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The modern US Navy shares many of the same challenges as the interwar US Navy. The geopolitical, technological, and socio-economic environments all bear striking resemblance to the ones faced during the interwar period. To overcome these challenges, there are distinct lessons in innovation management and fleet training from the interwar Navy that can be modernized and applied today in preparation for great power conflict with China.

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MASTER OF MILITARY STUDIES

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SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

LCDR John V. Russell
United States Navy

AY 2020-21

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Thesis: Two aspects of the U.S. Navy's preparation for war with Japan can be modernized and applied to prepare for a modern conflict with China:

1. Effective management of new innovations in naval warfare.
2. Large scale free-play fleet exercises.

Many measures taken by the Navy during the interwar period should be applied to today's problems in preparation for a China war fight.

Discussion: Following WWI, the U.S. Navy entered an extended period of fiscal limitation, anti-navalism, war-weariness, and popular isolationism. Compounding complexity was a plethora of new technologies that had the potential to drastically change the character of war. Fortunately, the Navy had the luxury of understanding where and against whom the next naval war would most likely be fought. For roughly twenty years from 1918 until the Pearl Harbor attack in 1941, the Navy effectively applied new technologies and cultivated doctrinal innovation through extensive large-scale exercises designed to find real solutions to the problems presented by modern weapon technology, geography, and parochialism. Although the Navy did not get it perfect, the preparation was vital to enabling creative thought and planted the seeds for winning the war in the Pacific.

Today, the Navy faces many similar problems in a possible China conflict. The geography has not appreciably changed from that faced in conflict with Japan. Although, a new revolution in technology has effectively shrunk the battlespace by making more of it accessible at longer range in shorter time. Echoes of the war-weariness and anti-militarism tenor of the interwar period can be felt in today's popular and economic fatigue from two long wars in the Middle East. In the midst of this atmosphere, the United States has returned to a great power competition with peer competitors in both oceans: Russia and China.

Conclusion: The interwar Navy used a time of peace to prepare for large scale war. Given the similar atmosphere and problem set, today's Navy should emulate the practices of the interwar Navy to achieve the necessary scale of preparation for a great power conflict.

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Preface

The origins of this research topic began as a look at innovation management by the modern U.S. Navy in response to competition from China. As the U.S. Navy searches for answers to the strategic problems in the western Pacific, I had hoped to find some new lens to apply to the problem of innovating new methods of naval warfare. After much consternation and frustration, I recognized substantial parallels between the competition environment today and that of the interwar period and refocused my efforts.

Given the problem similarities between the modern and interwar navies, the next logical question was what lessons from the past could be applied today to prepare for the future war? What did they do to prepare for war in the Pacific? I researched the U.S. Navy's responses to various political, economic, technologic, and geographic factors during the interwar period to establish the major movements that could be translated to the modern Navy. Through this research, I hope to show the Navy's actions to prepare for the Pacific war are relevant today. Large scale, free play exercises should be a part of our fleet training and preparation, but modern exercises are narrowly focused with limited participation.

I would like to acknowledge my MMS mentor, CDR Stephen Kelley, for his assistance in narrowing and targeting my efforts when I had lost the bubble.

INTRODUCTION

After the fall of the Soviet Union in 1991, the United States Navy entered a unipolar maritime world. For nearly 20 years beginning in 1990, the Navy had no legitimate competitor for supremacy on the sea. Today, with the rise of China and growth of Peoples Liberation Army Navy (PLA-N) capacity and capability, the United States Navy has returned to great power competition in the global commons. The contemporary problems faced by the U.S. Navy today are similar to those it faced during the interwar period from 1919 to 1941. First, China, the most dangerous potential threat to American interests in the Pacific, enjoys the same geographic advantage that the Empire of Japan enjoyed prior to World War II. Any conflict between China and the United States would take place in the enemy's front yard while the United States must defend interests and territories across the world's largest body of water. Second, rapid technological development during the interwar period challenged the prevailing conceptions of how navies fight. The Navy faces similar uncertainties when weighing the implications of advances in artificial intelligence, quantum computing, unmanned systems, and information warfare.

This thesis is animated by a simple question: what lessons from the interwar period can the U.S. Navy incorporate to enable it to better prepare for a potential future China conflict? It argues that two aspects that underpinned the U.S. Navy's preparation for a war against Japan can be modernized and replicated to better prepare it for a potential war against the PLA(N).

First, the interwar Navy effectively managed innovation, successfully incorporated new technologies, and developed doctrine that was employed during World War II. For example, in carrier aviation a variety of aircraft and tactics were developed and tested during the interwar period to identify how to most effectively employ Naval Aviation in a future war against a highly

capable adversary, the Imperial Japanese Navy (IJN). Similarly, while submarine warfare doctrine development was torturous and often ineffective, the Navy was nevertheless successful in developing effective fleet submarines for the Pacific war.[1] The Submarine force was ultimately responsible for over half of all Japanese tonnage sunk and was the major contributor to the economic strangulation of Imperial Japan.[2]

Second, the interwar Navy executed large-scale free-play exercises that tested new capabilities and technologies under realistic simulated combat conditions in a manner that enabled the Navy to incorporate them into doctrine while also preparing the officers and sailors of the U.S. Navy for the rigors of a prolonged war at sea against the IJN. The annual Fleet Problems enabled naval officers to experience the implications of new technologies and shape their conceptions of the future of naval warfare.[3] For example, through the end of World War I, U.S. Navy leaders viewed naval combat in terms of lines of battleships with big guns and massed firepower.[4] During Fleet Problem experimentation, the Navy discovered the utility of circular formations to defend against aerial attack and the advantages of organizing independent task forces.[5] By regularly executing realistic scenarios and experimentation with tools and doctrine, the Fleet Problems exposed sailors and officers to the best possible simulation of what the next war would look like.[6] The modern Navy can better prepare for a future great power conflict by modernizing and applying these interwar experimentation methods.

This paper addresses aspects of preparation that would be most valuable to the Navy at large. It covers the innovation and integration of carrier aviation and submarines into the fleet during the interwar period and illustrates how the Fleet Problems enabled development and growth of doctrine for the imagined future fleet. To establish relevance, a parallel comparison of context is necessary.

THE INTERWAR CONTEXT

Almost immediately following the First World War, the Navy identified that the United States' next war would likely be in the Pacific with the Empire of Japan.[7] Despite friendly history between the United States and Japan, American war planners predicted that Japanese desires to dominate the Far East and the American role as guardian of western influence in the East would ultimately lead to conflict.[8] In a war with Japan, the Navy would face significant geographic, social, and technological challenges.

The Tyranny of Time and Distance

Geographically, the Navy recognized that a war against Japan would be fought primarily in the western Pacific.[9] The United States retained interests overseas, including the Philippines and Guam, which national policy required the Navy to defend.[10] Japan began solidifying imperialist ambitions in the region during the First World War by separately negotiating the division of German spoils with Great Britain. In this agreement, later approved by the League of Nations, Japan would take control of all German territories in the Pacific north of the equator; specifically, the mandate islands comprised of territories in the Marianas, Caroline, and Marshall Islands.[11] Control of the mandate islands granted Japan bases and naval harbors from which to project power in a future war in the western Pacific. From the mandate islands, Japan could quickly attack Guam or the Philippines, disrupt sea-lines of communications to China, and cut the Philippines off from American relief.[12] Given these geographic realities, the United States' Joint Board, comprised of high-ranking officers from the U.S. Navy and U.S. Army, concluded in 1922 that any war with Japan could only be won in the western Pacific.[13]

This reality imposed significant distance and force projection challenges for U.S. Navy war planners. As conceived in the U.S. Navy's plan for war in Pacific, War Plan Orange, a war with

Japan would involve moving the U.S. Fleet over 5,000 nautical miles from the West Coast of the United States to the western Pacific with few points of land in between to wage a maritime war.[14] The Navy could take months or years to reach the Philippines, and would, following this long journey, confront confident, trained, and battle-ready Japanese air and naval forces in the mandate islands.[15] American planners theorized that Japanese resistance would slow the U.S. Fleet and erode its combat power before it arrived to fight and that the U.S. advance would involve intense battles to claim islands for use as forward naval bases.[16] Furthermore, Navy planners feared the loss of public support if a war lasted more than two years;[17] Japan could benefit from the American public growing tired from a costly conflict over far-off territories with little real value to the United States.[18] The tyranny of time and distance threatened to exact significant costs in a United States-Japan war.

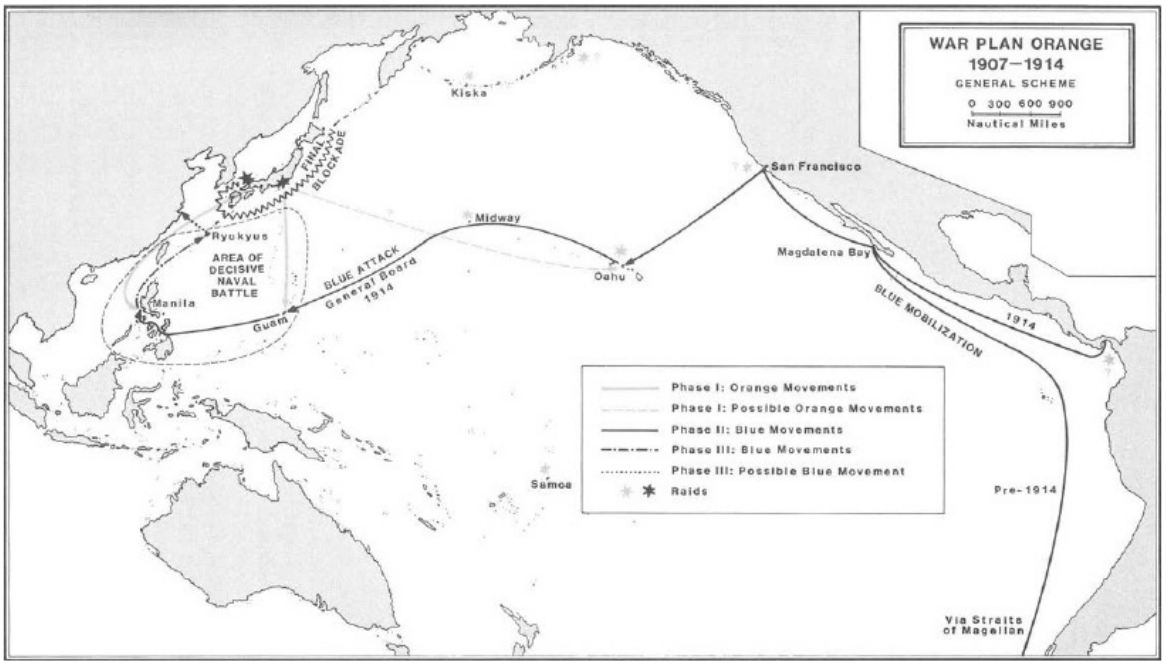

Figure 1: War Plan Orange, 1907-1914, General Scheme[19]

Politics, Economics, and the Naval Treaties

In addition to geography, the interwar Navy grappled with domestic social, political, and economic constraints. Following the war, U.S. Navy leaders and the Wilson administration supported continued expansion of the Navy.[20] Navies were not only tools of warfare, but instruments of domestic, economic, and foreign policy. Domestically, by the end of the First World War, Naval construction and associated government expenditures had become a normal part of the economy and helped cushion the post-war economic slump. [21] Externally, navies supported foreign policy objectives and President Wilson viewed continued naval expansion after 1918 as leverage to force European allies to the table in pursuit of arms reduction, redefinition of maritime rules of warfare, freedom of navigation, and the League of Nations.[22] Like most of the world after World War I, however, American politics and society was anti-militarist, and particularly, anti-navalist. Naval reductions would necessitate that the Wilson administration reconsider its expansive foreign policies and reconcile national aims with a more limited naval capability.[23]

This political environment made it nearly impossible to build a navy capable of winning the next war.[24] Popular and congressional resistance to naval expansion and development began to grow in 1918.[25] By 1920, growing fears of a naval arms race with Great Britain and Japan helped engender support for arms limitation treaties.[26] The anti-navalist sentiment grew throughout 1921 and led to the Washington Naval Conference. By the 1930's, public disillusionment with was at a peak and isolationism was popular.[27] With the exception of a few supporters, such as Carl Vinson and Franklin Roosevelt, popular and governmental support for a large Navy was at a very low level. This naturally translated to reductions in naval appropriations.

From November 1921 to February 1922, the United States, Britain, France, Italy, and Japan met in Washington, DC and negotiated a series of naval limitation treaties aimed at reducing the size and destructive power of each state's navy. It is easy to claim that the treaties limited the Navy during the interwar period; after all, the treaties did impose limits on the construction of battle fleets. The U.S. Navy was limited to 525,000 tons for capital ships, 135,000 tons for carriers, and no top limit for destroyers and cruisers.[28] However, due to budget and political constraints, none of the signatory powers would reach any of the limits before the treaty lapsed; only Great Britain came close.[29] It is more accurate, then, to say that the treaties had a greater impact on fleet design than fleet size.

The Washington Treaties were primarily focused on limiting the size of the great naval powers' capital ship programs.[30] One limitation imposed a 10-year build holiday on battleships.[31] Over the following decade, no substantive battleship development took place. Aircraft carriers, on the other hand, were considered experimental ships, and had no life-cycle limits in the treaties.[32] Like many navies during this period, the U.S. Navy converted two battle cruisers that were under construction into aircraft carriers and experimented with future carrier design. To compensate for smaller battleship limits, the Navy planned a fleet of 10,000 ton, 8-inch gun cruisers.[33] Although the U.S. Navy would never reach any of the tonnage limits stipulated in the Washington Treaties, the treaties' limits clearly impacted fleet design.

In addition to fleet limitations, the Washington Naval Conference prohibited signatories from fortifying islands under their control, which also imposed challenges that the U.S. Navy would face in the future war against Japan. Through 1919, the Navy had planned to fortify vital positions along a "Mid-Pacific Route" for use in a future Japan war; principal among them was the Panama Canal, Pearl Harbor, Guam, and the Philippines.[34] Prior to the conference, War Plan

Orange assumed that one or two western Pacific bases would be held.[35] During conference negotiations, the United States agreed to cease fortification of Guam and the Philippines in return for Japan's promise to not fortify their territories gained during WWI.[36] The agreement effectively wrote off both U.S. territories in a future war as they were surrounded by Japanese controlled islands. Strategically, the Washington Conference closed the mid-Pacific Route.[37]

The agreements reached at the Washington Naval Conference did allow for the development of mobile defenses and increases in forces.[38] Fortified bunkers and coastal defenses, fixed artillery and air defenses, new military ports, bases, and airfields were prohibited; but light mobile forces, such as mobile anti-air, destroyers, and submarines (that could fit in the current ports) were, theoretically, unrestricted.[39] This narrow definition of 'defenses' was hotly debated within the Navy, but was ultimately adopted by the Joint Board in 1922.[40] To mount a defense within treaty limits, the Navy decided to grow the Asiatic Fleet and maximize mobile defenses with the goal of forcing Japan to commit more forces to an attack on the Philippines, thereby enabling the Asiatic Fleet inflict as much damage as possible to the IJN before the arrival of the balance of the U.S. Fleet.[41] Ironically, where the treaties intended to prevent war by limiting arms, the Navy looked more aggressively westward. To execute War Plan Orange, the fleet would need ships and submarines with long range and endurance, overwhelming airpower to defend from Japanese aircraft, expeditionary forces, mobile upkeep/repair/resupply, and good relations with regional neutrals.[42] The base non-fortification agreement forced the Navy to plan and develop capabilities for the war they would face, a maritime war at great distance with limited basing and logistical support. [43]

While enormously impactful due to the non-fortification agreements, the conference treaties served more to shape vice restrain fleet development. The United States never reached treaty

tonnage limits before treaties collapsed in 1936 due to budgetary limits. Although there were significant advancements in fire control and methods for armoring against bombs, shells, and torpedoes,[44] there was little advancement in battleship capabilities; the capital ships of WWII were still built on 16in guns and armor designs that started to appear at the end of WWI. Aircraft carriers were allowed less tonnage than battleships. They could also be built and discarded in favor of improved designs, but budget constraints would prevent such wasteful development. The limits on carrier tonnage prevented the development of any concept of specialty driven carriers; there was not enough allocated tonnage to have some carriers specially built for scouting, others built for bombers, and others built for fighters. Thus, budget limits and tonnage limits encouraged designing new carriers that would support a high volume and high variety of aircraft.[45] The cold reality that the Philippines and Guam would fall in an Orange War necessitated ships and submarines that could transit across the Pacific and fight a highly capable adversary without forward basing infrastructure to rely on. The interwar Navy would prove innovative in designing an effective fleet within these constraints.

Through most of the interwar period, U.S. Navy budgets were not sufficient to build a modernized fleet while maintaining the size and growth established during WWI.[46] Budget constraints were imposed by small government movements, anti-navalist Congresses, and by the Great Depression.[47] The 1920 budget, for example, did not cover the costs of inflation and higher complexity of modern ships; the Navy was forced to cut 50,000 personnel.[48] The Navy's personnel shrank throughout the 1920s and early 1930s, but this was not without benefit. [49] As the national economic picture worsened in the depression, higher quality personnel were available for enlistment and were attracted to naval service for job security.[50] Where funds were inadequate to support new construction, abundant surplus materials from the war allowed

modernization and upgrades.[51] Budgets would not begin to climb until 1933 under President Roosevelt.[52] The result was a Navy that was small but modernized and technically proficient.

Emerging Interwar Technologies

While dealing with budgetary and political challenges, the interwar Navy also managed a then-unprecedented scale of technological change. Many of the technologies that enabled the naval campaigns in WWII debuted in WWI, although they were infantile at the time. Between the World Wars, emerging technologies, such as aviation, submarines, radio, and radar had the potential to reshape warfare in the future. During the interwar period, the airplane evolved from slow biplanes made of wood and cloth to high-performance, all-metal monoplanes capable of a variety of roles. Aircraft carriers evolved from support platforms that carried a few dozen planes for reconnaissance and over-horizon targeting to powerful offensive weapons with a variety of 90 or more planes on board.[53] American submarines grew from small, cramped, and unseaworthy coastal defense forces to ocean spanning raiders that would win the war against Japanese commerce.[54] The period also saw the advancement and integration of radar and radio into wide military use. Successfully managing the application of new technologies would be key to achieving victory.

Only 15 years after the first flight in 1903, the airplane had already been incorporated into military arsenals in WWI. The rapid pace of aviation advancement during the interwar period can best be illustrated by qualitatively and quantitatively comparing naval aircraft at the beginning and end of the interwar period. During the 1920s, the first carrier launched aircraft – the Curtiss TS-1 – was a small basic biplane with a 25ft wingspan, 465 mile range, 14,400ft ceiling, and top speed of 130 mph.[55] At the onset of WWII less than 20 years later, the Navy's primary carrier based fighter was the F4F Wildcat, an all-metal monoplane with a 38ft wingspan,

900 mile range, 35,000ft ceiling, and a 318mph top speed; it featured retracting landing gear, six .50 caliber machine guns, a capability to carry up to 500 pounds of bombs, and introduced folding wings to maximize the number that could fit aboard a carrier.[56] In less than 20 years, the performance capabilities of naval aircraft effectively doubled in every measurable metric.

In the undersea domain, the magnitude of technological change was equally pronounced. At the end of WWI, the U.S. Navy submarine force was made up of small coastal defense boats with limited capabilities. The K and L class boats designed and built during WWI had notoriously unreliable power plants, rudimentary SONAR, and four 18-inch torpedo tubes. [57] The boats suffered from poor reliability and crew habitability; American crews could not consistently stay at sea for more than 24 hours.[58] Just before the beginning of WWII, the Navy deployed the GATO class. Problems with American diesel engines were solved, the new boats incorporated radar, improved SONAR, and fire control systems that made detection and targeting more effective.[59] The GATO had ten 21 inch torpedo tubes and could dive over 100 feet deeper than previous classes, two features that provided ample armament for self-defense while reducing the effectiveness of adversary depth charges.[60] Most importantly, submarines at the onset of WWII had the endurance and habitability to carry war across the Pacific Ocean independently for weeks or months without basing or logistical support.

World War I also introduced the use of the electromagnetic spectrum into warfare. Like aviation and submarines, radio communication was new and became a significant factor in WWI. The idea that would become radar was conceived in 1904 when a German scientist created a device that used radio waves to detect objects up to 5 kilometers away; despite early interest from shipping companies, radar remained relatively unknown and obscure in military circles. [61] At the end of WWI, radios were bulky and mostly used for telegraphy rather than voice

communications and no military fielded a radar capability. Throughout the interwar period, radio and technologies continued to advance and miniaturize. By the onset of WWII, the terrifying implications of strategic bombing had necessitated radar that could locate aircraft at great distances, radio aids to navigation could enable allied aircraft to fix their position without transmitting, and ships carried high frequency radars that supported surface search and accuracy in gunnery.[62]

Summary of the Interwar Context

The interwar Navy managed a complex period filled equally with uncertainty and promise. Geographically, the Navy had the luxury of knowing who the principle maritime threat would be and where the war would be fought. Knowledge of the problem provided a framework in which it could plan, but also presented extensive challenges to overcome. War with Japan would require the fleet to operate thousands of miles away, with few bases for support, in areas where a threat could approach from any direction. Politically, the Navy had few Congressional allies and struggled with insufficient appropriations to meaningfully prepare for a great power conflict while treaty limitations – in addition to strategic ends – shaped force development. New technologies and innovation could provide solutions to some of the challenges and could tip the future war in the Navy's favor if correctly managed. Conversely, the same technological advances could also have provided decisive advantage to Japan if more effectively incorporated by the IJN; furthermore, new technologies could never truly be proven until war broke out. As will be discussed, many of these contextual factors are similar to the challenges the Navy faces today.

APPLYING EMERGING TECHNOLOGY ABOVE AND BELOW

To review, this thesis posits that effective management of new innovations is one of two aspects of interwar preparation than can be modernized and applied today. The interwar period was a time of rapid and continuous change in many fields of military technology.[63] The interwar Navy had to incorporate new technologies that would potentially challenge the status quo of naval warfare. An analysis of the development of naval aviation and submarine warfare illustrates that the Navy's innovation management during the interwar period embraced variety and flexibility.

The Growth of Naval Aviation

No interwar emerging technology threatened battleship orthodoxy more than aviation. Retaining aviation for the fleet was not a certainty for the interwar Navy. Air power zealots, such as Billy Mitchell, asserted that strategic bombing had rendered navies obsolete.[64] After the sinking of the WWI German Battleship OSTFRIESLAND in 1921 during ordnance testing, Mitchell and other airpower zealots rallied on the battleship's vulnerability to air attack to promote a unified air service.[65] To retain its air arm, the Navy would have to demonstrate effective organization and utility for naval aviation to prevent it from being absorbed into Mitchell's united air service.[66]

Had the air power zealots succeeded in centralizing all aviation in a unified air service, American naval aviation would have developed along a different path, if at all. General Mitchell and his acolytes espoused that strategic bombing was a war-winning advance and codified independent air operations in the Air Corps Tactical School curriculum.[67] Mitchell saw the Army and the Navy as constraints in the development of aviation.[68] Air power advocates of the interwar period had little interest in defending fleets or developing carrier aviation.

The Royal Navy Fleet Air Arm provides an example of what can develop under powerless, uninterested, or uncommitted leadership. After WWI, Britain centralized all military aviation in the Royal Air Force (RAF) which gutted the experienced base British naval aviators had developed during WWI. The Royal Navy (RN) was left with middle and senior leadership that were naval-minded (vice air-minded) officers.[69] In 1921 the Fleet Air Arm was re-established but responsibility for RN Aviation was divided between the Air Ministry (which also governed the RAF) and the Admiralty in a system of dual control. Both sides had to agree on every step of advancement in naval aviation, impeding promotions and slowing training. The RAF was also responsible for all aircraft design and procurement but had little expertise in naval aviation.[70] The British system of dual control impeded the Fleet Air Arm from developing expertise or acquiring capability, resulting in a naval air arm that was underdeveloped and inferior to Japanese and American naval aviation.

Fortunately, the Navy had clever supporters and theorists of its own. The creation of the Bureau of Aeronautics in 1920 elevated aviation development to the same level as other Navy bureaus, such as ordinance and navigation.[71] The bureau's first director, a former Battleship CO named RADM William Moffett, was clever enough to endorse the use of carriers as scouts for the battle line; by selling them as adjunct to the fleet, he won broad support for their construction from the conservatives in the Navy.[72] In his capacity as director, he established that aviators would be naval officers *first*, with the airplane as a weapon, and naval aviation would go to sea with the fleet.[73] Moffett recognized the impact to naval warfare that aviation would have and was resolved that a balanced fleet protected by sufficient naval aircraft was a necessity.[74] The Navy's balanced fleet concept was based on combined arms and called for orderly development of a variety of different ships.[75] Early in the interwar period, a balanced fleet meant battleships

to provide offensive firepower, destroyers to conduct and defend from torpedo attack, and cruisers and aircraft to scout and screen for the fleet. Later, the concept included the use of aircraft to defend the fleet and conduct offensive missions. Throughout the interwar years, with supporters like Carl Vinson, the Navy would be successful in swaying Congress and defending the balanced fleet.[76] The Navy would retain control of its aviation arm, ensuring broad diversity of tactical, operational, and strategic thought with regard to maritime air power.

With naval aviation secured, the next challenge was to develop its capabilities and doctrine. Many first-order questions required resolution. How should carrier- and land-based naval aviation be used? Would a few large carriers be best or many small ones? Were aircraft carriers to support and remained tethered to the battle line for reconnaissance and targeting or would it have independent offensive and defensive missions as well?

The interwar Navy applied theory, simulation, and testing to shape carrier aviation doctrine. USS LANGLEY (CV-1), the U.S. Navy's first aircraft carrier, could carry a maximum of 36 planes at up to 15.5 knots.[77] In the 1920's, no navy fielded aircraft carriers capable of operating with a large fleet and carrying large, hundred-plane air groups; but, several innovative thinkers in the U.S. and other navies were thinking about the future.[78] The U.S. Navy conceptualized an array of diverse aircraft that included long-range flying boats, dirigibles, fighters, dive bombers, and torpedo bombers. RADM Moffett was careful in the early interwar period to campaign for many different types of aircraft so the full potential of each could be determined and carriers would have opportunities to prove capabilities other than scouting.[79] The best way to examine each would be to build and test a variety of carriers and aircraft, but the Navy was limited by budgets and treaty restrictions.[80] The Navy spent the next two decades testing its ideas in wargames and exercises.

When the assets didn't exist, the Navy used simulation and theory to test ideas. In a 1923 wargame at the Naval War College, the Navy tested plans with five aircraft carriers – more than any country then possessed – that launched 200 planes to strike at the red fleet.[81] Through similar wargames and rigorous fleet exercises, the Navy shaped the requirements that would determine the size and composition of the future U.S. Fleet. By the 1930s, the carrier air wing began to take shape, predominantly around fighters and dive bombers that could perform strike and scouting duties; long range scouting duties were carried by flying boats; and deck parks were being used to maximize the number of aircraft that could be employed.[82] In 1931, Moffett had a large body of evidence of the aircraft carrier's utility as an offensive weapon and he openly advocated centering the fleet on the carrier.[83] Although this carrier-centric doctrine did not become practice until it was necessitated by the December 7, 1941, Pearl Harbor attack, the planes, carriers, and doctrine developed during the interwar period put the fleet in a position where it could recover from the loss of the battleship force at Pearl Harbor.

The development of carrier aviation could be described as innovation by variety. By advocating that air power would support the traditional fleet, Moffett and his cohorts avoided ruffling the wrong feathers in the early years and set the stage for the further development of aviation in maritime warfare. Rather than grasping a role and forcing it to culmination (as was the case in strategic bombing in the Army Air Corps), they pursued multiple paths for aviation to see which would perform best. Through testing, they incrementally expanded technological application and demonstrated the possible impact until it could not be denied by even the most conservative leaders in the Navy.

Technical Answers to Strategic Problems in Undersea Warfare

On the other end of the maritime spectrum, submarine development progressed under conflicting priorities: maximizing military potential versus fitting into a restrictive and traditional legal naval framework. During WWI, German submarines were enormously impactful against allied shipping despite starting WWI with a traditional fleet and only 20 U-boats.[84] During the war, Germany sank greater than 12,000,000 tons of merchant shipping accounting for over $1 billion in losses (1918 dollars, not counting the cargo).[85] Through unrestricted warfare, Germany attempted to impose a submarine blockade and nearly crushed the British maritime economy. The submarine's utility in warfare was decisively proven; however, the most impactful means of their use was (and would continue to be throughout the interwar period) contrary to international law.[86] In unrestricted warfare, submarines freely attack merchant shipping (including neutral flagged ships) bringing supplies to the adversary with no warnings or measures to provide for the safety of the crews. Conversely, under traditional prize rules, which were reaffirmed during the Washington Naval Conference and made applicable to submarines, merchants must be signaled, boarded, and searched before seizure and could only be attacked if they refused to cooperate; furthermore, the crew and passengers must be placed in safety before sinking the vessel.[87] The interwar Navy expended considerable resources to acquire German diesel technology to improve American submarines, but German submarines were optimized for a form of warfare that the victorious powers had condemned and sworn off. [88] The interwar Navy was challenged to force the square peg of submarine warfare into the round hole of traditional naval warfare.

The Navy could and did develop the necessary submarine technical capabilities for a war with Japan. To meet the geographic and operational necessities of a war with Japan, the Navy

developed long range fleet submarines to operate alone against Japanese battle fleets. Coincidentally, the Navy simultaneously optimized fleet submarines for commerce warfare. After the Washington Conference, the Navy understood that the Philippines and, probably, Guam would fall to the Japanese, removing any hope for maintaining forward submarine bases in these locations.[89] Future war submarines would have to transit 5-7,000 nautical miles to reach their operating areas and return after their patrols were complete. Submarine designs would need to trade off tactical speed for endurance, which would make them less effective against warships. If commerce war could not be the mission and the boats could not reach the necessary tactical speed to fight modern warships, what missions could they fill? The answer that the Navy planned for was scouting, mining, and ambushing large combatants in confined waters, such as near home ports and choke points.[90] The resultant 'V' boats could cruise between 10,000 and 18,000 nautical miles at 10 knots.[91] The later TAMBOR and GATO Classes improved on habitability, depth, speed, and maneuverability as well as improved fire control computers for targeting enemy ships.[92] During the first war, German submarines were optimized for commerce war by achieving moderate speed and long endurance; ironically, while trying to avoid commerce raiding as a mission, the interwar Navy developed submarines that were equally optimized for the commerce war it would fight.[93]

After the Pearl Harbor attack, like the Germans in WWI, necessity forced the U.S. Navy to resort to unrestricted submarine warfare.[94] There were few other means to attack the Japanese in the early months of the war.[95] The Navy quickly found that submarine commanders were not prepared to fight the war they were in. After purging ineffective commanders, the submarine force would go on to cripple the Japanese maritime economy. The interwar Navy failed to find a

traditional fleet doctrine for submarines that would support victory but succeeded in applying technology and delivering the right boats for the war.

Interwar and Modern Contrasts in Innovation

Today, technology advances at a pace with which acquisition and testing struggles to keep up. When faced with uncertainty over what roles aviation would play, the interwar Navy tested them all, and did it quickly. When concepts of submarine warfare didn't fit the dominant fleet paradigm, the Navy defaulted to creating boats that could perform in the right environment, regardless of the mission. By contrast, the modern Navy progresses slowly and methodically on emerging technologies. For example, carrier launch and landing of a potentially armed, low observable unmanned aerial vehicle (UAV) was demonstrated in 2013 with the X-47B. After proof of concept, the Navy abruptly ended further testing and development with thousands of test hours left on the airframes and shifted focus to develop a then unbuilt airborne tanker.[96] Further development of armed carrier based UAVs will wait until a multi-year test program is complete on the MQ-25 tanker.[97] Given the impetus on broad capability development during the interwar period, RADM Moffett's decision on UAVs might have been to pursue all of the above and do it now. In applying new technologies, the modern answer should be to develop and test it all. As the submarine force learned in WWII, it will always be more advantageous to possess a capability even if there is no initial intention to use it. The interwar Navy did not prepare commanders for unrestricted warfare; fortunately, the tools existed to effectively wage it.

PREPARING THE FUTURE FLEET

The interwar Navy treated tests and exercises as simulated wartime events. From 1923 – 1940 the U.S. Navy held 21 major exercises or "Fleet Problems." The Fleet Problems were the culminating event in the Navy's training year.[98] They were unique training exercises that were

as large-scale and free-play as possible. From 1922 until the mid-1930's, the bulk of the U.S. Navy had few national or operational demands; as a result, the fleet was available for use in training and experimentation. By mobilizing large numbers of ships, submarines, and aircraft over a wide area in a free-play setting, the Fleet Problems provided experience that could not be simulated in a wargame at the Naval War College.[99] Through sophisticated warfare simulation, commanders experienced the implications of modern technology and effectively integrated them into the fleet for the future war.[100] Clausewitz wrote that the only lubricant to the friction of war is combat experience.[101] During a time of relative peace, the Fleet Problems strove to provide the most realistic training and experimentation environment short of actual combat.[102]

Simulating a Future War

The Fleet Problems enabled the Navy to test and integrate new technology into the battleline and prepare for the anticipated war with Japan. The main objectives of the Fleet Problems were to train the fleet in large-scale maneuvers, train commanders in planning and situation estimates, and to test existing war plans, operational instructions, and tactical doctrine.[103] The Fleet Problems included a range of possible adversaries and scenarios; ten (a plurality) tested aspects of War Plan Orange, seven were based in the Caribbean, and the rest were to test various new capabilities such as carrier aviation, air defense, and submarines.[104] In an example of prescience, Problem XVIII (1937) simulated an "Orange" war with the opponent (Japan) attempting to seize Midway Island.[105] Additionally, of the scenarios based on other adversaries or Caribbean security, some were easily translated to an Orange scenario. For example, Fleet Problem X in 1930 was a Caribbean sea-control scenario against a Red (British) adversary, but could easily have been juxtaposed to west Pacific islands against Japan.[106] During some exercises, such as problems XVI (1935) and XVIII (1937), the Navy used the problems to evaluate locations for

advance bases and their vulnerabilities to amphibious attack.[107] Thus, the Fleet Problems prepared the Navy to fight with the tools that it would have, in the environment where the war would be, against the enemy that the Navy would face. During the Fleet Problems, the U.S. Navy evolved from a traditional Jutland-style battle fleet to one that envisioned integrating air, surface, undersea, and marine forces into a combined arms "naval force."[108]

The Fleet Problems provide a standard for comparison that demonstrates how modern U.S. Navy exercises do not have the necessary complexity to prepare for great power conflict. The most striking difference between the interwar Fleet Problems and modern Navy exercises is their size and scale. Compared to today's exercises, the Fleet Problems conducted by the interwar Navy were orders of magnitude larger and much broader scope. For example, Bold Alligator 2014 included participation of 15 USN/USNS ships, 3 coalition partner vessels, and roughly 3000 troops. It "focused on crisis response missions to include non-combatant evacuations, theater security and humanitarian assistance."[109] The largest multinational exercise the Navy currently holds, Rim of the Pacific (RIMPAC), included 22 ships and 1 submarine from ten participating nations in 2020.[110] By comparison, Fleet Problem XVIII in 1937 consisted of 152 ships, 496 aircraft, and 3 Aircraft Carriers.[111] The scale and scope of the Fleet Problems prepared the U.S. Navy for the dynamic nature of the interwar period.[112] Uncertainty from new technologies, challenging environments, and the political landscape of the interwar period meant the Navy would have to get the most out of its testing and training; the best way to enable the necessary organizational learning was to make the event as big and inclusive as possible while simulating as accurately as possible.

No Bruised Egos

Following each Fleet Problem was a detailed honest critique attended by representatives from every participating unit and staff; entire auditoriums were filled where participants discussed and debated the implications of their decisions.[113] In 1925, 800 officers representing all commanders down to the ship and battalion level gathered for the critique of Fleet Problem V. During that critique, the Army and Navy jointly identified that significant fortifications and base improvements would be required in Hawaii, such as a larger garrison, new aircraft facilities, base expansions at Pearl Harbor, coastal defenses, and equipment modernization.[114] The board also identified that a unified air command would be necessary for the future war.[115] These large group critiques allowed attendants to understand the whole picture and how various parts of their respective operations fit together. The critiques were interactive events where each side walked through their choices and performance with specificity in front of all participants.[116] By using the maximum scale possible and honestly assessing how the exercise transpired, the Navy enabled broad organizational learning, identified operational and strategic requirements for large-scale conflict, and allowed commanders to experience what a great power war at sea may look like.

Developing Naval Aviation

In the realm of aviation, the Fleet Problems provided a medium to evolve and expand beyond the initial concept of operations. Even where limited resources could not support experimentation, constructive simulation provided means to explore the potential value of innovative ideas.[117] Early Fleet Problems used imaginary carriers and aircraft when these forces simply did not exist. For example, during Fleet Problem I in 1923, an American "Black Fleet" simulated a Japanese Fleet attacking the Panama Canal; USS LANGLEY (CV-1), was

conducting its initial sea trials and was unable to participate. Nevertheless, the Navy used USS NEW YORK (BB-34) and USS OKLAHOMA (BB-37) to simulate aircraft carriers based on the LANGLEY design, each with a single sea plane to simulate a squadron of 15 aircraft.[118] During the Fleet Problem, the Black Fleet simulated a Japanese Fleet attacking the Panama Canal; rather than attacking the canal in a traditional manner with his battleship force, ADM Edward Eberle, opted to execute a simulated air raid. The simulated attack, carried out by the "squadron" from the "carrier" OKLAHOMA, successfully destroyed the Pacific side locks of the canal before any response by the Army Air Corps defense, trapping the Blue Fleet (U.S. Fleet) in the Gulf of Panama, and enabling a follow on attack by the rest of the Black Fleet.[119] The success of the air raid was written off by some of the conservative Navy leadership to simulation inaccuracy and the Army's lack of preparedness.[120] Despite the artificiality of simulation, some of the most significant conclusions drawn from the Fleet Problem were that the Navy needed aircraft and carriers as well as auxiliaries and escorts that could keep up with the fleet.[121]

Fleet Problem I opened initial discussion on roles for naval aviation that would be expanded upon throughout subsequent exercises. By Fleet Problem IX (1928), the Navy was experimenting with detached carrier task forces using live participants to deliver offensive fires and was exploring the expansion of roles beyond scouting and screening the battle fleet.[122] In Problem XII (1931), the Navy tested "aviation-heavy" forces with only one battleship against a traditional fleet with nine battleships and limited air power. From Fleet Problem XII, the Navy learned the extensive logistical demands associated with carrier aviation and affirmed the efficacy of independent carrier task forces.[123] Results from these simulations and exercises provided RADM Moffett with enough evidence to suggest redefinition of the carrier as a flying field at sea requiring the battle fleet to defend it as opposed to an adjunct member providing

support to the battle fleet.[124] The task force doctrines formulated during the Fleet Problems heralded the operations that would successfully defeat the Imperial Japanese Navy during WWII.

Searching for Undersea Doctrine

While very successful in developing carrier aviation, the Fleet Problems showed comparatively limited success in submarine warfare. Nevertheless, the Fleet Problems identified one of the most vital characteristics of submarine warfare: that submarines operate best independently. Submarines are fundamentally different from surface ships and aircraft; in the undersea medium, they operate most effectively when isolated with limited communications.[125] While this statement is seemingly obvious today, the interwar Navy faced enormous uncertainty in how to utilize submarines. Like aircraft, early proponents predicted that submarines would bring about the obsolescence of capital ships; battleships would be sunk, driven to port, or so constrained that they would be useless.[126] Unrestricted submarine warfare was considered abhorrent but the tactical and strategic value of submarines was undeniable. During the Washington Conference, proposals wildly swung from banning submarines entirely, to strict humanitarian constraints on their use.[127] The interwar Navy expended great effort to find an acceptable use for submarines during the Fleet Problems.

Early in the interwar period, the Navy attempted to make submarines supportive to the battle fleet in establishing sea control.[128] For example, a submarine would scout ahead of the battle fleet and ambush heavy enemy ships along their expected line of advance.[129] The Fleet Problems quickly showed that submarines of the period could not perform as a tactical arm of the fleet akin to a destroyer or battleship squadron. In a 1923 exercise, the fleet simulating an attack on the Panama Canal was slowed by accompanying submarines that were too slow to keep up.[130] Submarines also lacked sufficient sensor range and were vulnerable on the surface.[131] By Fleet

Problem V (1925), the Navy had separated submarines from the fleet and experimented with submarine groups; a senior submarine commander coordinated dispersed boats to detect and converge on the opposing fleet.[132] Due to the speed disadvantage, such a tactic depended on the enemy fleet continuing in a predictable direction long enough for the submarine group to take position. The consolidated picture during the interwar period was that submarines were too slow to keep up and combat ineffective in fleet action. It was only logical that success with submarines would require independent operations; a characteristic that has defined submarine operations through today.

The Fleet Problems did not effectively prepare submarine commanders for the commerce war against Japan. The exercises were often conducted in confined areas and calm seas.[133] Such conditions grant a tactical advantage to anti-submarine warfare (ASW) forces, thereby painting the submarine as more vulnerable than it would be in a wartime environment. Submarines were often discovered and attacked; commanders were severely chastised for being detected and encouraged to attack while deep.[134] Such artificialities had the effect of conditioning submarine commanders against taking risks, even when the objective shifted from warships to merchants during WWII. Nearly 30 percent of all submarine commanders were relieved in 1942 for combat ineffectiveness.[135]

The importance of the Fleet Problems in submarine warfare was not so much in developing what a submarine could do as it was in demonstrating what it could <u>not</u>. The interwar Navy tried and failed to fit submarines into a fleet construct as scouts and ambush forces. Unconventionally, submarines have historically proven best at attacking an enemy <u>state</u> rather than armed forces.[136] The basic characteristics of submarines make them inherently poor at tactical reconnaissance (scouting) and targeting, and the best strategies for their use do not

conform to classical naval warfare.[137] The key takeaway to submarine warfare in the Fleet Problems was that submarines would serve best detached from the fleet. Early submarine leadership failures in WWII showed that the interwar Navy did not quite identify the best employment for submarines, but the rapid turn-around and enormous successes beginning in 1943 suggest that the fundamental and technical skills developed supported the eventual shift to commerce warfare.

The Benefits of the Fleet Problems

The Fleet Problems enabled the interwar Navy to integrate new technologies and capabilities into the fleet. While the Navy could not buy the fleet that it desired due to treaty and budget constraints, the Fleet Problems provided a relatively free hand to test and experiment with the fleet that they had.[138] The Fleet Problems also provided a proving ground for new doctrines and ideas. Carrier aviation and submarine warfare demonstrate how Fleet Problems helped train the fleet and incorporate new innovations into the interwar Navy. Finally, the problems also contributed to the refinement of War Plan Orange.[139] Through effective simulation, the Navy shaped warfighters, exercised capabilities, and identified pitfalls and requirements associated with waging a protracted trans-pacific war against a capable adversary. The interwar Navy used large-scale free-play scenarios to extract the most value from limited resources; the modern Navy could and should follow a similar path to prepare for a modern great power conflict.

THE MODERN CONTEXT

In a possible China conflict, the modern U.S. Navy faces many challenges similar to those of the interwar Navy. Geographically, a conflict with China would again require transiting thousands of contested open-ocean miles to reach the battlespace. Domestically, the Navy faces rising congressional scrutiny over most of its programs as systems become more expensive and

recent new platforms have failed to perform satisfactorily. Additionally, emerging technologies may once again reshape warfare. In each of these areas, striking parallels exist with the interwar environment.

A Familiar Battlespace

Geographically, the United States continues to retain national interests in the western Pacific that will ensure that preparing for a conflict with China in that theater will be a priority for the United States. Although the United States has released many historic territories (such as the Philippines), the United States remains committed to advancing cooperation in mutually beneficial alliances and partnerships in the region.[140] The United States' shared interests in the western Pacific include respect for sovereignty and independence and adherence to rules and norms, such as freedom of navigation and overflight.[141] A main line of effort, articulated in the 2019 Indo-Pacific Strategy Report, depends on strengthening traditional alliances with Japan, South Korea, Australia, the Philippines, and Thailand and expanding partnerships in the Indian Ocean Region and Southeast Asia with states such as India, Singapore, Taiwan, and Vietnam.[142] The Indo-Pacific Strategy implies the U.S. Navy will be obligated to go where the conflict is in the event of Chinese aggression toward one or more partners or allies or a threat to the shared interests. The Navy must be prepared to act in the region where partnerships and allegiances can be most effective.

Chinese preparations suggest the PLA-N will focus efforts on the western Pacific; it has devoted extensive resources to fortification in the form of anti-access / area-denial (A2AD) systems that are capable of threatening any forces within the first and second island chains. These developments in anti-access / area-denial (A2AD) systems will heighten risks and costs to any American military force that defends against aggressive Chinese action in contested regions,

such as Taiwan, the East and South China Seas, and a conflict on the Korean Peninsula.[143] These A2AD capabilities could be used as a shield behind which China can commit aggression against its neighbors or in territorial areas it claims.[144] The Chinese A2AD system extends beyond the first island chain and is capable of delivering strike and anti-ship effects as far as Guam. As a result, any U.S. forces west of Guam would be under threat from long-range land-based missiles and PLA-N ships, submarines, and aircraft.

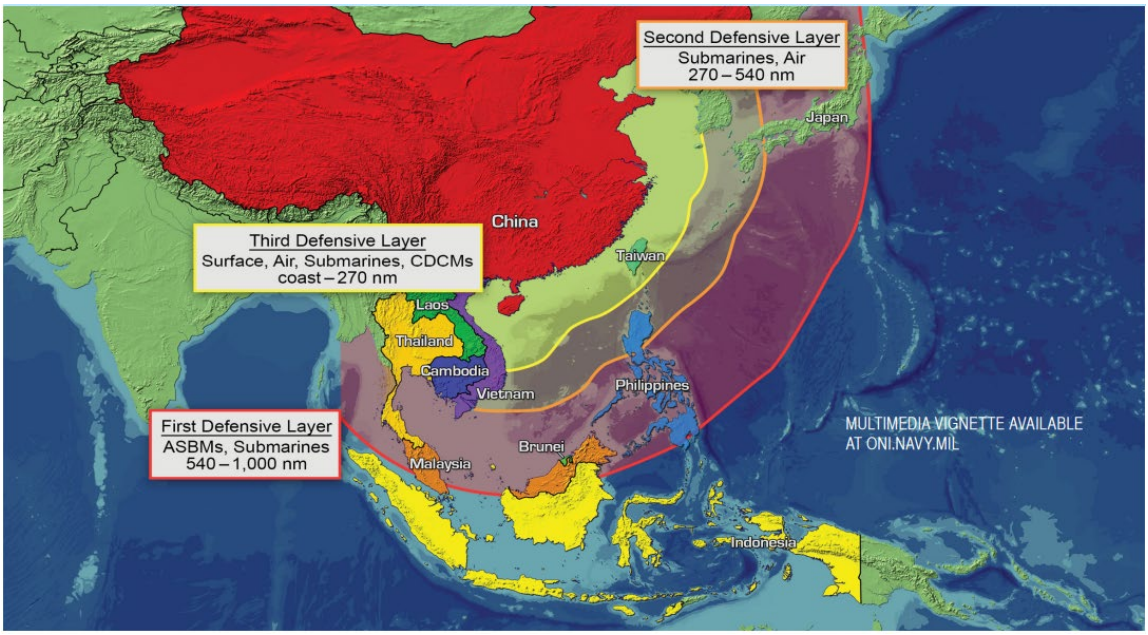

Figure 2: China's Defensive Layers[145]

The geographic challenges facing the United States Navy in a China conflict almost mirror those of the interwar Navy. Where the interwar Navy had to plan along the mid-Pacific route and account for Japanese presence in the Marshall, Caroline, and Mariana Islands, the future Navy may have to contend with Chinese presence in the Philippine, Senkaku, and Spratly Islands.[146] Where the interwar Navy would have to fight through Japanese controlled islands fortified and defended by air power and the IJN, the modern Navy will have to cross the same expanse while defending itself against the A2AD threat and Chinese naval and air forces that will become denser as the U.S. Fleet advances westward. By comparison, the PLA-N has no

need to exit the A2AD umbrella. In a China conflict, whether centered on the South China Sea or Taiwan, the U.S. Navy will have to cross a contested ocean to reach the conflict area.

Politics and Economics

Economically, the U.S. Navy faces fiscal limitations that could restrict necessary capacity and capability development. As previously discussed, during the interwar period the Navy suffered from general lack of funding and Congressional support. The fiscal challenge for the modern Navy is more nuanced as it must overcome bureaucratic friction and political scrutiny to modernize and expand in a manner commensurate with the modern great power threat posed by the PLA-N. Over the past 20 years, the U.S. Navy has made a number of highly visible and costly mistakes in development of new capabilities, appropriation of funds, and shipbuilding. The newest aircraft carrier, USS GERALD R. FORD (CVN-78), was supposed to begin deployments in 2018, has been in development for over ten years, has surpassed a $13 billion price tag, and cannot effectively launch and land aircraft.[147] The ZUMWALT (DDG-1000) class destroyers were intended to be the main combatant of the future surface fleet. Due to rising costs and the failure or delay of several technologies planned for the class, the program was reduced from 32 to three hulls that are years behind schedule, have suffered repeated electrical and mechanical breakdowns, and were built around a gun system that the Navy has abandoned due to its cost and poor performance.[148] The Littoral Combat Ship (LCS) program has not delivered on expected performance from its mission modules, delivery of one variant has been halted due to problems with the propulsion system, and several of the earliest ships will be decommissioned ten years early to save money.[149]

Considering the above, Congress has taken an increased interest in the Navy's plagued development and procurement process. Congressional interest, in this context, translates to

tighter control over development and budgets. In the case of the FORD, congressional attention has extended to specific subsystems such as weapon elevators, arresting gear, and launch catapults.[150] The modern Navy does not hold the trust of many lawmakers that control the purse strings; it will be challenged to demonstrate both need and viability of new technologies and platforms to earn the budget necessary to grow the fleet.

Aggravating matters further, the Navy and Congress do not share the same vision for the future fleet. To counter the PLA-N, the Navy plans to expand to more than 500 ships by 2045, with heavy emphasis on unmanned systems and reduced reliance on aircraft carriers.[151] Congress, however, remains committed to a future fleet more conventionally built around 12 aircraft carriers and has been skeptical of the Navy's plans for as yet unproven unmanned systems.[152] The U.S. Military receives higher funding than any other military in the world and that is not likely to change, but defense spending is expected to remain flat for the next several years while the cost of future platforms continues to increase.[153] Additionally, those resources come with oversight and political strings attached. The Navy's 2021 shipbuilding budget was cut by 20% compared to the 2020 budget.[154] The 2021 National Defense Authorization Act (NDAA) limits progress on any medium or large unmanned surface vessels until the expected propulsion and electrical systems can be qualified through continuous operation for 30 days with no preventative, corrective, or emergency maintenance.[155] This requirement will be difficult to meet; even long-established technologies require daily preventative maintenance and care to keep the systems running. Additionally, the NDAA prohibits any change to the composition of surface combatants until reports on mission and industrial base impacts are submitted and reviewed by Congress.[156] The Navy, therefore, cannot adjust the fleet composition (types and mix of combatants) to leverage new platforms until plans for operations and life-cycle

sustainment are evaluated by Congress. Ultimately, these two clauses in the NDAA may impede technological integration and encourage new platforms that look and perform in the same capacity as established ones. While the modern Navy has deeper financial support than the interwar Navy, accessing and applying those resources for substantive fleet change will be contentious and slow with political obstacles at every phase of development.

Incorporating Emerging Technology

Finally, like the interwar U.S. Navy, the modern one must integrate rapidly advancing technologies as it prepares for potential future wars. The U.S. military has benefitted from technologies that provided asymmetric advantages since the Cold War. Early examples include low observable technology (stealth), global positioning (GPS), and cruise missiles. The challenge for the U.S. Navy, and the Department of Defense writ large, is that the pace of technological growth has risen, while development of new capabilities in the Navy has historically been slow due long ship lifecycles.[157] With high capital investment costs, the Navy must plan ships and aircraft to fill their roles for two to three decades or even longer. Meanwhile, with less invested in legacy naval and military forces, China has beaten the United States to fielding a hypersonic missile system, out ranges U.S. forces, and is rapidly developing and fielding new systems designed to exploit U.S. vulnerabilities in electronic warfare.[158]

Artificial intelligence (AI) is one of the most militarily impactful emerging new technologies. Artificial intelligence will enhance the ability to locate and classify targets in the maritime environment. For example, in the undersea domain, AI will enable more capable SONAR systems and enhance undersea and anti-submarine warfare (USW / ASW) by deriving adaptive thresholds for signal-to-noise ratios, finding and evaluating discrete properties of acoustic signals, and improving the accuracy and performance of sonar arrays.[159] Additionally, AI can

improve the modeling of sound or energy propagation; an accurate environment model paired with knowledge of the undersea geography can assist in localizing targets.[160] Above the surface, the integration of AI will enhance electromagnetic spectrum (EMS) management and enable rapid analysis and adaptation to a contested electromagnetic environment.[161] China has indicated through investment that its vision of a future war heavily emphasizes the EMS.[162] AI capable radars, jammers, and communications systems will be able to adapt parameters at machine speed to compete with those of an adversary. In all domains, the application of AI will enhance combatants' ability to find targets and inhibit adversaries from doing the same.

Unmanned systems are another emerging technology that can reshape maritime warfare. Drones have been an asymmetric American advantage since the end of the Cold War. In the future, they will proliferate as they become smaller, cheaper, and more autonomous, thus contributing to a complex and crowded battlespace. In 2019, China unveiled several new drones capable of a variety of missions that include intelligence, surveillance, and reconnaissance (ISR); electronic warfare (EW); over-horizon targeting; and strike.[163] The expansive variety of unmanned platforms developed by the PLA indicates its commitment to enhancing its ISR and command and control (C2) capabilities while attacking American capabilities in those areas. Additionally, while newer drones will be increasingly AI-enabled, the U.S. military's development of autonomous systems has been slow and out paced by the commercial sector.[164] Military drones, once exclusively a tool of advanced militaries, can now be bought online and weaponized drones are easily viewed on YouTube.[165] The future fleet will need to incorporate rapidly emerging technologies like artificial intelligence and autonomous unmanned systems.[166]

In the first two decades after the fall of the Soviet Union, the Navy had no credible maritime competitor and the American technological advantage over adversaries was pronounced. With

the rise of the PLA-N, the Navy must modernize en-masse with a rapidly evolving variety of new technologies to incorporate. As in the interwar period, the shape of the future fleet will reflect how leaders envision the future war.

FLEET PROBLEMS MODERNIZED

In the modern era, the concept of the Fleet Problems has returned. The Navy has correctly assessed that wartime, free-play training is missing from the Navy's Optimized Fleet Response Plan (OFRP) and initiated a new round of Fleet Problems that would take place when units depart on deployment.[167] The modern Navy ensures that deploying units are proficient at an array of individual skills but does not practice many of them together.[168] For example, a Carrier Strike Group may be able to conduct strike as part of an exercise, but the OFRP does not adequately demonstrate whether they could do it concurrently with multiple other tasks in a high threat environment against an informed and free-playing adversary. The new Fleet Problems, which began in 2016, aim to identify those gaps and promote the learning necessary to address them. Due to their recent addition, very little open source information exists about the new Fleet Problems. At the time of this writing, only a 2018 article by ADM Scott Swift describes the conduct and objectives of the new Fleet Problems.[169]

Making a Modern Fleet Problem

From the limited information available, the new Fleet Problems can be improved in three ways. First, the new Fleet Problems should be ramped up in scale. The modern exercises do not approach the scale of the interwar Fleet Problems and it does not appear that they will. As previously discussed, the large scale of the interwar exercises in both execution and analysis simulated wartime complexity and promoted organizational learning. The new Fleet Problems have been conducted on a much smaller scale than those of the interwar period using participants

that have departed for deployment. Additionally, the post-exercise critique takes place via a visit to each participant by the exercise controllers.[170] In this manner, analysis from participants will be limited to the tactical level and there are no discussions between commanders. The commander's perspective may also be skewed by limiting his/her resources to those available at the time, which reflect peacetime operations.

Second, the new Fleet Problems should include doctrinal experimentation. The interwar fleet utilized simulation to test tactics and doctrine for the forces and tools they believed they would go to war with. As previously discussed, a single plane or ship was often used to represent a squadron or flotilla; cruisers or battleships simulated aircraft carriers. The modern exercises do not attempt to employ any systems or techniques that are not already deployed and in use.[171] While maintaining a grounded approach to the exercise promotes realism and may benefit the participating units for the deployment on which they have just embarked, the Navy could benefit from testing early doctrine for new or expected capabilities such as distributed lethality, the Marine Corps' expeditionary advanced base operations (EABO), or future unmanned systems. Today's rapid technological change demands representative training and experimentation under free-play conditions.[172] By not leveraging innovation, the modern exercises may more closely resemble an added inspection or evaluation than a laboratory for experimentation. Participants may default to executing standard operating procedures that were just certified during the deployment preparation period.

Last, to support the necessary scale and experimental nature of the new Fleet Problems, they should be executed as standalone events and not as an exercise during deployment. The timing for the exercise was chosen in part because the crowded OFRP left no space to add additional training.[173] This is a proverbial double edged sword; if there is no time during deployment

work-up to train units for high-end combat, the Navy is implicitly sending ships on deployment that are not ready should that conflict arise. As part of the OFRP, every deploying ship works up and certifies for a range of warfare capabilities; units then deploy and perform some collection of those missions. At no point during the OFRP do units bring tactics and skills together in a high-end scenario against a thoughtful and reacting adversary.[174] The modern Fleet Problems aim to create that scenario, but, as scheduled, they are a major event with a different set of parameters than the participating units prepared for, awkwardly inserted into the deployment schedule, only for units to return to the previous set of mission parameters immediately afterword. On the subject of scale, placing the Fleet Problem within a deployment ensures that participation by much more than a carrier or expeditionary strike group is unlikely. The modern Navy deploys in groups, rather than as a fleet. Any conflict with China would require significantly greater forces than a single strike group; modern wartime simulation should account for it. The scheduling of modern Fleet Problems has suffered from a dense OFRP bookended by the mission demands of a deploying peacetime Navy. If preparing for a great power conflict is truly a priority, the modern Fleet Problems require dedicated attention to achieve the necessary scale.

CONCLUSIONS

The challenges faced by the modern Navy in preparing for great power conflict with China share many similarities with those of the interwar Navy preparing for war with Japan. The geographic challenges of armed conflict in the western Pacific are much the same today as they were in 1941; the Navy's path to a western Pacific conflict zone will be contested by adversary fighters, bombers, ships, and missile systems based and operating throughout a myriad of islands and purpose built to slow and attrite the U.S. Fleet on its long transit westward. Like the interwar Navy, the modern Navy enjoys certainty in who the adversary will be and where the

conflict will happen, but must wrestle with the uncertainty of new technologies, how the war will be fought, and with what tools. Finally, where the interwar Navy managed uncertainties with resources limited by political opposition and a depression, the modern Navy must manage uncertainty in an environment where Congress does not trust the Navy's judgement in future planning.

To manage emerging technologies, the Navy must look to the interwar period and modernize the methods and techniques used to prepare for WWII. The interwar Navy integrated aviation through innovation by variety. Rather than seizing upon a single concept of operations, the Navy tested many and ultimately found the most effective solution for the carrier air wing. Today, new systems are not procured or tested until a valid requirement is identified; essentially, testing does not begin until the concept of operations for the system is already known. Following modern processes during the interwar period might have left the Navy with predominantly dirigibles, scouts, and torpedo bombers vice fighters and dive bombers during the war. Innovation does not happen without failures and failures can be costly, but as the submarine force demonstrated in WWII, even a failure to identify a good concept of operations can still produce effective tools of warfare.

The importance of the Fleet Problems in preparing the Navy for WWII cannot be overstated. Through the Fleet Problems, the Navy tested new technologies and tactics, identified strategic and operational requirements, and prepared crews and staffs for great power conflict. Through large scale free-play exercises, the interwar Navy exposed officers and crews to a vision of what the next war would be like. Today, a new generation of Fleet Problems attempts to meet the same objectives. While a step in the right direction, the new Fleet Problems lack the scale to effectively simulate great power conflict. Additionally, the relatively closed-door critique

process and lack of tactical or operational experimentation make the modern Fleet Problems appear more as added evaluations than avenues for learning. Lastly, the Fleet Problems need to be their own event. By bolting them onto the deployment, the Navy is implicitly sending unprepared forces overseas and ensures the training audience will remain a collection of 'who is available' rather than 'who needs to be there.' If the OFRP is not producing ships that are ready for conflict and is too dense to add the necessary events, perhaps re-thinking the OFRP is necessary. Preparation for great power conflict demands dedicated attention.

End Notes

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