows that the cruiser's requirement decreased to 28 ships and that the need for aircraft carriers and aircraft increased significantly.

183 Asada, "From Washington to London," 178.

184 Yamada, *Gunbi Kakuchō no kindaishi*, 125–6.

185 Peattie, *Sunburst*, 62.

Table 4. Changing of Required Military Force in the Imperial Defense Policy[186]

	The IDF in 1907	The IDF in 1918 (1st Amendment)	The IDF in 1923 (2nd Amendment)	The IDF in 1936 (3rd Amendment)
Required Military Force	8 Battleships 8 Armored Cruisers *less than eight year of warship's age	8+8 Battleships 8 Armored Cruisers *less than eight year of warship's age	8 Battleships 3 Aircraft Carriers 40 Cruisers	12 Battleships 10 Aircraft Carriers 28 Cruisers 65 Land Based Air Units

In conclusion, the IJN changed its military strategy and force structure according to the outcome of the naval disarmament treaty. This change was a crucial factor in the development of aircraft carriers and aircraft. Due to the impact of the Washington Naval Treaty, a large aircraft carrier was built that was not planned, and the strategic value of aircraft and aircraft carriers increased as auxiliary warship building was limited by The London Naval Treaty (see Table 5). These changes promoted the development of aircraft carriers and aircraft, and the IJN had the aircraft carrier fleet that was equal or superior to that of the United States in 1941. The naval disarmament treaty allowed the IJN to look for other means of compensating for its lack of force strength by imposing restrictions on the existing mainstream naval vessels. Therefore, the naval disarmament treaty played a crucial role in triggering military innovation in the IJN based on aircraft carriers and aircraft.

Table 5. Changing of Commitment Force for Strategic Concept

		1905–1922	1923–1930	1931–1941
The IJN's Military Strategy		Fleet Decisive Battle	Interception-Attrition Strategy	
Commitment Force	Interception	Battleships Battle Cruisers	Battleships	Battleships + Land Based Air Unit
	Attrition	-	Cruisers + Submarines	Aircraft Carriers + Cruisers + Submarines

[186] Adapted from Yamada, *Gunbi Kakuchō no kindaishi*, 43; Defense Agency Defense Institute War History Room 防衛□防衛□修所□史室, *Daihon'ei rikugun-bu 〈dai 1〉 Shōwa jū go-nen gogatsu made* 大本□陸軍部〈第1〉昭和十五年五月まで[Army Division of Military General Staff until May 15th of Showa 15] (TōKyō: Asakumo Shimbunsha, 1967).

C. FACTIONS AND MILITARY CHANGE

Bureaucratic politics greatly influences peace-time military innovation. Stephen P. Rosen analyzed that military innovation occurs through a competition of branches in military service to gain influence through various case studies.[187] In other words, the intra-service competition over prestige, limited resources, reputation, and promotion can drive military innovation. Hence, this section examines the competitive relationship between the 'Fleet Faction' and 'Treaty Faction' for analyzing the influence of the IJN's bureaucratic politics over the aircraft carrier-based military innovation during the interwar period.

In order to explain the influence of the Factions within the IJN, it is necessary to understand the special power relations of Imperial Japan. Its right of supreme command was to the Emperor, not to the Prime Minister. This distinguished the IJN's military authority from general state affairs so that politicians could not engage in military affairs.[188] In other words, the JNGS was able to deal with matters related to the right of command without the Prime Minister's opinion or approval. On the other hand, the Cabinet generally controlled the IJN's administration. The issues of military composition, troop capacity, and budget were closely related to the diplomacy and finances of the state. Therefore, these belonged to general governmental matters and were under the jurisdiction of the Navy Ministry, which was under the command of the Prime Minister.[189] To summarize, the naval command right was under the jurisdiction of the JNGS, which the Emperor direct controlled, while the Navy Ministry, which was under the control of the Cabinet, had jurisdiction over the administration. The Navy Ministry, the supreme organization of the IJN, exerted influence on the JNGS, but the possibility of conflict was inherent due to special power relations.

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[187] Stephen P. Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, NY: Cornell, 1991).

[188] Jeongyoung Lee 이정용, "leondeongunchughoeuiwa ilbon haegun 런던군축회의와 일본 해군[London Naval Conference and the Japanese Navy]," *Korea-Japan Military Culture Research 한일군사문화연구* 9 (2010): 150–1, http://kiss.kstudy.com/journal/thesis_name.asp?tname=kiss2002&key=2840450.

[189] Lee, 150–1.

The command and administration rights were separated, and only the military administration right was under the cabinet control, because of this, the factions were formed inside the IJN. The officers of the IJN were clearly distinguished from their careers and dispositions. Navy Ministry cadres, the Treaty Faction, were brilliant officers who combined political sense and administrative ability. Most of them graduated from the Naval Academy with the best grades. They made judgements based on rationality and insisted on the necessity of the navy disarmament treaty in consideration of national finances and international relations. Also, they maintained a positive stance on the construction of naval air power. The Treaty Faction accomplished the early development of the IJN's air power through the introduction of aviation technology from the United Kingdom.[190] In particular, Admiral Yamamoto Isoroku, called the father of the Japanese naval aviation, never worked in the JNGS since he was a naval officer.[191] Like this, the Treaty Faction recognized the need for a strategic choice in consideration of national power levels and was amenable to new changes.

On the other hand, the Fleet Faction, so-called "sea warriors," comprised the JNGS. They did not pay much attention to the development of the initial aviation force because they believed the 'fleet decisive battle' and the 'big ships, big guns' ideology were the most important factors to win naval warfare. They opposed the naval disarmament treaty because it limited the possession of capital ships that they wanted. Therefore, they were called the anti-Treaty Faction or Fleet Faction.[192] They served as instructors of military schools or as commanders of fleets, influencing the vast majority of young naval officers. For example, many officers honored and trusted Kato Kanji, the head of the Fleet Faction, when he served as a vice principal of the Naval Academy (1911-13), president of the Gunnery School (1916-18), and president of the Naval Staff

190 Yamada, *Gunbi Kakuchō no kindaishi*, 132.

191 Sadao, *From Mahan to Pearl Harbor,* 183–4.

192 Yamada, *Gunbi Kakuchō no kindaishi*, 119–20.

College (NSC) (1920–21).[193] The respect was the driving force behind Kato's influence over the IJN even after he resigned from the chief of the JNGS.[194]

The confrontation between the Fleet Faction and the Treaty Faction began to surface due to the naval disarmament treaty. The Treaty Faction judged that it needed to reduce naval development and limit the naval competition on the basis of national financial issues. However, the Fleet Faction argued that the reduction of naval power through the naval disarmament treaty posed a serious threat to national security.[195] Navy Minister Katō Tomosaburō tried to dispel the worries of the Fleet Faction by ensuring that the United States and Britain would not set up additional bases in the Pacific, but the Fleet Faction's position was stubborn.[196] Their obstinate stance was not only due to the threat of national security. Restricting the size of the armada meant reducing the opportunity for promotion.[197] In particular, the damage was direct to the Fleet Faction because it was mainly made up of officers serving in the fleet and warships. Due to the strong leadership of the Navy Ministry Katō Tomosaburō at that time, the Fleet faction could no longer complain, but the situation after the London Navy Treaty was different.

With the ratification of the London Naval Treaty, the Treaty Faction seemed to have won the confrontation with the Fleet Faction, but the center of power within the IJN shifted toward the Fleet Faction. The Fleet Faction tried to capture the power of the IJN based on the support of retired generals such as Admiral Tōgō, who many praised as the hero of the Russo-Japanese War. The Fleet Faction appointed Imperial Prince Fushimi Hiroyasu as commander of the JNGS, strengthening its commanding leadership. In addition, the Fleet Faction converted the "jurisdiction over the size of armaments" that the Navy Ministry had had with the Navy Minister Mineo Ōsumi, who was supported by Prince Fushimi and the Fleet Faction.[198] The Fleet Faction secured a practical right to

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193 Sadao, *From Mahan to Pearl Harbor,* 165–6.

194 Sadao, 155.

195 Yamada, *Gunbi Kakuchō no kindaishi*, 119–20.

196 Stephen E. Pelz, *Race to Pearl Harbor: the Failure of the Second London Naval Conference and the Onset of World War II* (Cambridge, MA: Harvard University Press, 1974), 1–3.

197 Evans and Peattie, *Kaigun*, 200–1.

198 Sadao, *From Mahan to Pearl Harbor,* 169–71.

control the IJN by minimizing the Navy Ministry. In particular, the Treaty Faction rapidly lost its power as the Navy Minister Ōsumi purged its leading generals.[199] As a result, the Fleet Faction dominated the whole navy as the JNGS stepped into the areanas of the Navy Ministry, such as the construction of the force, training, and education.

The strengthening of the Fleet Faction had a positive and negative impact on the IJN's aviation power generation. As mentioned earlier, the Fleet Faction was maintaining the fleet decisive battle concept. However, as the Washington Naval Treaty limited the tonnage of battleships, the IJN established the Interception-Attrition Strategy and began to concentrate on building air power when auxiliary warships were limited due to the London Naval Treaty. Although the Fleet faction still emphasized the importance of battleships, the IJN's air power was able to develop at a rapid pace in the 1930s with attention to aviation and aircraft carriers as auxiliary power.

However, there was drawback to the development of aircraft and aircraft carriers. It was bigger than positive impact. The Fleet Faction did not want to build the air power more than necessary. They wanted only the development needed to perform the attrition operations. Accordingly, the JNGS controlled and limited the naval aviation doctrinal research and education, which was above their preferred level. For example, in 1936, Naval Education Director Capt. Takijirō Ōhishi was ordered not to research aviation strategy by the JNGS. Also, in 1938, the JNGS ordered the lecture on naval strategy and tactics of the NSC's Minoru Genda to stop because the JNGS thought it would ruin the students' strategic thinking.[200] In addition, Admiral Shigeyoshi Inoue, the chief of the Naval Aviation Department, insisted on the uselessness of battleships, the limitations of the Interception-Attrition Operations, and the construction of additional aircraft carriers, and Genda insisted that air power should be the main force for the decisive battle. However, the Fleet Faction that was in the core position of the JNGS did not listen to their claims. Rather, they demoted Admiral Inoue to the commander of the Fourth Fleet,

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199 Sadao, 172–4.

200 Minoru Genda and Masataka Chihaya, "How the Japanese Task Force Idea Materialized," in *The Pearl Harbor Papers: Inside the Japanese Plans*, ed. Donald M. Goldstein and Katherine V. Dillon (Dulles, VA: Prange Enterprises, 1993), 8

defending the Truk Lagoon.[201] Hence, the IJN's air force and aircraft carriers were forced to develop at a limited level. In other words, the overwhelming dominance of the Fleet faction prevented the expansion of the influence of aviation officials, which hindered the explosive development of air power and the emergence of the innovative concept of naval warfare.

D. NEGATIVE INFLUENCE OF THE ORGANIZATIONAL CULTURE

Organizational culture determines how an individual or group in an organization responds to a particular problem. Edgar H. Schein argues that organizational culture impacts the perception of a problem and on finding and responding to that problem.[202] Therefore, this section examines the organizational culture of the IJN during the interwar period and its origin and impact. The Battle of Tsushima influenced the organizational culture of the IJN. The perfect victory of the Battle of Tsushima was consolidated as the theory of victory for the IJN. After this battle, the IJN began to emphasize the fleet decisive battle and the importance of tactics.[203] These evolved into a strategic and tactical doctrine of the IJN and shaped the IJN 's organizational culture by influencing the IJN officers' way of thinking.

The organizational culture of the IJN in the interwar period was the fleet decisive battle ideology and mentality. The fleet decisive battle ideology became the basic naval doctrine of the IJN. In 1908, Satō Tetsutarō systematized the doctrine and tactics of the IJN and reflected them in the *Kaisen you murei* (Naval Battle Guideline).[204] Thereafter, although the IJN changed their way of operation, the basic premise of achieving victory through a battle using capital ships did not change.[205] For example, the Interception-Attrition Strategy was designed to reinforce the lack of combat power due to the

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201 Sadao, *From Mahan to Pearl Harbor,* 184–6.

202 Schein, *Organization Culture and Leadership*, 4.

203 Stille, The Imperial Japanese Navy, 129.

204 Evans and Peattie, Kaigun, 136–43.

205 Todo Ryoichi, Teramoto Yoshiya, Kamata Shinichi, Suginohio Takao, Murai Tomohiro, and Nonaka Ikujiro □部良一, 寺本義也, 鎌田伸一, 杉之尾孝生, 村井友秀, and 野中郁次□, *Shippaino honzitu: Nihongunno sosikironteki kenkyu* 失敗の本質: 日本軍の組織論的□究[Origin of Failure: A histological study of the Japanese army] (Tōkyō: Chuukou bunko, 1991), 292.

Washington Naval Treaty. This strategy also intended to create a favorable environment to the fleet decisive battle.

The fleet decisive battle ideology dominated the minds of the IJN officers and limited the possibility of accepting new organizational changes due to the special nature of naval school education and promotion systems. The core of the education of the IJN officers was the Navy Staff College. The Navy Staff College was the birthplace of the innovative strategy and doctrine of the IJN in the 1890s.[206] However, the NSC of the interwar period transformed into the generator of fixed credo. After the Russo-Japanese War, the NSC tactical instructors were consist of the officers who participated in the Battle of Tsushima, such as the Combined Fleet G-3(operation part) staff officer Akiyama Saneyuki, and the 2nd division G-3(operation part) staff officer Satō Tetsutarō.[207] Because they were heroes to the IJN officers, their tactical viewpoints were reflected directly to the IJN cadres.

The promotion system of the IJN maximized the effects of such education. At that time, educational performance served as a very important criterion for promotion in the IJN. The IJN promoted officers to upper class on the basis of a 'hammock number' representing the order of officers. This number was greatly influenced by educational achievement.[208] Ultimately, the naval officers, who best internalized the lessons of Tsushima, were able to receive excellent grades, and they succeeded in a favorable environment in which they could enter the core positions of the Navy. This combination of the promotion and education systems was very effective in concentrating the officers' capabilities to move the IJN in one direction, but it made a rather insensitive organizational culture for new changes.

The experience of Genda in 1936 clearly shows the formation of this organizational culture in the IJN. He emphasized the importance of aviation in aviation-

206 Masataka Chihaya, "An Intimate Look at the Japanese Navy," in *The Pearl Harbor Papers: Inside the Japanese Plans*, ed. Donald M. Goldstein and Katherine V. Dillon (Dulles, VA: Prange Enterprises, 1993), 321.

207 Yamada, *Gunbi Kakuchō no kindaishi*, 27–8.

208 Ryoichi, Yoshiya, Shinichi, Takao, Tomohiro, and Ikujiro, *Shippaino honzitu*, 336–7.

related classes and suggested that the decisive battle should be based on aviation power rather than battleships. However, all instructors and students of the NSC attacked his proposal and also suspected his mental soundness. After all, his lecture was abolished because it ruined students' strategic thinking.[209] Like this, the IJN officers had the fixed idea and were insensitive to new changes due to the uniformity of naval education that emphasized only the fleet decisive battle ideology and the excessive importance of educational achievements in the promotion system.

Moreover, the IJN emphasized its mentality. Through their victory in the Russo-Japanese War, the IJN determined that strong mental strength, efficient weapons, and good strategies and tactics could overwhelm superior enemies. Therefore, the IJN quantified the effect of mental power and weapon efficiency on fleet power.[210] This led to an overestimation of their combat power by judging their abilities irrationally and an efficiency that was difficult to judge rather than objective evidence.[211] Thus, this mentality instilled an optimism that could win the war with the United States. Ironically, Admiral Yamamoto, who emphasized the importance of air power and knew better than anyone that Imperial Japan could not win the war with the United States, emphasized mentality in order to make up for the lack of objective power in a letter to the Navy Minister Koishiro Oikawa. He recognized that the Interception-Attrition Strategy was unlikely, and he sought to overcome the differences in mechanical strength by breaking the U.S. Navy and American morale.[212] This thought was embodied in the Pearl Harbor surprise attack. Even Admiral Yamamoto, who had the most innovative judgement in the IJN, was not free from the way his organization was thinking.

In conclusion, the organizational culture of the IJN was formed on the basis of the lessons of Tsushima, emphasizing the fleet decisive battle and forming an optimistic view

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209 Genda and Chihaya, "How the Japanese Task Force Idea Materialized," 7–8.

210 Jisaburo Ozawa, "Development of the Japanese Navy's Operational Concept against America," in *The Pacific War Papers: Japanese Documents of World War II*, ed. Donald M. Goldstein and Katherine V. Dillon (Washington, D.C: Potomac Books, 2004), 73–5; F = M x A x S, F: Fighting strength, M: Mechanical strength, A: Efficiency (the extent of training), S: Mental strength.

211 Ryoichi, Yoshiya, Shinichi, Takao, Tomohiro, and Ikujiro, *Shippaino honzitu*, 325–6.

212 Isoroku Yamamoto, "Letter from Yamamoto," in *The Pearl Harbor Papers: Inside the Japanese Plans*, ed. Donald M. Goldstein and Katherine V. Dillon (Dulles, VA: Prange Enterprises, 1993), 115–6.

of victory of war, which prevented the IJN from recognizing the need for a new change. The organizational culture of the IJN was more fixed by the Fleet Faction started to dominate the IJN as described above. Thus, the development of new technologies and tactics was limited to strengthening and improving existing doctrines. As an example, the strategic value of German-certified submarines in WWI was not important to the IJN.[213] For the IJN, a submarine was only a means of reducing enemy combat power in order to create a favorable environment for a decisive battle by battleships.[214] The IJN's thinking about air power was the same. The development of various strategies and tactics utilizing aviation was not recommended. Rather, it was controlled and blocked.[215] Therefore, the organizational culture of the IJN was weak in its receptive capacity for new technologies and tactical abilities, which hampered military innovation.

E. IMPORTANCE OF ADAPTATION

Military organizations vary in shape depending on their strategic environment and the nature of the enemy. Hence, if a military organization is exposed to a new strategic environment or faces new enemies, adaptation and innovation can occur in this process. In particular, the adaptation of operational forces to tactical and operational-level issues to which operational forces are faced may develop new concepts of the operation of new weapon systems or create entirely new forms of combat.[216] This adaptation occurs primarily in war-time because it usually occurs by facing new environments and enemies.[217] Therefore, this section analyzes the military innovation cases achieved through adaptation by the IJN during the Second Sino-Japanese War. It especially looks at what adaptations the IJN made in aircraft operations and how they affected aircraft carriers and aircraft military innovation.

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213 In WWI, Germany achieved considerable strategic accomplishment by attacking the line of communication with submarines.

214 Chihaya, "An Intimate Look at the Japanese Navy," 329.

215 Genda and Chihaya, "How the Japanese Task Force Idea Materialized," 7–8.

216 Russell, *Innovation, Transformation, and War*; Robert Foley, "A Case Study in Horizontal Military Innovation: The German Army, 1916–1918," *Journal of Strategic Studies* 35, no. 6 (December 2012), 799–827.

217 Russell, *Innovation, Transformation, and War*, 000.

In the Second Sino-Japanese War, aircraft carriers mainly supported ground operations. The IJN organized the aircraft carrier *Kaga*, *Hōshō*, and *Ryūjō* into the Third Fleet, and these were deployed on the shores of central China. These carrier divisions mainly supported landing operations and carried out missions such as bombing major bases and airfields.[218] The IJN also carried outranged bombardment using ground-based medium bombers as well as aircraft carriers. The IJN operated this ground bombing with ground-based medium bombers in the Kisarazu Air Group in Sasebo and in the Kanoya Air Group in Taiwan.[219] The IJN experienced a lot of trial and error through the Second Sino-Japanese War, and based on this, it refined its method of naval aviation warfare more precisely.

The IJN benefitted from the Second Sino-Japanese War. The IJN improved its pilots' capability, elaborated aviation-related organizations, changed the role of fighters, and developed the concept of aircraft carrier operation. First, the Second Sino-Japanese War enhanced the pilots' capability. In this war, the IJN conducted its first naval aviation operation with aircraft carriers. The IJN adapted the aviation tactics built through combat experiments and training to the actual war. The IJN perfected their tactics by improving and developing the problems of their basic combat formation, the *Shotai*, based on their early combat experience during the Second Sino-Japanese War.[220] Second, the IJN aviation-related organizations became more sophisticated through the war. Through the execution of the war, it reduced unnecessary organizations and expanded organizations related to command such as research and testing.[221] In addition, the IJN established an excellent support system by elaborating system of combat support and repair organization.[222]

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[218] Ikuhiko Hata and Yasuho Izawa, *Japanese Naval Aces and Fighter Units in World War II* (Annapolis, MD: Naval Institute Press, 1989), 17–26; The Japanese Navy organized *Hōshō* and *Ryūjō* in the 1st carrier division and *Kaga* in the 2nd carrier division.

[219] Peattie, *Sunburst*, 103–5.

[220] Peattie, *Sunburst*, 125.

[221] Peattie, 125.

[222] Peattie, 125.

Third, the IJN expanded its fighter mission area through the Second Sino-Japanese War. Prior to the war, the fighter was regarded as a defensive weapon and performed mainly air defense missions. Therefore, the fighters' main mission was to protect friendly fleets or warships from enemy bombers. However, on August 17, 1937, the Chinese aircraft shot down the 11 Japanese bombers launched from the aircraft carrier *Kaga*. At this time, the fighters did not escort the bombers.[223] Therefore, the IJN determined it necessary to escort bombers by figters to ensure their survivability and to maximize the effect of bombing. After then, the IJN mandated fighters to escort bombers for the first time in the world.[224]

Lastly, the IJN considered that concentrating large-scale aircraft was important for effective bombardment.[225] This changed the IJN's aircraft carrier doctrine. After the Second Sino-Japanese War, the operational concept of the IJN aircraft carriers changed from 'decentralization' to 'concentration'. This was because the IJN recognized the "effectiveness of scale" of air power.[226] In other words, it found that the operation of large-scale bombers was important to achieve the effect of air bombing. Therefore, the IJN deployed a number of aircraft carriers on one Fleet in order to secure strong offensive power through the concentration of its air force.[227] In April 1941, the IJN formed the First Air Fleet and concentrated the IJN's aircraft carrier power. In the First Air Fleet, seven aircraft carriers and 474 aircraft were deployed. The First Air Fleet was a groundbreaking concept and was the most powerful "agglomeration of naval air power" in the world at the time.[228]

In all, the IJN refined the concept of aircraft carrier operation and established a new concept of fighter operation through the Second Sino-Japanese War. It was based on

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223 Stephen Howarth, *The Fighting Ships of the Rising Sun: The Drama of The Imperial Japanese Navy, 1895–1945* (New York: Atheneum, 1983), 213.

224 Peattie, *Sunburst*, 125.

225 Minoru Genda, "Evolution of Aircraft Carrier Tactics of the Imperial Japanese Navy," in *Air Raid: Pearl Harbor*, ed. Paul Stillwell (Annapolis, MD: Naval Institute Press, 1981), 24.

226 Peattie, *Sunburst*, 124.

227 Genda, "Evolution of Aircraft Carrier Tactics of the Imperial Japanese Navy," 24.

228 Evans and Peattie, *Kaigun*, 349.

the trial and error and lessons learned from the battlefield they faced. In the Second Sino-Japanese War, China did not have an aircraft carrier, so there was no maneuver battle between aircraft carriers, and the aircraft carrier's mission was confined to ground operation support. The IJN, however, achieved innovation by appropriately applying the improvements in ground operations to aircraft carriers and by specifying how to conduct combat at the tactical level. Nevertheless, military innovation through the adaptation of the IJN did not change the concept of aircraft carrier operation at a strategic level. Still, the strategy of the IJN to carry out the war with the United States was set in the fleet decisive battle, and aircraft carriers were the auxiliary force for the Interception-Attrition Operation.

IV. CONCLUSION

A. HYPOTHESIS VERIFICATION

This section restates the research hypotheses based on the research area of military innovation and examines their influence on the military innovation of the IJN during the interwar period. Furthermore, this section evaluates the validity of the hypotheses to determine which factors best explain the military innovation of the IJN during the interwar period.

The first hypothesis is that the introduction of new technologies leads to military innovation. An empirical analysis of the IJN's military innovation shows that the first hypothesis is valid. The IJN's early introduction of aviation technology positively influenced the IJN's air power. In particular, aviation technology grew rapidly as private companies actively participated in technology development. This improvement of the IJN's aviation technology did not lead to more radical evolution because it did not coincide with the IJN's naval strategy. However, when the IJN needed air power after the London Naval Treaty, Japanese aviation technology had not perfectly fit its technologically superior naval strategy but had the capacity to support it. With the change of naval strategy in 1930, the systematic investment of the Navy was added to its existing technology development, and the aviation technology of the Japanese Navy developed rapidly.

However, the first hypothesis is hard to regard as complete because after 1930, the rapid development of aviation technology hardly a result from technological power exceeding a certain level. After the London Naval Treaty, the IJN's strategic changes became inevitable and the IJN began to emphasize air power. As a result, the IJN initiated strategic and organizational investments in air power and set its specific standards. Since then, aviation technology started to develop to meet the standards set by the IJN. Hence, after 1930, the IJN's naval strategy led its aviation technology. Consequently, the development of aviation technology in the IJN created environments and conditions that enabled military innovation, but it was not a 'driver.' This supports

Theo and Terriff's argument. They argue that technology itself cannot be a crucial factor in military change, but it can influence military innovation through interaction with strategy, politics and culture.[229]

The second hypothesis is that IJN's military innovation occurred through the naval disarmament treaty. Generally, the signing of a naval disarmament treaty is a diplomatic policy expressed by the leaders of a nation or a parliament regarding the expansion and contraction of military power. Thus, civil-military relations affect military innovation. However, the IJN's military innovation related to naval disarmament treaties was hardly an example of civil-military relations. As previous research illustrates military innovation is generated in a process in which leaders or decision-making groups press the military with the will of change.[230] For example, former U.S. Secretary of State Condoleezza Rice established a lesson learned from U.S. experience in Vietnam and throughout Malaya and suggested a new strategy for the Iraq war in October 2005. In particular, the presentation of the core concepts of pre-revolutionary and stabilization operation doctrines raised the necessity of exploring new military doctrines and strategies.[231] However, the signing of the Washington and London Naval Treaties aimed at enacting the soundness of Imperial Japan's finance rather than its naval military innovation. In addition, civilian leaders who supported the naval disarmament treaty did not intend to provide a specific vision for the military innovation of the IJN. Therefore, the impact of the naval disarmament treaty on the military innovation of the IJN should be explained under the influence of the international strategic environment.

Therefore, the second hypothesis verified through the realist / international relations theory. The Washington Naval Treaty limited the power of the IJN to 60% of the U.S. warship tonnage, and the London Naval Treaty limited its construction of

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229 Theo and Terriff, "The Sources of Military Change," 16.

230 Barry Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (London: Cornell University Press, 1984), 220–4.

231 Byeonggu Lee 이병구, "Ilakeu Jeonjaeng Jung Migun-ui Gunsahyeogsin-Naebujeog Geuligo Oebujeog Gunsahyeogsin Ilon-ui Tadangseong Geomjeung-eul Jungsim-eulo 이라크 전쟁 중 미군의 군사혁신-내부적 그리고 외부적 군사혁신 이론의 타당성 검증을 중심으로 [Military Innovation During the Iraq War - An analysis on theValidity of Internaland External Military Innovation Theories]," *Military History* 91 (2014. 6): 377–8, http://www.dbpia.co.kr/Article/NODE06507583.

auxiliary warships. Hardliners of the IJN recognized these disarmament treaties as a national security threat. In other words, the IJN needed other means to strengthen its power in the realistic perspective. The IJN used auxiliary warships for compensating its shortage after the Washington Naval Treaty, and after the London Naval Treaty, it used air power to remedy its shortcomings. In the process, the IJN achieved military innovation in its aircraft and aircraft carriers. Therefore, the second hypothesis is valid and the establishment of this hypothesis shows that the military innovation of the IJN can explain through the realist / international relations theory.

The third hypothesis is that military innovation occurred due to the rivalry between the Fleet Faction and the Treaty Faction. Through empirical case studies, this hypothesis is invalid. The Fleet Faction had a positive effect on the strengthening of air power, as it tried to utilize the air power in attrition operations. However, the strengthening of aviation was merely an auxiliary means to achieve its ultimate goal. In other words, strengthening aviation power was an inevitable choice for the Fleet Faction as shipbuilding was limited, not a voluntary choice. This is even more evident through the fact that the Fleet Faction blocked the development of tactics and the increase of air power beyond necessity.[232] The Fleet Faction did not want to miss the initiative they had by excluding aviation-related officers from key positions and limiting aviation-related education and tactical discussions. Consequently, bureaucratic politics hindered the military innovation of the IJN.

The fourth hypothesis is that the organizational culture of the IJN facilitated military innovation. This hypothesis is also invalid. The organizational culture of the IJN became rigid after the Battle of Tsushima. In particular, in 1930, the IJN's organization culture became more inflexible as the Fleet Faction formed the mainstream of the IJN. The emphasis on the fleet decisive battle and mentalism, which affected the IJN officers' thinking style, their behavior and military doctrine formation. As seen from the case studies, the promotion system linked to the education of the IJN further strengthened this organizational culture. In this organizational culture, innovative claims centering on

[232] Genda and Chihaya, "How the Japanese Task Force Idea Materialized," 8.

aviation enthusiasts were the subject of criticism, and officers who claimed the importance of the aviation power were suspected of mental illness. Accordingly, the organizational culture of the IJN during the interwar period hampered the military innovation of the IJN.

The fifth hypothesis is that the adaptation to war promotes military innovation in the IJN. This hypothesis is valid. The IJN experienced the Second Sino-Japanese War before WWII. The IJN could apply the developed aviation power to the battlefield through this war, and the IJN was able to correct its errors in aviation tactics established through combat experiments and trainings and to develop the tactics to maximize the attack power. The adaptation of the IJN cannot regard as a 'driver' that triggered military innovation, but it can be seen as an 'enhancer' that facilitated military innovation.

In conclusion, hypotheses 1, 2, and 5 were established, but hypotheses 3 and 4 were rejected. As the hypotheses are based on the factors of military innovation, one can generalize each hypothesis as a military innovation factor, as shown in Table 6.

Table 6. The Result of Hypothesis Verification and Military Innovation Model

	Hypothesis	Military Innovation Model	Verification Result
#1	The IJN's military innovation in the interwar period was a result of the introduction of new technologies.	Technology Model	○[a]
#2	The Naval Disarmament Treaty triggered the IJN's military innovation in the interwar period.	Realist/IR Theory Model	○
#3	The rivalry between the Fleet Faction and the Treaty Faction influenced the IJN's military innovation in the interwar period.	Bureaucratic Politics Model	×
#4	The IJN's organizational culture reinforced the military innovation of the IJN	Culture Model	×
#5	The military innovation of the Japanese Navy was a result of adaptation based on the lessons of the WWI and the Second Sino-Japanese War	Adaptation Model	○

[a] A valid hypothesis: ○, an overruled hypothesis: ×

B. CONCLUSION AND IMPLICATION

The purpose of this study is to examine what factors could best explain the initial superiority of WWII that the IJN achieved through military innovation. For these purposes, this thesis analyzes the factors that have the most significant impact on the aircraft carrier and aircraft innovation. The study found that technology, international relations, and adaptation positively influenced military innovation in the IJN. These factors influenced the military reform of the IJN in different directions. With the newly developed aviation technology, the IJN laid the groundwork for military innovation and this innovation occurred in the course of the IJN's response to the two naval disarmament treaties and through the Second Sino-Japanese War, the IJN elaborated its aircraft and aircraft carrier doctrine. In other words, the enabler of the IJN's military innovation in the interwar period was technology, the driver was realist/international relations theory, and the enhancer was adaptation.

There are three implications from this study. First, the international environmental change is an important factor of military innovation. The IJN defined the United States as the enemy and established a specific scenario (naval strategy) to deal with the United States and built the necessary power on this basis. Typically, this is an example of a threat-based defense plan. It aims to balance power by enhancing or innovating its military power based on the enemy's threat from a realistic perspective of international relations.[233] The realistic response of the IJN to the changing international environment caused by the naval disarmament treaty generated its development of naval aviation. Therefore, realistic theory is useful to explain the cause of military innovation. This can expand the scope of military innovation research. Posen explained that the Balance of Power theory could well explain military doctrine innovation.[234] The case of the IJN strengthens and expands this Posen explanation.

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233 Yongseob Han 한용섭, *Gugbangjeongchaeglon* 국방정책론[Art of Defense Policy] (Seoul: Bakyoungsha, 2012), 220.

234 Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars,* 79–80.

Second, this study shows that technology itself does not generate military innovation. A cutting-edge military technology that is developing today is seen as a revolutionary change in and of itself. However, it is hard to achieve true military innovation with only innovative technology without the associated military strategy and changes in military structure. These examples can be seen not only in the case of the IJN but also in the cases of the tanks introduced in France and Germany at the outbreak of WWII. Germany and France had tanks of almost equal size, but Germany developed a new doctrine, 'blitzkrieg', centering on the operation of tanks. Yet France used tanks just as infantry support weapons. France succeeded in the development of such new technologies but failed its military innovation by missing to change its military strategy and military structure.[235] Therefore, policy makers avoid the simple logic that the development or introduction of new technologies is the achievement of military innovation. In particular, when introducing new technologies from other countries, the military officers should effort to establish military doctrine and operational systems accordance with the nation's military structure and characteristics.

Third, this study suggests that a broad understanding of organizational culture is needed in promoting military innovation. Because cultural elements determine the behavior of organizational members, a broader understanding of organizational culture is positive to predict members' thinking and approach innovation. Therefore, in order to promote military innovation, it is necessary to investigate the organizational culture. It is not easy to change organizational culture, but it is possible to recognize negative organizational culture for innovation and take appropriate measures accordingly.

[235] Jeffery R. Barnett, *Future War: An Assessment of Aerospace Campaigns in 2010* (Montgomery, AL: Air University Press, 1996), 14; At the time, Germany had 3,200 tanks and France had 3,400 tanks.

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