ENVISIONING AMERICA'S FLEET: AN INTELLECTUAL HISTORY OF HOW THE NAVAL OFFICER CORPS INFLUENCED NAVAL MODERNIZATION, 1865-1898

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ABSTRACT

Between 1865 and 1898, the United States Navy underwent an unprecedented technological and professional modernization. This modernization involved the use of advanced technology in ship construction, propulsion, and armament. Steel replaced wood as the primary building material in ship construction, steam propulsion replaced sail propulsion, and rifled guns and automobile torpedoes replaced smoothbore and muzzle loading guns. The naval officer corps also moved towards professionalization with the creation of advanced training schools, such as the Naval War College. Utilizing the academic works of naval officers found in the *Papers and Proceedings of the United States Naval Institute*, it is possible to track the intellectual processes that facilitated naval modernization. Through decades of development and lobbying Congress for appropriations, naval officers influenced the modernization of the U.S. Fleet that decisively defeated the Spanish Navy during the battles of Manila Bay and Santiago de Cuba.

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CHAPTER 1

THE MODERNIZED U.S. FLEET AT MANILA AND SANTIAGO DE CUBA

At 9:00 A.M. on Monday April 25, 1898, the U.S. Asiatic Squadron under the command of Commodore George Dewey weighed anchor in Hong Kong and steamed toward the Philippine Islands to attack the port of Manila. Just four days earlier, the United States had declared war against Spain. The tensions that triggered the pending hostilities stemmed from deepening American concerns over the Cuban War of Independence, and the mysterious explosion that sank the armored cruiser USS *Maine* in Havana Harbor. The warships following Dewey's squadron consisted of the armored cruisers *Olympia* (Dewey's flagship), *Baltimore*, *Boston*, and *Raleigh*; the gunboats *Petrel* and *Concord*; and the cutter *McCulloch*.[1] Dewey's squadron represented the fruits of a thirty-three year modernization campaign that had transformed the U.S. Navy. Since 1865, American naval officers had been pushing for an all-steel, all-steam powered and professionalized naval force. The battle of Manila Bay would be the modernized U.S. Navy's first test.

By 5:15 A.M. on May 1, 1898, Dewey and his ships had managed to steam through the mined mouth of Manila Bay. At 5:45 A.M., Dewey issued one of the most celebrated orders in U.S. naval history: "You may fire when you are ready, Gridley."[2]

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[1] Leeke, Jim, *Manila and Santiago: The New Steel Navy in the Spanish-American War* (Annapolis: Naval Institute Press, 2009), 46.

[2] Dewey, George, *Autobiography of George Dewey, Admiral of the Navy* (New York: Charles Scribner's Sons, 1913), 214.

Captain Charles Gridley, the commanding officer of the *Olympia*, relayed the order to all of the American ships.

The Spanish fleet, under the command of Contraalmirante (Rear Admiral) Patricio Montojo, engaged the U.S. squadron with seven of its ships, including the *Reina Cristina* (flagship), *Castilla*, *Don Juan de Austria*, *Don Antonio de Ulloa*, *Isla de Luzon*, *Isla de Cuba*, and *Marques del Duero*. All seven Spanish warships were underpowered, outgunned, and no match for the superior Asiatic Squadron. The breech-loading, rifled guns onboard the U.S. ships allowed them to pound their inferior Spanish opponents into oblivion while their superior armor protected them from sustaining any significant damage. The U.S. armored cruiser *Baltimore* sustained at least five hits, but only one Spanish shot managed to inflict damage resulting in eight slightly wounded sailors.[3] At 12:40 P.M., the Spanish struck their colors and surrendered.

The Battle of Manila Bay was an overwhelming success for the United States and an utter catastrophe for the Spanish. The Asiatic Squadron reported eight men with minor wounds, one dead due to possible heatstroke, and one armored cruiser with minor damage. The Spanish fleet reported 381 casualties, but according to historian Jim Leeke, that number could have been as high as 320 Spanish dead and 300 wounded.[4] By crushing the Spanish fleet in Manila Bay, the U.S. Navy opened the door for an American occupation of the Philippine Islands that lasted until the archipelago's independence in 1946. Two months after the Battle of Manila Bay, the modernized U.S. Navy again

[3] Leeke, *Manila and Santiago*, 71.

[4] Ibid., 73.

showed its newfound might to the world when it faced off against another element of the Spanish Navy 9,800 miles away in the Battle of Santiago de Cuba.

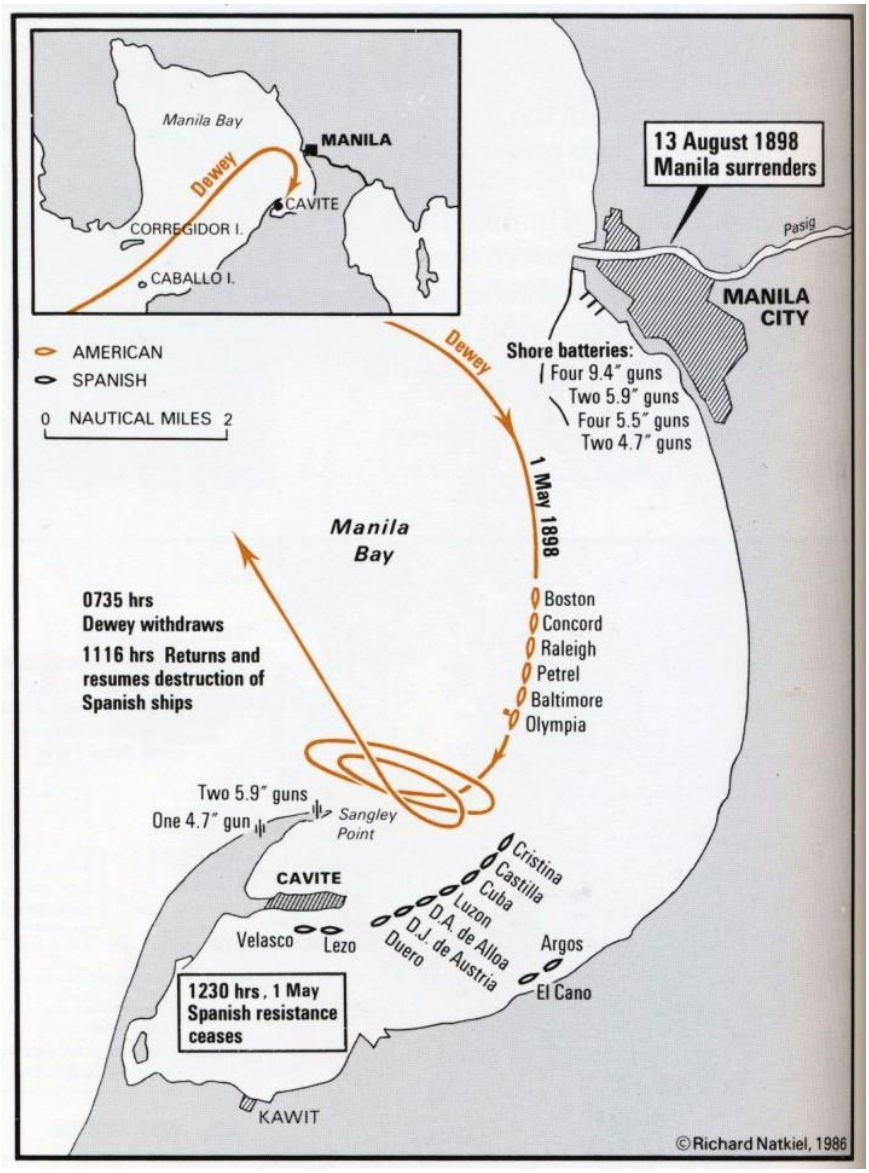

Illustration 1

This map details the U.S. Asiatic Squadron's line of battle as well as the Spanish fleet and shore defenses during the Battle of Manila Bay. (*Atlas of Maritime History*)

Illustration 2

This photograph depicts Dewey's flagship, the USS *Olympia,* currently serving at the Independence Seaport Museum located at Philadelphia's Penn's Landing. (flickr.com)

The Spanish government dispatched several warships to defend Cuba in the hope that a decisive naval victory would bring an expeditious end to the war. Commanded by Admiral Pascual Cevera y Topete, the Spanish Caribbean Squadron consisted of four armored cruisers, *Almirante Oquendo*, *Vizcaya*, *Infanta Maria Teresa*, and *Cristóbal Colón*; and two destroyers, *Pluton* and *Furor*. Unfortunately for Spain, the ships' crews had very little training, and the condition of ships themselves was deplorable. Cevera's most capable ship, the armored cruiser *Cristóbal Colón*, departed for the Caribbean without ever having its 10-inch main guns mounted.[5] Cevera, aware that his squadron was no match for the modernized American warships, advised his superiors against an

[5] Ibid., 95.

open naval engagement with the U.S. Navy to no avail. Dejected by his orders and the state of his command, Cevera steamed towards Cuba, evading the U.S. Navy, until his ships moored in the harbor of Santiago.

Tasked with locating and destroying the Spanish Caribbean Squadron was Rear Admiral William T. Sampson of the North Atlantic Squadron. Sampson's command consisted of five battleships, the *Texas, Indiana, Massachusetts, Oregon,* and *Iowa*; the armored cruisers *New York* and *Brooklyn*; the converted yachts *Gloucester* and *Hist*, and the torpedo boat *Ericsson*.[6] After receiving intelligence on Cevera's whereabouts, Sampson's squadron steamed towards Santiago harbor. By May 24, Sampson's ships arrived on station and began a tight blockade of Santiago harbor. In a desperate bid to save the Spanish ships, Cevera prepared to attempt to break out from Santiago harbor. Shortly after 9:30 A.M. on July 3, the North Atlantic Squadron spotted smoke billowing from the Spanish warships as they attempted to effectuate their escape.

As the Spanish ships left the harbor, the U.S. Navy engaged them with accurate and overwhelming fire. One by one, the Spanish ships struck their colors and surrendered. At 1:10 P.M., the last Spanish ship, *Cristóbal Colón* struck its colors, turned towards the shore, and subsequently ran aground.[7] The Battle of Santiago de Cuba was over. U.S. casualties amounted to one dead and one seriously wounded, while the Spanish suffered an estimated 323 dead and another 151 severely wounded. The Americans also captured approximately 1,600 Spanish officers and crew.[8] Just as the

[6] Ibid., 163.

[7] Ibid., 139.

[8] Ibid., 142.

U.S. Navy had done at Manila Bay, they showed off their newfound power of technological and professional superiority at Santiago de Cuba.

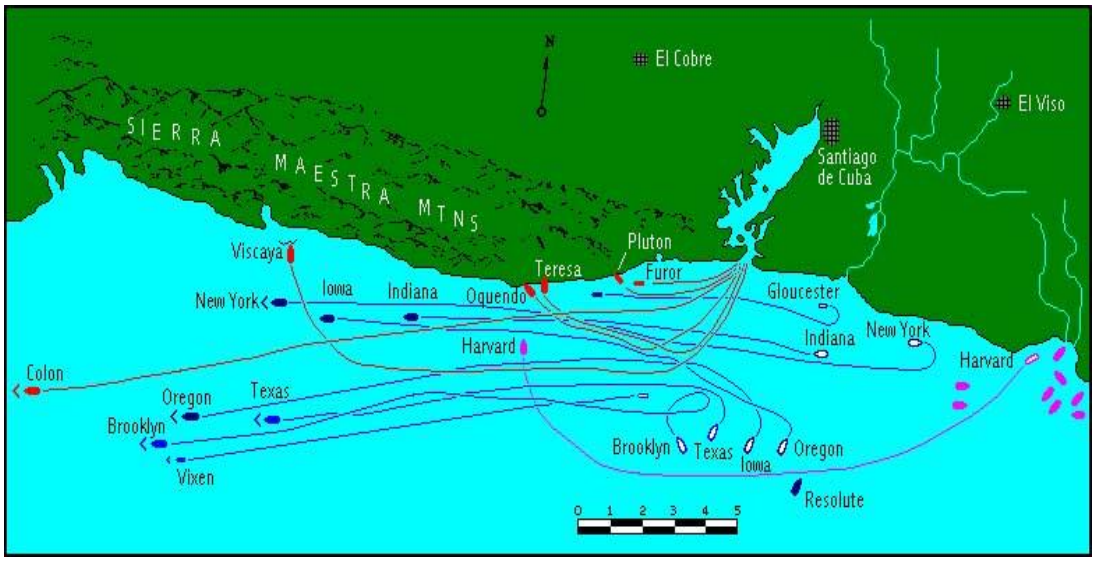

Illustration 3

This map depicts the Battle of Santiago de Cuba and includes the movement of the U.S. Fleet and the location of the wrecked Spanish vessels. (angloboerwarmuseum.com)

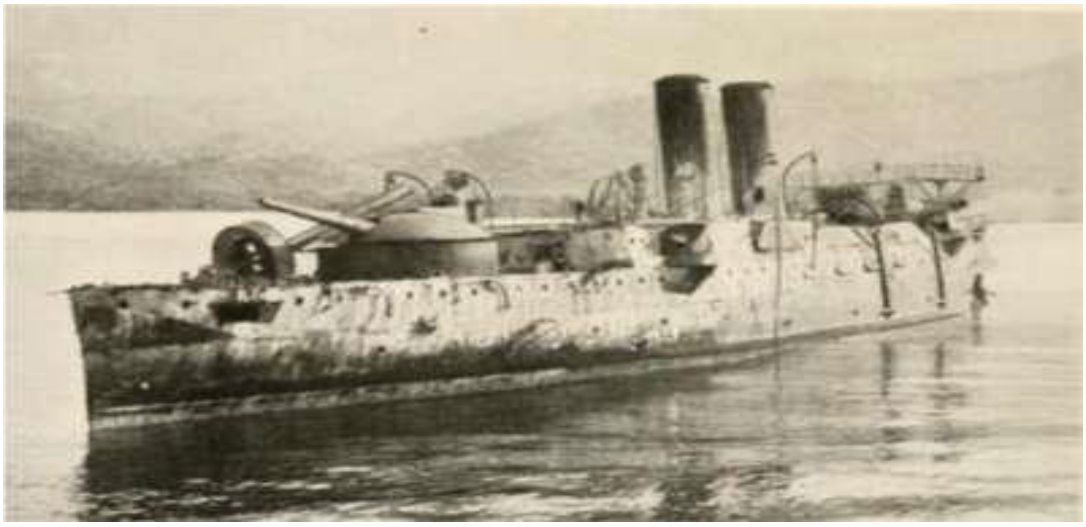

Illustration 4

The wreck of the Spanish warship *Vizcaya*, destroyed during the Battle of Santiago de Cuba. (SpanishAmericanWar.info)

Although the U.S. Navy enjoyed both technological and professional superiority over its Spanish opposition during the war, the question remains: how did the it achieve that edge in the years preceding the conflict? This question is especially important considering that the Spanish-American War marked the first serious contest that American sailors had faced since the Civil War thirty-three years earlier. According to the naval historian, James C. Rentfrow, "U.S. naval history creates a 'black box' in which the wooden navy of the cruising era is entered in one end and the New Steel Navy magically appears from the other end in time for war in 1898."[9] Few historians have explored the U.S. Navy's modernization process during the post-Civil War period, and no scholar has done so from the perspective of the naval officer corps' influence over ship design.

[9] James C. Rentfrow, *Home Squadron: The U.S. Navy on the North Atlantic Station* (Annapolis: Naval Institute Press, 2014), 3.

One important work on the post-Civil War navy, Peter Karsten's *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism*, explains the navy's evolution by examining the development of the naval officer corps from the founding of the United States Naval Academy in 1845 to the 1920s.[10] Another book, William H. Thiesen's *Industrializing American Shipbuilding: The Transformation of Ship Design and Construction, 1820-1920,* attributes American naval modernization to the development of practical shipbuilding methods that made possible building a modernized all-steel navy in the late nineteenth-century.[11] James Rentfrow's book, *Home Squadron: The U.S. Navy on the North Atlantic Station*, credits the U.S. Navy's training program, which depended on obsolete warships, as the catalyst for operational and organizational change that led to the acceptance and production of modernized all-steel warships in time for America's war with Spain.[12] While the current historiography provides insights as to how and why the U.S. Navy modernized between 1865-1898, it fails to examine the thought processes of the naval officers who wielded significant influence over the navy's development during that period.

What is missing from the historiography is how the rapid, technological modernization of the U.S. Fleet that took place in Rentfrow's "black box" took its lead from the naval officer corps. Naval officers spent decades conducting research and

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[10] Peter Karsten, *The Naval Aristocracy: The Golden Age of Annapolis and the Emergence of Modern American Navalism* (Annapolis: Naval Institute Press, 1972), xii-xvii.

[11] William H. Thiesen, *Industrializing American Shipbuilding: The Transformation of Ship Design and Construction, 1820-1920* (Gainesville: University Press of Florida, 2006), ix.

[12] James C. Rentfrow, *Home Squadron*, 3.

development projects, engaging in naval training and education programs, and lobbying for congressional funding. Their efforts are documented by the papers they published in the quarterly journal, *Papers and Proceedings of the United States Naval Institute*.[13] Groups of naval officers influenced every decision made in the modernization process, including line officers, engineers, ordnance specialists, and scientists ready to advise their superiors in the fleet, as well as Congress, as to how best to pursue comprehensive modernization. Throughout this process, naval reformers utilized academic forums and publications as a means of influencing the development of warship function and design.

[13] Ibid., 3.

CHAPTER 2

THE NAVAL RECESSION (1865-1874)

After the Civil War concluded in 1865, a small budget and lack of public and congressional interest severely impeded the technological development of the U.S. Navy for the first decade of the postwar period. According to the naval historian, Kenneth J. Hagan, "Naval officers attributed the pinched budgets to unwarranted popular confidence in patchwork fleets assembled during war as well as to… preoccupation with domestic matters."[14] With the Confederacy conquered and no impending threat from abroad, the U.S. Navy reverted to its traditional emphasis on commerce raiding and coastal defense. Ironically, another contributing factor to the postwar stagnation in American naval development was the rapid advances that had been made during the Civil War.

That conflict heralded the dawn of a new age for the United States Navy because it was the first Americans fought in which rapid technological advances played a significant role. Some of the most important advances included improved steam propulsion, ironcladding of wooden hulls, iron-built hulls, the use of propellers instead of paddlewheels, and improved naval ordnance.[15] Although those strides caused scientists and engineers to exalt, they inspired skepticism and unease among many professional sailors and traditional line officers. Admiral David Dixon Porter was one of the most influential line officers to oppose postwar naval modernization.

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[14] Kenneth J. Hagan, *American Gunboat Diplomacy and the Old Navy, 1877-1889* (Westport, CT: Greenwood Press, 1973), 5.

[15] William M. McBride, *Technological Change and the United States Navy, 1865-1945* (Baltimore: The Johns Hopkins University Press, 2000), 16.

Porter came from one of America's most distinguished naval families. His father, Commodore David Porter, served with distinction during the First Barbary War and the War of 1812. His adoptive brother, David G. Farragut, was the captor of New Orleans and victor of the Battle of Mobile Bay during the Civil War. Farragut later became the first admiral in U.S. naval history. Like his brother, Porter was also a notable veteran of the Union Navy and played an instrumental part in Major General Ulysses S. Grant's Western Rivers campaigns. Although Porter utilized ironclads and steam-driven gunboats with great success during the Civil War, he echoed the opinion of his fellow line officers that the Naval Engineering Corps had risen to a position of unwonted prominence. In the late 1860s, he spearheaded a campaign to undermine the naval engineering profession epitomized by the engineer in chief, Benjamin Franklin Isherwood.[16]

Isherwood had served in the U.S. Navy as an engineer since the Mexican-American War and rose to the title of engineer in chief by the time the Civil War broke out in 1861. During Isherwood's tenure as engineer in chief, he strove to expand the influence of naval engineers in naval organization. His goal was to ensure that engineers received equal advancement opportunities in terms of rank and naval administrative appointments, despite heavy opposition from the line officers. According to Isherwood's biographer, Edward William Sloan III, "although the naval engineer was technically a commissioned officer…the fact remained that, in practice, he was still not a Navy man

[16] Karsten, *Naval Aristocracy*, 62.

but only a glorified mechanic, especially in the eyes of line officers."[17] The contempt that Porter and the other line officers felt for Isherwood resulted in the outright rejection of many of his most promising projects, such as the sloop-of-war *Wampanoag*.

Designed for the U.S. Navy's strategy of commerce raiding, the *Wampanoag* was built for speed. Isherwood took an unorthodox approach to ship construction by designing the *Wampanoag* around its engineering space in an effort to outfit it with the largest engines and boilers available. Constructed from wood and iron, the *Wampanoag* measured 335 feet long, and 44 ½ feet wide. It drew 18 ½ feet, and displaced 4,216 tons.[18] The *Wampanoag* launched in December 1864, but did so without its machinery installed. Cost and material deficiencies delayed the fabrication of Isherwood's large and complex engines until the summer of 1867.[19]

During the *Wampanoag*'s sea trials, it boasted the then incredible speed of 17.75 knots and was able to cruise 4,700 miles at 11.5 knots.[20] Despite this promising performance, Congress was unimpressed. Politicians complained that the oversized machinery onboard left little to no room for stores and crew and that the ship consumed too much coal. Naval architect and *Monitor* designer John Ericsson argued that "the cruiser was worthless because she was so cramped that after the trial sixty-five men had

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[17] Edward William Sloan, III., *Benjamin Franklin Isherwood Naval Engineer: The Years as Engineer in Chief, 1861-1869* (Annapolis: United States Naval Institute, 1965), 3.

[18] Sloan, *Benjamin Franklin Isherwood*, 170.

[19] Ibid., 176.

[20] Ibid., 179.

been removed to a receiving ship because of a lack of berthing space."[21] The criticism of the *Wampanoag*'s performance by Porter and other line officers led Secretary of the Navy Gideon Welles to order an inspection board to determine the fitness of the vessel in 1868.

The board recommended that the *Wampanoag* undergo modifications to its engineering machinery to make it more practical for the navy's peacetime needs despite Isherwood's protests. With the modifications in place, Congress accepted the *Wampanoag* into service as the flagship for the New York Naval Yard in February 1868. The new warship's service was short-lived, however, and it was ordered decommissioned in May 1868. Despite the *Wampanoag*'s revolutionary design and speed, the mentality of traditional line officers proved too much for Isherwood to overcome in the late 1860s.[22] Porter and his clique continued to resist the winds of technological change in the Navy and used Isherwood's perceived failures as a means of denigrating the U.S. Naval Engineering Corps.

Porter's relentless attacks on Isherwood and naval engineers continued to build momentum as the *Wampanoag* faded into obscurity. Porter pressured Congress to immediately remove Isherwood as engineer in chief and committed to using other drastic measures if necessary. Porter even considered scrapping the Bureau of Steam Engineering altogether or conducting a personal investigations of Isherwood's financial

[21] Ibid., 182.

[22] Karsten, *Naval Aristocracy*, 62.

records, hoping to discover he had embezzled funds in order to have him removed from the navy.[23]

Porter used his powerful influence to persuade several U.S. senators to join his scorched-earth campaign to oust Isherwood. Porter believed that without Isherwood the remaining opposition to the traditional line officers' influence would cease.[24] With Porter firmly in control of the Navy Department, Isherwood had no one left to aid him in his defense. On March 16, 1869, Isherwood received orders to leave the navy. Porter and the traditionalists retained power until the mid-1870s, when a political disaster nearly plunged the U.S. Navy into a war it was unlikely to win.[25]

[23] Sloan, *Benjamin Franklin Isherwood*, 206.

[24] Ibid., 208.

[25] Ibid., 232.

CHAPTER 3

THE *VIRGINIUS* AFFAIR AND THE KEY WEST EXERCISES

In late October 1873, a political crisis known as the *Virginius* Affair embroiled the U.S., British, and Spanish governments, and subsequently helped uncover the glaring inadequacies of the U.S. Navy. The *Virginius* affair began during the Ten Years' War between Spain and Cuban insurrectionaries when the Spanish Navy intercepted an American merchant ship, the *Virginius*, running guns to the rebels. The colonial Spanish government tried all the men caught onboard as pirates, including British and American citizens. The Spanish then executed fifty-three of the *Virginius*' crew, including its American captain, Joseph Fry.[26] The *Virginius* affair sparked outrage throughout the United States. The U.S. government responded to the executions by ordering the European and Southern Atlantic squadrons to consolidate at Key West in a show of force.[27]

Once assembled at Key West, American naval commanders became aware of just how deplorable the state of the U.S. Fleet was. Historian Jim Leeke states that the U.S. Navy's "conditions were pathetic, stores nonexistent, and the fleet laughable."[28] Porter himself admitted that the U.S. Fleet was materially inferior to any other European power and hoped that the experience and skill of the American naval officers and sailors would

[26] McBride, *Technological Change*, 18; Leeke, *Manila and Santiago*, 13.

[27] Kenneth J. Hagan, *A People's Navy: The Making of American Sea Power* (New York: The Free Press, 1991), 180.

[28] Leeke, *Manila and Santiago*, 13.

make up for it. Fortunately for the American navy and its commanders, Secretary of State Hamilton Fish quickly negotiated a peaceful settlement with the Spanish government. On December 18, Spain returned the 102 survivors of the *Virginius* to American custody.[29]

Although the crisis with Spain abated, the Navy Department decided to conduct drills and practice tactics while the fleet was concentrated at Key West. The massive exercise lasted two months and involved about 30 warships (including ironclad monitors), unarmored ships, and amphibious landings with about 3,000 soldiers. The exercise proved to be a fiasco due to poor supply and maneuverability. The shortcomings of America's collective naval might helped ignite the spark of reform.[30] Naval officers, such as Commodore Foxhall A. Parker, used the exercises as an opportunity to take stock of their service's current state and address its shortcomings in print.

In an article titled "Our Fleet Maneuvers in the Bay of Florida, and the Navy of the Future," Parker detailed the problems that the U.S. Navy faced during its Key West maneuvers. He lamented the ineffectiveness of the torpedo boats' performance stating that they lacked maneuverability and that seven out of eighteen torpedoes used during the exercise failed to detonate.[31] Gunnery exercises fared little better. As Parker put it, "The howitzer-firing from the boats, however, on this occasion, was neither rapid nor well

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[29] Hagan, *A People's Navy*, 181.

[30] Ibid.

[31] Foxhall A. Parker, "Our Fleet Maneuvers in the Bay of Florida, and the Navy of the Future," *Papers and Proceedings of the United States Naval Institute* Vol. 1/1/1 (December 1874) No page numbers in online format, Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1874-12/our-fleet-maneuvers-bay-florida-and-navy-future.

sustained, nor was the howitzer manipulated afloat as dexterously as it should have been."[32] Fleet maneuvers fell short of expectations and the dilapidated ships could only maintain a dismal speed of 4 knots for the duration of the exercise.[33]

Parker argued that although the United States enjoyed a state of peace for the moment, conflict with foreign powers remained inevitable and the country needed to be prepared for war. He remained wary of the growing power of European navies in an age of ever advancing technology and insisted that his country follow suit by building a fleet capable of defending the American coast as well as its commerce on the high seas. Parker complained, "What more painful to one who loved his country and his profession—than to see a fleet armed with smoothbore guns, requiring close quarters for their development, moving at the rate of four and a half knots an hour?"[34] Horrified and saddened by what he had witnessed at Key West, Parker dedicated the rest of his paper to advocating for naval reform.

Going against the grain of the traditionalists, who were content to rely on sail power in conjunction with steam, Parker contended that the navy should commit itself to a fleet powered exclusively by steam. He claimed that when "the high price now paid for surplus masts, spars, rigging, and cordage is deducted from the bill, I think it will be found that an efficient steam navy can be maintained at a cost but little exceeding that of our present nondescript one."[35] With the need for naval reform made abundantly clear

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[32] Ibid.

[33] Ibid.

[34] Ibid.

[35] Ibid.

by the Key West exercise, the Navy Department turned to the recently developed U.S. Naval Institute to solve its modernization woes.

CHAPTER 4

THE U.S. NAVAL INSTITUTE AND THE *PAPERS AND PROCEEDINGS*

Founded in October 1873, the U.S. Naval Institute at the Naval Academy was created by naval officers as a means to advance the "professional and scientific knowledge in the Navy."[36] As noted by historian Kenneth Hagan the institute's, *Papers and Proceedings of the United States Naval Institute* offered a forum in which naval professionals "could cast off the inhibiting restrictions of their hierarchical subculture in order to debate their collective future."[37] That journal would serve the navy as a major agent of modernization for the next two decades. It allowed officers from ensign to admiral to submit academic papers expressing opinions and scientific findings as a means of advancing the U.S. Fleet. The institute offered an annual cash prize for the best article in its journal to encourage good work. According to one of the institute's presidents, Rear-Admiral Edward Simpson, "This Institute is one of the proofs of the aspiration for advancement that felt the need of a field in which to exhibit prowess."[38]

Papers and Proceedings enabled naval officers to influence the modernization of the fleet in three ways. First, this journal served as a forum for discussing new tactics and strategies. Second, it helped advance naval research and technology through

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[36] "Constitution," *Papers and Proceedings of the United States Naval Institute* Vol. 1/1/1 (1874), https://www.usni.org/magazines/proceedings/1874-12/constitution.

[37] Hagan, *A People's Navy*, 184.

[38] Edward Simpson, "Annual Address: The Navy and its Prospects of Rehabilitation," *Papers and Proceedings of the United States Naval Institute* Vol. 12/1/36 (June 1886), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1886-01/annual-address-navy-and-its-prospects-rehabilitation.

experimentation with steam engineering, naval ordnance, armor and ship design. Lastly, it provided influential naval officers and lobbyists tangible proposals to bring to Congress in order to secure approval for new naval construction.

Papers and Proceedings helped influence the development of new naval strategies and tactics that determined what types of ships the United States constructed. Since the American republic's inception, it had relied on the naval strategy of *guerre de course*. Also known as commerce raiding, *guerre de course*, involved utilizing smaller, faster ships to attack the enemy's merchant fleet. Commerce raiding suited a country with a weak navy because it did not require the construction or maintenance of numerically strong fleets with larger and more expensive warships. The strategy also allowed for quicker merchant vessels to be retrofitted for naval use as commerce raiders in times of war.

The Confederate Navy utilized *guerre de course* extensively during the Civil War. In *Gray Raiders of the Sea: How Eight Confederate Warships Destroyed the Union's High Seas Commerce*, historian Chester G. Hearn claimed that commerce raiding was the Confederacy's most successful strategy. By his account, Confederate commerce raiders destroyed 110,000 tons of Union shipping and forced merchants to sell another 800,000 tons to foreign owners.[39]

Although the U.S. Navy engaged in commerce raiding in the American Revolution and War of 1812, by the late 1870s it was clear to naval officers that such as strategy would not ensure an American naval victory over a contemporary European

[39] Chester G. Hearn, *Grey Raiders of the Sea: How Eight Confederate Warships Destroyed the Union's High Seas Commerce* (Camden: International Marine Publishing, 1992), xv.

power. If the United States wanted to compete on the same basis with such an opponent, it would have to adapt to the strategy of *guerre d'escadre*. *Guerre d'escadre*, or war of squadrons, involved fleet-versus-fleet combat. The advanced fleets marshaled by European powers were built around large, powerful ships-of-the-line, such as battleships and armored cruisers. General naval engagements found favor with the British and French because they reflected their status as preeminent naval powers. American naval reformers lobbied for the adoption of *guerre d'escadre* in order to become a dominant naval power.[40] *Papers and Proceedings* proved to be an influential soapbox from which to broadcast the need for this U.S. naval strategic change.

In an article for that journal, "The Purposes of a Navy, and the Best Methods for Rendering It Efficient," Rear-Admiral Daniel Ammen argued that the functions of a navy in peacetime were just as important as they were in war and that having the proper ships was as important as having well-trained men to crew them. Ammen emphasized that "the nation that, in time of peace, should disregard its obligation to perform its part of a common duty, would, in time of war, suffer disadvantages and losses which would be incalculably greater."[41] In addition to maintaining a constant state of operational readiness in the event of war, Ammen advocated a peacetime navy to protect world trade

[40] McBride, *Technological Change*, 5.

[41] Daniel Ammen, "The Purposes of a Navy, and the Best Methods of Rendering It Efficient," *Papers and Proceedings of the United States Naval Institute* Vol. 5/2/7 (February 1879), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1879-04/purposes-navy-and-best-methods-rendering-it-efficient. .

and to engage in diplomatic expeditions, such as Commodore Matthew C. Perry's expedition to Japan in 1852.[42]

Ammen strongly opposed the tradition of arming merchant vessels for naval service. He noted that "in relation to the adaptation of vessels built for the merchant service to the fighting purposes of a Navy, it may be said that there is not one in a hundred that … would stand an equal chance in a naval engagement with the best types of vessels built for fighting."[43] Ammen proposed that the United States should deploy more powerful classes of warships to foreign stations. Such vessels could police the high seas and be used in fleet-versus-fleet engagements or commerce raiding as the situation dictated. Ammen concluded by stressing the importance of using peacetime to experiment with ship design and any other means of making naval warfare more destructive to ensure success in future wars. Fortunately for Ammen and the rest of the U.S. Navy, dedicated naval engineers and scientists were already conducting such experiments.[44]

By the inaugural issue of *Papers and Proceedings* in 1874, more than a generation had passed since the introduction of the steam engine onboard American warships. The journal aided naval officers in accepting the advances in naval technology by making engineering and other technical developments more accessible to naval officers. Articles, such as Chief Engineer C.H. Baker's "Compound Engines," discussed

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[42] The Perry Expedition, led by Commodore Matthew Perry, was a diplomatic expedition to Japan from 1853-1854. Perry's mission was to break Japan's policy of isolation and establish diplomatic and trade relations.

[43] Ammen, "Purposes of a Navy."

[44] Ibid.

the modifications of steam engines for maritime use, which would increase the fuel economy of warships.[45] By enabling the engine's pistons to withstand greater pressures, Baker argued that the efficiency of the engine itself could be drastically improved, making it suitable for use in warships. Baker maintained that many experiments had proved that, for the common pressures employed in marine engines, a measure of about twice the initial volume is attended with the most satisfactory economical results."[46] While American naval engineers continued to make advances with propulsion systems, ordnance experts strove to improve weapon designs.

In "The Armament of Our Ships at War," Captain W.N. Jeffers explained the method behind the composition of a ship's battery.[47] Jeffers argued that a ship's armament should be determined by three principles. These included the aggregate weight of the guns should be in proportion to the tonnage, the development of the greatest power of which the armament is susceptible, and the relation of the battery to the speed of the vessel. In an age of advancing shell, shot, and gun technology, Jeffers stated that one large and efficient gun could outmatch a larger ship armed with many smaller guns.[48] By publishing engineering and scientific studies in an open forum, *Papers and Proceedings*

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[45] C.H. Baker, "Compound Engines," *Papers and Proceedings of the United States Naval Institute* Vol. 1/1/1 (January 1874), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1874-12/compund-engines.

[46] Ibid.

[47] W.N. Jeffers, "The Armament of Our Ships of War," *Papers and Proceedings of the United States Naval Institute* Vol. 1/1/1 (December 1874), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1874-12/armament-our-ships-war.

[48] Ibid.

increased the accessibility of information that helped dispel many of the negative connotations traditional line officers had equated with the modernization efforts.

The first tangible signs of naval modernization began to take shape in the early 1880s. In June 1881, Secretary of the Navy William H. Hunt launched the Naval Advisory Board as a means of figuring out what vessels the navy needed. According to *Papers and Proceedings* records, the strength that the navy desired at the time was 70 unarmored cruisers. The journal revealed that "the Board in its report of November 7, 1881, stated that there were 32 vessels in the Navy fit for service."[49] Although the Advisory Board still deemed ironclad ships necessary for coastal defense, it did not consider the ironclad class to be within the immediate needs of the new navy and did not consider building more as their design lagged behind those of European classes.

Congress passed a naval appropriations bill on August 5, 1881, which gave the Advisory Board authority to build two newly proposed ships. The first ship was a first-rate steel, double-decked unarmored cruiser, having a displacement of about 5,873 tons, an average speed of 15 knots, and a battery of four 8-inch and 21 6-inch guns. The second ship was a first-rate steel, double-decked unarmored cruiser, having a displacement of about 4,560 tons, an average sea speed of 14 knots, and a battery of four 8-inch guns and 15 6-inch guns.[50] These vessels marked an improvement over other classes in the U.S. Fleet at the time because of their all-steel construction which rendered the placement of plated steel over a wooden hull obsolete.

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[49] Simpson, "Annual Address."

[50] Ibid.

In 1882, Secretary of the Navy William E. Chandler picked up where Hunt had left off and took further action to reform American naval strategy and ship construction. To assist him with this daunting challenge, Chandler appointed Rear-Admiral Robert W. Shufeldt as chairman of the Naval Advisory Board. A brilliant naval theorist and administrator, Shufeldt served in posts such as the Bureau of Equipment and Recruiting from 1875-1878. According to Shufeldt's biographer, Frederick C. Drake, the admiral's "period at the bureau also produced changes in Schufeldt's attitude toward the condition and the role of the navy."[51] When Shufeldt left the bureau, he went on to spearhead American commercial and naval expansion in Africa and Asia. While assigned to the screw sloop-of-war *Ticonderoga*, Shufeldt successfully negotiated a treaty opening Korea to American trade in 1882.[52] Shufeldt's knowledge of the U.S. Navy's administration coupled with his shrewd political tact made him an exceptional representative to persuade Congress to grant naval reforms.

In 1883, Congress took its first steps towards modernizing the navy when it approved funding for four all-steel warships. According to Admiral Simpson's 1886 address to the Naval Institute, "On January 2, 1883, the secretary of the navy recommended to Congress … the construction of one steel cruiser of about 4,000 tons displacement, three steel cruisers of about 2,500 tons displacement, one dispatch boat of 1,500 tons displacement, and one cruising torpedo boat."[53] The most important of those

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[51] Frederick C. Drake, *The Empire of the Seas: A Biography of Rear Admiral Robert Wilson Shufeldt, USN* (Honolulu: University of Hawaii Press, 1984), 174.

[52] Ibid., 298.

[53] Simpson, "Annual Address."

new vessels, collectively known as the ABCD ships, were the protected cruisers *Atlanta, Boston, Chicago,* and *Dolphin*. The ABCD ships bridged the gap between their predecessors in the old wood-and-sail navy and the fully modernized steel-and-steam navy.

Although the ABCD ships represented a vast improvement over the rest of the U.S. Fleet, they still lagged behind their counterparts of European design. American ships with all-steel hulls lacked the additional armored plating of European vessels of the same class. Furthermore, the ABCD cruisers came fully rigged with masts and sails for propulsion rather than relying exclusively on steam.[54] Due to the conspicuous flaws of the ABCD cruisers, Congress questioned the wisdom of investing in warships of inferior design.

In 1884, Simpson tried to assuage Congress' concerns by writing Chandler about the need for ships like the ABCD. Simpson maintained that "in consideration of the great need of cruisers to carry the flag abroad it recommended as the first step in rehabilitating the Navy the construction of vessels to supply this, the most pressing want of the service."[55] Simpson suggested that a class of cruisers, such as the ABCD ships, be built until more advanced ship designs were practicable. He argued that the construction of more sophisticated warships at such an early stage in the Navy's rehabilitation would consume too much time and money to be effective. Simpson also suggested that more

[54] Hagan, *People's Navy*, 186.

[55] Simpson, "Annual Address."

time was needed to experiment and determine the new types of warships the Navy should construct in the future.[56]

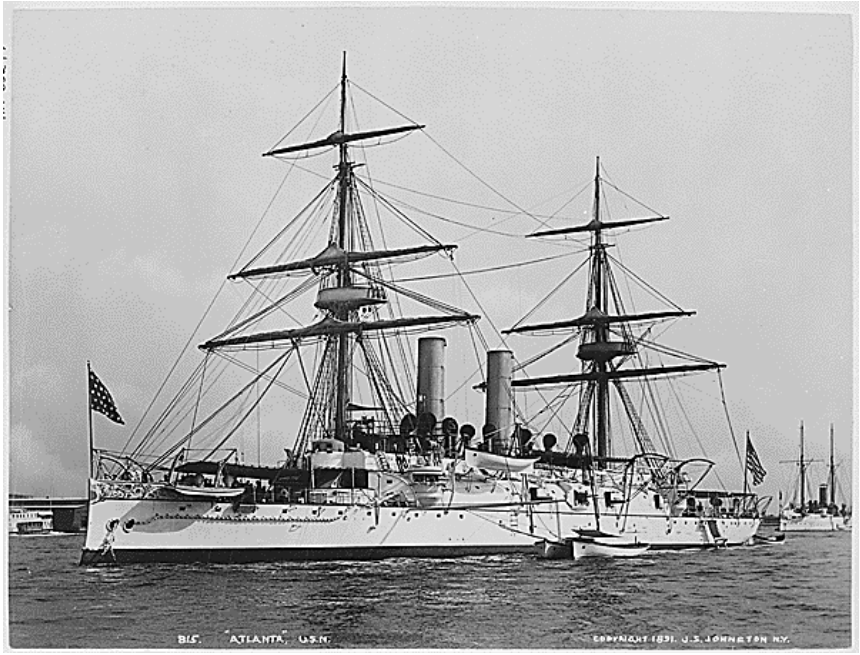

Illustration 5

This is a photograph of the cruiser USS *Atlanta*. Note the two masts complete with rigging and sails. Although this ship represented a step forward in U.S. naval modernization, the sails represent the Navy's reluctance to fully commit to building first-rate modernized warships. (flickr.com)

Simpson's letter included examples of two of the most advanced foreign armored warships for comparison, the *Riachuelo* and the HMS *Imperieuse*, both British-built. While the *Riachuelo* was not nearly as heavily armored as the *Imperieuse*, it displaced 1,700 tons less, making it the faster of the two designs. By comparing the two British ship designs, Simpson appealed to Congress that "a board cannot, except after the most

[56] Ibid.

careful study and examination, decide upon even the size and general dimensions of an armored vessel best suited for our purposes."[57] He also made several recommendations for the future of naval ship design by discussing the size of future warships, as well as the types of armor and weapons they should use, including large-bore rifled guns and self-propelled torpedoes.

Simpson's letter reached Congress and eventually made its way into the press. As a result, *Papers and Proceedings* articles featuring weapons designs, metallurgy, and armor plating technology appeared more frequently than they had in past issues. In 1886, *Papers and Proceedings* published seven papers regarding naval ordnance alone. Simpson's appeals to Congress and his use of the Naval Institute's journal as a medium with which to communicate the perceived needs of the navy bought naval researchers time and provided them with a direction on which to focus their future efforts.

One of the key points Simpson made in his address was the advancement of U.S. naval ordnance. According to historian Frederick Leslie Robertson, the use of cannon on ships first occurred by the year 1412.[58] From the early fifteenth to the early nineteenth-centuries, naval guns changed surprisingly little in both construction and the type of projectiles they fired. Cannon foundries typically cast the guns from iron and used them to fire stone or solid cast-iron shot. By the early nineteenth century, the first significant advance in naval ordnance came in the form of the exploding shell projectile, which dealt greater damage to the enemy ship and crew as opposed to traditional solid shot. After the

[57] Ibid.

[58] Frederick Leslie Robertson, *The Evolution of Naval Armament* (London: Constable & Company LTD., 1968), 63.

exploding shell, the next great breakthrough was the development of rifled guns, which began gaining popularity among the European powers of Great Britain and France during the 1850s. By drilling grooves into the bore of the barrel and utilizing cylindrical shot, the projectile would spiral as it left the barrel, giving it better range and accuracy than traditional smoothbore guns.

The godfather of U.S. naval ordnance during the mid-nineteenth century was Rear-Admiral John A. Dahlgren. According to his biographer, Robert J. Schneller, Jr., Dahlgren "was chief of the Bureau of Ordnance, guns that bore his name armed almost every ship in the Union navy, and naval officers recognized him as the foremost ordnance expert in America, if not the world."[59] Dahlgren devoted much of his career to conducting research on ballistics, metallurgy, explosive powders, as well as smoothbore and rifled cannon design. He made enhancements to ordnance equipment, such as gun carriages, sights, and breeching tackle, that saw service during and after Civil War.[60] Dahlgren died in 1870, and although he did not live to see the modernization of the U.S. Fleet, his work served as a springboard for generations of naval ordnance officers. One of those officers, Rear-Admiral Bradley A. Fiske, embraced Dahlgren's inventive spirit and revolutionized naval gunnery in the 1880s and 1890s.

Throughout Fiske's childhood, he demonstrated an aptitude for science and engineering which led him to obtain an appointment to the Naval Academy in the fall of 1870. In 1874, Fiske graduated with what biographer Paolo E. Coletta called "a technical

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[59] Robert J. Schneller, Jr., *A Quest for Glory: A Biography of Rear Admiral John A. Dahlgren* (Annapolis: Naval Institute Press, 1996), xiii.

[60] Ibid., 51.

education comparable to that offered by any good engineering school of the day."[61] Commissioned as an ensign in 1875, Fiske was part of a generation of naval officers who came into the navy after the seeds of the technological revolution had been planted. These young naval officers, such as Fiske, did not possess the prejudices against technological change like the traditionalists who preceded them. Because of his aptitude for science, Fiske yearned to break free of the constraints placed on engineers and scientists by traditionalists of the old wood-and-sail navy. Although he was commissioned as a line officer, Fiske's interest in science, particularly electrical engineering, earned him an assignment with the Bureau of Ordnance.[62]

As an officer in the Bureau of Ordnance, Fiske was responsible for designing and outfitting armaments for the navy's new warships. Between 1882 and 1888, Fiske conducted numerous experiments involving the integration of electricity into the gun systems onboard warships. Fiske's applications of electricity in weapon systems began during the construction of the ABCD cruisers in 1884. Fiske designed electric primers to fire the guns in the new ships. He developed an electrical system for aiming and firing heavy guns which could be done by a single gun captain using only a pistol grip. According to Coletta, "upon learning that no shipboard range finder existed, he decided to invent one."[63] By 1895, Fiske had succesfully created and tested the electrical ammunition hoist, range finder, range transmitter, range indicator, position indicator,

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[61] Paolo E. Coletta, *Admiral Bradley A. Fiske and the American Navy* (Lawrence: Regents Press of Kansas, 1979), 7.

[62] Ibid., 18.

[63] Ibid., 19.

electrical turret-turning gear, the telescopic sight, the stadimeter, and the first telephones for use onboard warships.[64]

As a dedicated naval officer and scientist, Fiske became an active member of the U.S. Naval Institute in 1886.[65] From 1886 to 1898, his works on electricity and various inventions were published or cited a total of 24 times in *Papers and Proceedings*, including S. Dana Greene's 1889 article "Electricity on Board Warships."[66]

Although the gun formed the backbone of U.S. ordnance in the late nineteenth-century, another weapon attracted significant interest, the steam-launched torpedo. As the use of armor plating on ships became more and more common, naval ordnance specialists tried to find new and innovative ways to overcome such protections. Many naval professionals believed the torpedo to be the next dominant weapon since, by design, it targeted enemy ships below the waterline where there was no armored protection.

When torpedoes first appeared in naval warfare, they were little more than floating or partially submerged explosive mines that detonated upon contact with an enemy ship. The next advance in torpedo deployment was the spar torpedo. This involved a ship attaching a torpedo mine to the end of a long spar and detonating it by ramming into the enemy ship. Finally, the self-propelled, steam-launched torpedo appeared in the 1860s. This weapon enabled the attacker to quickly deliver a payload at a

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[64] Ibid., 42.

[65] Ibid., 48.

[66] S. Dana Greene, "Electricity on Board Warships," *Papers and Proceedings of the United States Naval Institute* Vol. 15/3/50 (January 1889), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1889-07-0/electricity-board-warships.

greater distance than a spar torpedo, and escape without having to linger in range of an enemy ship's guns. Many U.S. naval officers, such as Lieutenant-Commander W.W. Reisinger, recognized the significant advantages of including the steam torpedo in the modernized U.S. Fleet.[67]

In an 1888 prize-winning article, Reisinger predicted that the self-propelled torpedo "will be a most prominent factor in all future wars."[68] He insisted that "it must have a place in the front rank in any defensive operations, and will not be found wanting in the offensive."[69] Among the various designs for the self-propelled torpedo the U.S. Navy adopted the Howell and Whitehead torpedoes, for active service. Throughout the 1880s and 1890s, naval researchers conducted numerous experiments with both the Howell and Whitehead torpedoes and published their findings in *Papers and Proceedings*.[70]

Developed in 1870, the Howell torpedo relied on a flywheel to drive the propeller. Unlike the Howell torpedo, the Whitehead torpedo utilized an engine driven by compressed air as a means of propulsion. The difference in propulsion design meant that the Howell had to be loaded into a firing tube and its flywheel spun before it could be launched, whereas the Whitehead could be loaded and fired at will since its propulsion

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[67] W.W. Reisinger, "Torpedoes," *Papers and Proceedings of the United States Naval Institute* Vol. 14/3/46 (July 1888), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1888-07/torpedoes.

[68] Ibid.

[69] Ibid.

[70] E.W. Very, "The Howell Automatic Torpedo," *Papers and Proceedings of the United States Naval Institute* Vol. 16/3/54 (June 1890), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1890-06/howell-automobile-torpedo.

charge was self-contained. This feature gave the Whitehead torpedo both a faster firing rate and greater speed through the water.[71] The Whitehead torpedo's warhead contained 220 lbs. of gun-cotton and reached a speed through the water of 28 knots.[72] By contrast, the Howell torpedo contained only 100 lbs. of gun-cotton in its warhead and reached a speed of 26 knots.[73] According to the American naval officer, Lieutenant W.J. Sears, "These torpedoes are a decided improvement, in the matter of speed and certainty of work, on the earlier type of shorter torpedoes."[74] Due to the Whitehead torpedo's speed, explosive capability, and self-contained means of propulsion the navy determined the Whitehead torpedo was superior.[75]

In *Torpedo: Inventing the Military Industrial Complex in the United States and Great Britain*, historian Katherine C. Epstein argued that the torpedo irreversibly changed the scope of naval warfare. Epstein notes that while gun-technology continued to improve throughout the nineteenth-century, torpedo technology improved on a scale of

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[71] Ibid.

[72] W.J. Sears, "A General Description of the Whitehead Torpedo," *Papers and Proceedings of the United States Naval Institute* Vol. 24/1/85 (January 1898), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1898-01/general-description-whitehead-torpedo; Karl Rohrer, "Gun-Cotton: Its history, Manufacture, Use," *Papers and Proceedings of the United States Naval Institute* Vol. 15/3/50 (July 1889), Accessed April 20, 2018, https://www.usni.org/magazines/proceedings/1889-07-0/gun-cotton%E2%80%94its-history-manufacture-use. Gun-cotton is an explosive substance four times more powerful than gunpowder. It is created by dipping cellulose in a mixture of nitric and sulphuric acid.

[73] E.W. Very, "Howell Automatic Torpedo."

[74] W.J. Sears, "Whitehead Torpedo."

[75] Ibid.

800 percent in terms of speed and 5,000 percent in terms of range.[76] The torpedo had the power to upend colossal naval powers, such as Great Britain, because lighter, faster craft could now easily destroy much larger warships with one or more well placed torpedoes. The effectiveness of the torpedo during the late nineteenth-century ensured its use by navies around the world. It also helped fuel an arms race between American and European powers during the twentieth-century.

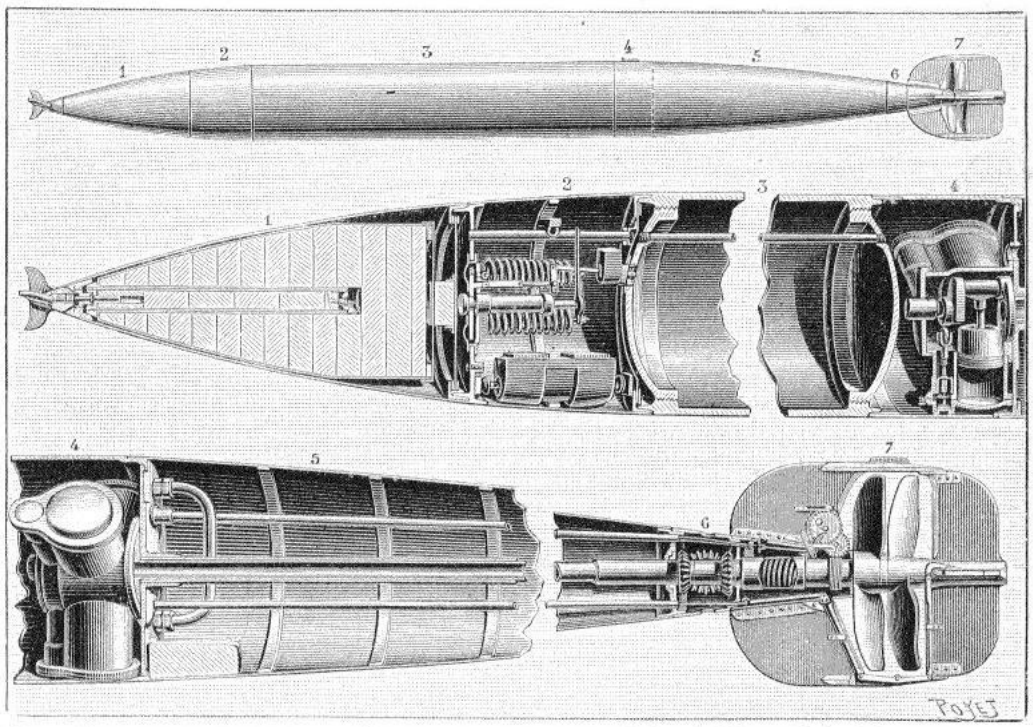

Fig. 1. — Torpille automobile Whitehead. — 1. Magasin. — 2. Chambre à secret. — 3. Réservoir d'air comprimé. — 4. Chambre des moteurs à air comprimé. — 5. Flotteur ou chambre de flottaison. — 6. Mécanisme de commande de rotation des hélices. — 7. Hélices et gouvernails.

Illustration 6

A drawing of the Whitehead torpedo complete with propulsion components, detonation device, and warhead. (Wikimedia.org)

[76] Epstein, Katherine C. *Torpedo: Inventing the Military Industrial Complex in the United States and Great Britain* (Cambridge, MA: Harvard University Press, 2014), 5.

The development of weapons like the Whitehead torpedo led naval researchers and officers to debate the best means of deploying them.[77] While the U.S. Navy had utilized specialized torpedo boats in the past, such craft were designed to use the older spar torpedoes rather than the newer self-propelled ones. Again, *Papers and Proceedings* offered a forum in which officers could propose new tactics and platforms in order to harness the maximum effectiveness of torpedo technology.

In 1892, British Royal Naval historian Sir William Laird Clowes published a prize-winning *Papers and Proceedings* article that stated the function of torpedo boats was "to steal up in the dark and deal a blow which some may deem rather the blow of the assassin than of the hero."[78] Clowes' statement revealed that the primary tactic of a torpedo boat armed with self-propelled torpedoes was to strike the enemy quickly and by surprise. The combat methods that Clowes advocated made it necessary for torpedo boats, which were unarmored and too small to carry heavy guns, to operate under the protection of larger warships. Clowes and other naval researchers also suggested that the tiny torpedo boats should refrain from deployment on the high seas due to their limited range and stability and should be utilized for coastal operations.[79]

In conjunction with naval ordnance testing, naval officers and researchers continued to experiment with the armored protection on American ships. The application

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[78] William Laird Clowes, "Prize Essay for 1892: Torpedo-Boats: Their Organization and Conduct," *Papers and Proceedings of the United States Naval Institute* Vol. 18/2/62 (February 1892), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1892-04/prize-essay-1892-torpedo-boats-their-organization-and-conduct.

[79] Ibid.

of metal armor plating to warships began in Europe during the mid-1850s to negate the destructive power of the new exploding shell. Both the Union and Confederate navies adopted the concept of adding sheet-metal plates to provide additional protection.

Although primitive and unsuited for high-seas use, ironclads such as the *USS Monitor* and CSS *Virginia* proved that metal armor could be applied to warships to enhance survivability against enemy firepower. On March 8, 1862, a day before fighting the *Monitor* to a draw, the *Virginia* successfully engaged the wooden Union ships *Cumberland* and *Congress*, causing what historian James M. McPherson called "the most lethal day in the history of the U.S. Navy until December 7, 1941."[80] The *Virginia*'s armor allowed it to ram and sink the *Cumberland* and force *Congress* to run aground while only sustaining two lost guns and two men killed. The Union Navy suffered 121 dead on the *Cumberland* and another 240 dead on the *Congress*.[81] After the Battle of Hampton Roads concluded the following day, ironclad warships saw increased service by both the Union and Confederate navies, especially in rivers and inner coastal waters.

In the decades following the Civil War, the U.S. Navy continued to use ironclad warships, but it still relied on unarmored wooden ships for warfare on the high seas. The armor plating that was applied to wooden-hulled ships in the post-Civil War period was rendered obsolete by advances in ordnance technology. By the mid-1870s, naval researchers faced the difficult task of developing armor plates that could resist drastically improved shot and shell. Even the all-steel hulls of the ABCD cruisers built in 1883 were

[80] James M. McPherson, *War on the Waters: The Union & Confederate Navies, 1861-1865* (Chapel Hill: University of North Carolina Press, 2012), 101.

[81] Ibid.

no match for the guns of their European contemporaries. According to U.S. Navy professor of mathematics P.R. Alger, "even at fighting ranges the heaviest armor now in use will be no match for the 13-inch gun, provided the impact is nearly normal."[82] By the 1890s, naval researchers and shipbuilders began applying cutting-edge metallurgical technology to the advancement of armor plating for use in warship construction.

In 1891, Joseph W. Richards, a professor of metallurgy at Lehigh University and a member of the U.S. Naval Institute, published an article titled "Electro-Metallurgy" in *Papers and Proceedings*. Richards defined electro-metallurgy as "the art of extracting metals from their ores or of refining them, on a commercial scale, by the agency of the electric current."[83] He argued that such electro-metallurgical technology could be applied to the steel industry in order to mass produce stronger materials. Such metals of superior quality and quantity could then be put to use in warship construction and protection. The United States steel industry applied electro-metallurgy along with other metal hardening processes throughout the 1890s, which provided the navy with durable steel for ship construction and armament.

Around the same time that Richards explained his findings regarding electro-metallurgy, another metallurgical breakthrough took place that had important implications for warship armor. Alger claimed that around 1891 "the surface-hardening process was found practicable, and at once armor development appeared to take an

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[82] P.R. Alger, "Armor for Ships of War," *Papers and Proceedings of the United States Naval Institute* Vol. 21/4/76 (October 1895), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1895-10/armor-ships-war.

[83] Joseph W. Richards, "Electro-Metallurgy," *Papers and Proceedings of the United States Naval Institute* Vol. 17/2/58 (April 1891), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1891-04/electro-metallurgy.

immense stride forward."[84] He noted that surface-hardening made steel plates impervious to different types of ordnance. For example, a 6-inch gun could not penetrate a 6-inch surface-hardened steel plate, a 10-inch gun could not penetrate a 14-inch plate, and a 12-inch gun could not penetrate a 17-inch plate.[85] Advances in metallurgical technology pushed American shipbuilders to adopt new methods of production and materials handling, including the introduction of hydraulic and pneumatic tools.[86]

Twelve years ago, historian William H. Thiesen argued that while advances in metallurgical technology and theoretical ship design methods influenced American shipbuilding, so too did America's rapidly advancing production of heavy equipment and machine tools.[87] Such heavy equipment and machine-tool production facilitated the mechanization of American shipyards, which made the construction of larger and more sophisticated warships possible. With shipyards such as San Francisco's Union Iron Works modernizing their facilities with hydraulic and later pneumatic tools, they remained at the cutting-edge of ship construction. As Thiesen put it, American steel manufacturers provided the high-quality steel necessary for the U.S. Navy to produce state-of-the-art warships, such as the USS *Olympia* and USS *Oregon*."[88] After decades of

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[84] P.R. Alger, "Armor for Ships of War."

[85] Ibid.

[86] William H. Thiesen, *Industrializing American Shipbuilding: The Transformation of Ship Design and Construction, 1820-1920* (Gainesville: University Press of Florida, 2006), 169.

[87] Ibid.

[88] Ibid., 176.

careful research and development, the U.S. Navy had the resources and the materials to build its modernized fleet, all it needed next was more congressional support.

CHAPTER 5

LUCE AND MAHAN: NAVAL LOBBYISTS

By 1884, the U.S. Navy had taken its first steps towards modernization with the construction of the ABCD cruisers, but great strides still needed to be made in the development of naval professionalization and strategy. The two preeminent naval officers who made the greatest strides in lobbying political support for naval reform were Rear-Admiral Stephen B. Luce and Captain Alfred Thayer Mahan. Over the course of two decades, Luce devised and implemented significant changes to naval education with the creation of the Naval War College in 1884. The Naval War College provided naval officers with advanced training in fleet tactics and grand strategy, including general fleet engagement. Mahan utilized his time serving with academic institutions, such as the U.S. Naval Institute and the Naval War College, to work on publishing his influential books on sea power. Mahan used his works on sea power to promote his political agenda, which was the increase of American sea power through a large navy. Adept in the art of public relations, Luce and Mahan garnered the support of the American public and American politicians, which helped the navy expand throughout the 1890s.

Then-Captain Luce first proposed the idea of advanced training and naval reform while serving as commander of the screw sloop-of-war USS *Hartford* from 1875 to 1877. In 1877, Luce wrote to Secretary of the Navy R.W. Thompson to petition for what would later become the Naval War College. Luce argued that "the introduction of steam and the telegraph … renders it absolutely necessary that to be a successful naval captain of the

present day an officer must be a strategist as well as a tactician."[89] He worried that the navy lacked the resources to enable junior officers to learn advanced concepts of warfighting in an age of expanding naval technology. Luce lobbied for advanced courses in subjects ranging from gunnery, naval tactics and strategy, and advanced ship handling. He contended that a lack of naval professionalization plagued navies across the world and that the United States could gain a significant tactical and strategic advantage if they prepared its officer corps with a "post graduate" course on advanced warfare.[90]

Captain Luce first attempted to implement his ideas of naval reform while serving as the commander of various training positions from 1877 to1883. In 1884, the newly promoted Commodore Luce assumed command of the North Atlantic Squadron, and he used his authority to further his goal of advancing naval professionalism. Luce coupled operational exercises with classroom instruction while he commanded the North Atlantic Squadron.[91] Luce routinely drilled his sailors in exercises designed to prepare them as a combat unit capable of meeting an enemy in a general fleet engagement.

Throughout Luce's tenure with the North Atlantic Squadron, he continued to petition Congress for authorization for a naval war college. After writing several letters similar to the one he addressed to Thompson and delivering related speeches at the Naval Academy, Luce managed to gain the congressional attention he had been seeking. In 1884, Secretary of the Navy Chandler assembled a board tasked with the reporting on the

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[89] Albert Gleaves, *Life and Letters of Rear Admiral Stephen B. Luce U.S. Navy, Founder of the Naval War College* (New York: Putnam's Sons, 1925), 169.

[90] Ibid., 171.

[91] Rentfrow, *Home Squadron,* 39.

consideration of a post-graduate course for naval officers and assigned Luce to be the president. The report insisted on the need for such a school in order to further train the naval officer corps, its course of instruction and potential location.[92] A duly impressed Congress approved the creation of the Naval War College based on the report of Luce's board.[93] On October 6, 1884, the Navy Department issued General Order No. 325, which established the Naval War College at Newport, Rhode Island.[94]

Having used the North Atlantic Squadron as a trial run for his advanced training methods, Luce assumed the duties as the first president of the Naval War College. Early classes at the new school included Naval Tactics, Naval Gunnery, Military Tactics and Strategy, and Sea Coast Defense, and Maritime Defense.[95] Luce also collected a staff of notable naval reformers, such as Commander C.F. Goodrich and Captain Alfred Thayer Mahan, both of whom had been heavily involved in the U.S. Naval Institute and had contributed to *Papers and Proceedings*. In 1886, Luce received orders to return to sea duty, which led to the appointment of Mahan as the second president of the Naval War College.

One could argue that Mahan was destined to become a renowned military theorist and scholar. Born in September 1840, his father was Dennis Hart Mahan, an army officer and professor of mathematics and engineering at the United States Military Academy at West Point. Dennis was also a brilliant tactician and published several pamphlets on

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[92] Gleaves, *Letters of Stephen B. Luce*, 175.

[93] Rentfrow, *Home Squadron*, 53.

[94] Gleaves, *Letters of Stephen B. Luce*, 176.

[95] Ibid., 181.

field fortifications, attack and defense, and grand strategy.[96] Infatuated by sea stories read as a child, young Alfred sought and attained an appointment to the U.S. Naval Academy in 1856. Over the next three years, Mahan worked tirelessly to hold himself and his classmates to a high standard of discipline and conduct, a principle he would continue to maintain throughout his naval career. Mahan graduated in the summer of 1859 and after serving as a passed midshipman on the USS *Congress*, he received his commission as a lieutenant in 1861. Mahan served in the Union Navy during the Civil War, operating under the command of Luce and Dahlgren.[97] While Luce and Mahan served together, they developed a strong mutual respect. Mahan was the first officer Luce requested to join the faculty of the Naval War College, and Mahan credited Luce as a source of inspiration for many of his works.

After the Civil War, Mahan completed naval tours on the Asiatic station, Montevideo, and in Europe. By 1876, he found himself subjected to the ongoing naval cutbacks and was placed on furlough. It was during this time that Mahan concentrated his efforts on writing. When *Papers and Proceedings* offered a prize for the best essay on "Naval Education for Officers and Men" in 1878, Mahan, who was vice-president of the Naval Institute at the time, seized the chance to have his say on the subject.[98]

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[96] W.D. Puleston, *The Life and Work of Captain Alfred Thayer Mahan, U.S.N.* (New Haven: Yale University Press, 1939), 6.

[97] Ibid., 35, 39.

[98] Ibid., 57.

Mahan's paper received third place and honorable mention, which further motivated him to seek naval reform.[99]

In the aforementioned essay, Mahan called for reform of not only the Naval Academy's curriculum, but of its entrance standards as well. He sought to shake up what historian Peter Karsten called the "naval aristocracy" by recommending the acceptance of applicants from all social classes. According to Puleston, Mahan "did not wish to exclude boys with more native ability simply because they had been denied educational advantages in their youth, believing that the younger they entered, the easier it would be to mold their character."[100] As head of the Navy's Department of Ordnance, Mahan also argued that discipline and drills with the most advanced guns, coupled with seamanship (which was his own weakness) were paramount for the future success of the officer corps. The concepts of strict training and discipline outlined in his paper formed the cornerstone of the professionalization of the navy that was instrumental in its future modernization.[101]

On Mahan's subsequent tour of duty in South America, he continued to refine his ideas of sea power and what the U.S. Navy needed in order to be successful. He argued that the best way to maintain peace was to occupy a position of strength as a means of threat deterrence.[102] Mahan emphasized the necessity of a large and first-class steel navy

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[99] Ibid.

[100] Puleston, *Captain Alfred Thayer Mahan, 57.*; Karsten, *Naval Aristocracy*, 37-39.

[101] Puleston, *Captain Alfred Thayer Mahan*, 59.

[102] Ibid., 72.

capable of maintaining a global presence like that of Great Britain.[103] Despite the unpopularity of such expansionist beliefs in the reactionary navy of the 1870s, Mahan continued to defy the naval traditionalists and lobbied for modernization.

Throughout the late 1870s, Mahan pushed modernization. He conducted his own analyses of U.S. warships compared to those of foreign navies and found the former grossly outmatched. Mahan blamed the poor state of the navy on politicians who did nothing to address the deterioration of American ships.[104] Disgusted by the navy's decay, Mahan's dedication to duty and perseverance led him away from sea duty and onto the faculty of the Naval War College.

After, Mahan succeeded Luce as the president of the Naval War College, he balanced his academic duties with writing his first book, *The Influence of Sea Power Upon History, 1660-1783,* which he published in 1890. Mahan drew much of the inspiration for his writings from Antoine-Henri Jomini, a Swiss-born military officer and writer, who served in the French Army from 1805 to 1814 and the Russian Army from 1823 to 1829. Jomini's books, *History of the Campaigns of the Revolution and Empire* and *The Summary of the Art of War,* served as the foundations for Mahan's own works.[105] Mahan's writings and his lectures at the Naval War College so closely resembled Jomini's maxims that he was often referred to as the "naval Jomini" by his colleagues.[106]

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[103] A.T. Mahan, *The Influence of Sea Power Upon History* (Boston: Little, Brown an Company, 1918), 541.

[104] Puleston, *Captain Alfred Thayer Mahan*, 72.

[105] Ibid., 79.

[106] Ibid., 83.

Mahan's *The Influence of Sea Power Upon History, 1660-1783* emphasized the mutual relationship between maritime interest and a nation's power. To dominate the seas meant to consolidate power, and the only way to do so was with a strong and well-trained navy. He broke down the elements of sea power into six categories: geographical position, physical conformation, extent of territory, population, national character, and government character.[107] Mahan used historical case-studies, most of them from Europe's past, as a guide for how the U.S. might obtain sea power. He provided not only detailed accounts of battles, but also analyzed the underlying causes of various wars. Mahan argued that the struggle for power was unceasing and that neither peace nor war would end it.

Mahan also used his book to warn his fellow naval officers of the folly of failing to adapt quickly to changes in military technology. In his introduction, he quoted the eighteenth-century French historian, Sébastien Bigot de Morogues: "Naval tactics are based upon conditions, the chief causes of which, namely arms, may change; which, in turn causes necessarily a change in the manner of handling them, and so finally in the disposition and handling of fleets."[108] His use of historical examples of adapting to new technology served not only as a plea to his fellow officers to accept change, but also as a critique of the current government's failure to understand the importance of naval modernization as it related to national security.

Mahan pointed to French intervention in the American Revolution to demonstrate how the lack of a proper navy forced the Continentals to rely on the French Navy for

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[107] Mahan, *Influence of Sea Power*, 29, 35, 42, 44, 50, 58.

[108] Ibid., 1.

support. According to Puleston, Mahan sought to "remind his countrymen that their independence was due to the temporary command of the sea by a French Fleet."[109] Mahan appealed to the American people's sense of patriotism by using examples of the American Revolution and maritime enterprise. This made his book popular with the American public and not just the American military. By doing so, he aimed to draw national attention to the navy's current shortcomings and potential for greatness.

The Influence of Sea Power Upon History, 1660-1783 met with international acclaim despite lacking an original thesis. According to historian Jon Tetsuro Sumida, the importance of sea power was recognized throughout history. He argued that Mahan's book owed its success to external factors in play at the time of the book's publication. Such factors included expanding public interest in the rapid advance in naval technology, economics, and international relations.[110]

Mahan's easy-to-follow explanations of naval engagements and concepts of sea power made his book a popular read for both civilians and military professionals alike. Although initially embraced by European nations, such as Great Britain, Mahan's book quickly found its intended target audience in the United States. In 1892, Mahan published a second book, *The Influence of Sea Power Upon the French Revolution and Empire, 1793–1812*, in which he expanded upon his previous volume by detailing the importance of maritime economics in times of war.

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[109] W.D. Puleston, *Life and Work of Captain Alfred Thayer Mahan*, 103.

[110] Sumida, Jon T, *Inventing Grand Strategy and Teaching Command: The Classic Works of Alfred Thayer Mahan Reconsidered* (Baltimore, MD: Johns Hopkins University Press, 1997), 2.

Taken together, Mahan and Luce's efforts served as valuable propaganda for the modernization of the U.S. Fleet because they increased national awareness for the importance of an effective navy. Karsten contended that "the concept of sea power … proved to be an effective ideological weapon," which helped to break up the congressional log-jam.[111] Mounting national attention put pressure on Congress, and that eventually led to an increase in naval appropriations throughout the late 1880s and early 1890s. Naval reform lobbyists found a powerful ally in Secretary of the Navy Benjamin F. Tracy. Tracy, who held office from 1889 to 1893, dedicated himself to realizing the reformers' dream of a modernized U.S. Navy capable of competing with first-rate fleets such as Great Britain.[112]

[111] Peter Karsten, *The Naval Aristocracy*, 353.

[112] Kenneth J. Hagan, *A People's Navy*, 194.

CHAPTER 6

CONCLUSION

According to Kenneth Hagan, "the United States Navy, with no more than forty-four ships in service or under construction, stood twelfth among the naval powers," by 1890.[113] Secretary Tracy and his supporters in Congress lobbied for the construction of armored warships, including battleships designed for both offensive and defensive operations. In June 1890, Congress authorized appropriations for the construction of three battleships, one protected cruiser, a torpedo cruiser, and one light torpedo boat. The new *Indiana*-class battleships including the *Indiana*, *Massachusetts*, and *Oregon*, displaced more than 10,000 tons and boasted main batteries of four 13-inch and eight 8-inch rifled and breech-loading cannons mounted on state-of-the-art rotating turrets.[114]

In reference to advances in armament aboard the new warships, P.R Alger stated that "as a rough estimate, I should say the mean error of one of our large guns, measured on a vertical plane, is about one yard at a range of 2000 yards."[115] The weapons systems the new ships also utilized such cutting-edge technology as electric firing primers, telescopic sights, and rangefinders originally invented by Fiske, which increased their accuracy and reliability. The guns also possessed faster firing rates. Alger calculated

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[113] Ibid., 195.

[114] Ibid., 197.

[115] P.R. Alger, "Improvements in Ordnance and Armor in the Recent Past and Future," *Papers and Proceedings of the United States Naval Institute* Vol. 23/1/81 (January 1897), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1897-01/improvements-ordnance-and-armor-recent-past-and-future.

that "the rate of fire is once every five minutes for the 13-inch, once every two minutes for the 8-inch, three times a minute for the 5-inch, and four times a minute for the smaller rapid-fire guns."[116] In addition to the finest weapons, the new ships came equipped with the latest in armor technology. Indiana-class battleships also featured a state-of-the-art armor system that utilized layering steel, wood, and rubber on top of each other to provide protection. Although the hulls of the new battleships were steel, naval engineers and scientists realized that placing a moderate layer of wood behind the steel armor would help absorb and displace the impact of an enemy round. Rubber was added around the rivets and fittings in order to create a water-tight seal.

Throughout the early 1890s, Republicans controlled both houses of Congress and were keen on naval expansion. Tracy and his fellow Republicans embraced the idea of a strong navy as a means of realizing their aspirations for American imperialism. According to Hagan "they cited the need for coaling stations as their immediate motive for advocating overseas expansion."[117] The growing presence of European power as well as newly developed Japan, put additional pressure on Congress to build more capital warships as a means of exerting their control over the Hawaiian Islands and the Caribbean.

Between 1890 and 1895, Congress authorized the construction of six battleships in addition to several armored cruisers already in production. The former included the

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[116] P.R. Alger, "Armor for Ships of War," *Papers and Proceedings of the United States Naval Institute* Vol. 21/4/76 (October 1895), Accessed April 1, 2018, https://www.usni.org/magazines/proceedings/1895-10/armor-ships-war.

[117] Hagan, *A People's Navy*, 201.

Texas, *Maine*, and *Olympia*.[118] Thus, as Hagan put it, "in 1887, for the first time in American history, the battleship sat at the core of the United States Navy."[119] U.S. naval professionals had finally made progress towards reaching their goal of 30 modernized ships by the turn of the twentieth-century. After 33 years of struggle, research, development, and lobbying, the modernized U.S. Fleet was born.

U.S. naval officers, including line officers, engineers, and scientists, stood at the forefront of the U.S. Navy's modernization process from 1865 to 1898. Naval reformers initially faced stiff opposition from traditional line officers, such as David Dixon Porter, who derailed progressive projects such as *Wampanoag* and the career of Benjamin Isherwood. Analysis of the historiography indicates the traditionalists' reluctance to change technology and tactics hampered naval development for more than a decade after the Civil War. An obsession with cost-saving and the lack of a perceived foreign threat caused Congress to conclude that there was no need for the U.S. Navy to undergo a massive upgrade.

Such negative attitudes towards naval modernization in the early post-antebellum period contributed to the embarrassing performance of the U.S. Fleet during the Key West exercises. The Key West exercises served as a catalyst for the modernization of the fleet to maintain national security and pride. This fiasco also contributed to the acceptance of the U.S. Naval Institute, whose quarterly *Papers and Proceedings* gave naval officers of all ranks a platform in which to voice their ideas on how to improve the naval profession and modernize the fleet.

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[118] Karsten, *The Naval Aristocracy,* 354.

[119] Hagan, *A People's Navy*, 209.

An analysis of the *Papers and Proceedings of the United States Naval Institute* indicates the tremendous influence U.S. naval officers of all ranks had on the modernization process. Although the reform movement involved officers of all ranks and backgrounds, several individuals stand out as leaders of the movement. Officers, such as Benjamin Franklin Isherwood, Captain Alfred Thayer Mahan, Admiral Robert W. Schufeldt, and Admiral Stephen B. Luce helped guide the reform movement by advocating technological change and professionalization. These officers also helped extricate the navy from the antiquated naval strategy of commerce raiding and move it towards more conventional fleet-versus-fleet tactics. The acceptance of a new naval strategy also dictated change in the makeup of the U.S. Fleet, making the construction of new and more technologically advanced warships a possibility.

In the mid-1870s, new warships such as the ABCD cruisers bridged the gap between the old sail-powered ships and the new all-steel steamships of the future. As time progressed, the U.S. Navy continued to rely on its officer corps to provide suggestions and advanced technology to improve future classes of warships such as the armored cruiser *Olympia,* and the *Indiana* and *Iowa* class battleships. Naval theorists such as Luce and Mahan also used the new congressional appropriations to realize their dreams of creating a more professionalized naval force with the development of the Naval War College and the publication of Mahan's books, *The Influence of Sea Power Upon History, 1660-1783*, *History of the Campaigns of the Revolution and Empire* and *The Summary of the Art of War*.

By the outbreak of the Spanish-American War in 1898, the U.S. Navy boasted a fleet of more than 30 modernized all-steel, steam-powered warships. According to Jim

Leeke, "the United States Navy had then quietly molded for twenty years. But in doing so, it had also avoided the missteps and tragedies that haunt any era of rapid technological change."[120] Careful planning and experimentation, coupled with the advanced professionalization of the U.S. Naval Officer Corps, as evinced in *Papers and Proceedings*, enabled the U.S. Fleet to rise from an antiquated coastal defense force to a modernized power capable of defeating a European colonial power.

[120] Leeke, *Manila and Santiago*, 46.

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