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Review of "Torpedo: Inventing the Military-Industrial Complex in the United States and Great Britain"

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Abstract
On 26 March 2010, a sudden explosion rocked the South Korean warship Cheonan, breaking the vessel in two and causing the death of 46 sailors. Analysis by an international team of experts concluded the disaster resulted from an external underwater explosion generated by a torpedo manufactured in North Korea.1 Although the North Korean government denied involvement, many experts in undersea warfare believe a North Korean midget submarine likely launched the fatal blow that sent Cheonan to the bottom of the Yellow Sea.

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Contents

- Introduction by Jon Sumida, University of Maryland, College Park .................................................. 2
- Review by Jeffrey A. Engel, Southern Methodist University ................................................................. 5
- Review by Keith Neilson, Emeritus, Royal Military College of Canada ........................................... 9
- Review by Timothy S. Wolters, Iowa State University .............................................................................. 12
- Author’s Response by Katherine C. Epstein ........................................................................................... 17
On 26 March 2010, a sudden explosion rocked the South Korean warship *Cheonan*, breaking the vessel in two and causing the death of 46 sailors. Analysis by an international team of experts concluded the disaster resulted from an external underwater explosion generated by a torpedo manufactured in North Korea.\(^1\) Although the North Korean government denied involvement, many experts in undersea warfare believe a North Korean midget submarine likely launched the fatal blow that sent *Cheonan* to the bottom of the Yellow Sea.

The *Cheonan* tragedy seems to confirm several popular conceptions about the torpedo; conceptions rooted both in public memory and much of the historical discourse on this notorious weapon of war. The first revolves around the connection between the torpedo and the submarine, a link cemented into public consciousness a century ago by the sinking of *Lusitania*. A second popular conception reinforced by the *Cheonan* incident is the idea that the torpedo is a weapon of the weak. Lacking the industrial infrastructure or trading partners to build and operate a modern navy, North Korea has invested heavily in mines and torpedoes, the archetypal weapons of asymmetric naval warfare.\(^2\) Finally, discussions of the *Cheonan* disaster show that many observers are willing to place the torpedo inside a ‘black box,’ viewing the weapon as an artifact whose functions can be understood without an analysis of its internal workings.\(^3\)

In *Torpedo*, a well-conceived and impressively researched monograph, Katherine Epstein blows a hole in these and other misconceptions surrounding the early development of the self-propelled torpedo.\(^4\) She begins her story in the late 1860s with torpedo pioneer


\(^4\) Only in the latter nineteenth century did military personnel begin to make a distinction between stationary torpedoes (which came to be known as mines) and self-propelled, or automobile, torpedoes. Timothy S. Wolters, “Electric Torpedoes in the Confederacy: Reconciling Conflicting Histories,” *Journal of Military History* 72, no. 3 (July 2008), 755-783.
Robert Whitehead and follows events through the eve of the Great War. Concentrating on developments from 1894 to 1914, Epstein uses previously untapped archival sources to explore the history of the torpedo in both Great Britain and the United States. The reader learns that in these two nations the submarine had little to do with early torpedo development and gains a deep appreciation for the political, fiscal, technical, and legal complexities faced by policymakers. Epstein convincingly shows that most policies related to torpedoes were “an accretion of day-to-day problem solving, sometimes but not always with sensitivity to long-term consequences, and rarely committed to documents with titles revealing their significance” (215).

Epstein organizes *Torpedo* into three chapter pairs, bookended by an introduction and a conclusion. Each pair offers a comparative look at various aspects of American and British torpedo development. Chapters one and two explore the problems faced by leaders in both countries as they worked to turn the torpedo into an effective instrument of war. For the United States Navy these efforts revolved largely around the development of an indigenously manufactured torpedo, while for the British Royal Navy this meant working closely with the Whitehead Company. Both institutions struggled with the issue of horizontal guidance until Whitehead acquired the rights to the Obry gyroscope in 1896. The Obry gyroscope offered the potential for accurate torpedo runs out to 2,000 meters (22), but adoption of the device was far from straightforward in either nation. Epstein skillfully covers the internal debates and external negotiations that frustrated both navies as they sought to acquire a gyroscope that could dramatically improve torpedo performance.

Epstein’s third and fourth chapters examine events from 1903 to 1908. In a nutshell, she argues that the Royal Navy was more successful than the U.S. Navy in developing and acquiring torpedoes during these years. For Epstein, the U.S. Navy’s relative weakness in research and development meant that it had to pursue novel ideas in hopes of achieving a major technical breakthrough. The United States thus pursued an unproven turbine engine and had to deal with a supply crisis “so serious that vessels were forced to sail for foreign stations without torpedoes,” eventually forcing naval leaders to admit “the US bid for independence from the foreign Whitehead torpedo had failed” (85).

The book’s final chapter pair looks at the five years preceding the outbreak of the Great War. Once again Epstein is critical of the U.S. Navy, writing that its Bureau of Ordnance, “suffered the consequences of its earlier errors,” and then “repeated them” (133). For its part, the Royal Navy had developed torpedoes of “impressive speed and range,” but ones still bedeviled by “poor direction keeping and poor depth keeping” (184). By 1914, then, the torpedo was not the ship killer it eventually would become, but for nearly two decades it had been good enough to create major tactical and strategic problems. Epstein also gives considerable attention to several legal cases that demonstrate how the torpedo

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represented a new type of invention, one where the distinctions between public and private, collaboration and competition, and employer and employee had all become highly blurred.

Epstein puts forward three key arguments in *Torpedo*, one centered on the relationship between automobile torpedoes and naval power, another that addresses technological change and the nature of innovation, and a third that examines shifting legal norms for intellectual property. All three relate to the book’s framing concept, which is the notion that the origins of the military-industrial complex should be placed before the turn of the twentieth century rather than in the middle of it. Epstein borrows heavily from the historian William McNeill, who a generation ago posited that over the three decades running from 1884 to 1914 industrial weapons systems became so complex and expensive that even the biggest firms needed to mitigate their research and development risks. For Epstein, the torpedo was a weapon developed through extensive (and in many ways, unprecedented) public-private collaboration and therefore exemplifies what McNeill labeled “command technology.”

The first of Epstein’s arguments is that torpedoes did not represent asymmetric anomalies to Mahanian notions of sea power, or as she puts the matter, “torpedoes were adjuncts to, not anomalies within, the capital-ship paradigm” (217). Epstein’s ability to unpack the black box of torpedo development by analyzing technical Admiralty records shows that the Royal Navy embraced the new weapon even as its leaders camouflaged “their real views about the morality as well as the power of torpedoes,” and lends much credence to her claim that many historians “have proven gullible” in accepting public pronouncements stigmatizing torpedoes as illegitimate weapons of the weak (218). The U.S. Navy also embraced the torpedo, although never as heartily as the Royal Navy. Partly for this reason, the British torpedo program was affected less by fluctuating defense budgets than was its American counterpart.

A second argument made by Epstein is that the early history of the self-propelled torpedo in Britain and the United States highlights the role of material resources in shaping both the course and pace of technological development. In comparing its torpedoes to those of the Royal Navy (and presumably to those of other navies as well), the U.S. Navy found itself somewhat lacking. To compensate for the Royal Navy’s relative superiority in research and

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development, the U.S. Navy sought a comparative advantage in its theoretical design work. Yet, because much of the basic science behind torpedo development was not fully understood, the existence of adequate resources to engage in systematic, trial-and-error experimentation was crucial. According to Epstein, the United States experienced major difficulties because torpedo technology evolved more through empirical processes than through science-based innovation. Efforts to develop torpedoes “through bold leaps in design” via “the drafting room rather than the testing range” were unlikely to succeed, so the Americans were “unable to look before they leapt” and “paid for their poverty with a troublesome turbine and corresponding delay in superheater development” (221).

Epstein’s third big argument is that command technology rendered obsolete the contract terms, patent procedures, accounting methods, and pricing assumptions of a procurement paradigm centered on the government’s purchase of finished military products from the private sector. A new model arose in which governments and commercial firms shared in the costs of research and development, but such collaboration raised fundamental questions about the nature of intellectual property as it related to new technology. In both Britain and the United States, the torpedo lay at the heart of such questions. Epstein looks at a series of legal cases that established the property rights to torpedo technologies jointly developed, ultimately concluding that “the governments won” (15). The comparative aspect of her work is especially valuable here, as Epstein shows how the British government used its authority to grant secret patents and the Official Secrets Act of 1889 to sidestep “the worst legal headaches of torpedo command technology” (226). Government victory took longer in the United States, which meant the Navy’s Bureau of Ordnance frequently found itself embroiled in legal battles that slowed torpedo development.

For all of Torpedo’s strengths, and there are many, this reviewer has one minor quibble and one major question. The quibble stems from Epstein’s decision to introduce a fascinating new concept, that of “servant technology” (15), and then bury her most thorough discussion of the idea in the middle of chapter three. For historians of technology, Epstein’s argument that torpedo development led to a new class of technology – one dedicated to generating the information needed to improve more sophisticated command technologies – will be intriguing, as will her suggestion that “the information generated by servant technology was a commodity unto itself. Indeed, it amounted to a distinctive type of property” (75).

The question is historiographical. Where are the French? Given the wide differences between the continental legal system of France and the common-law legal system shared by Great Britain and the United States, one would not necessarily expect to see the French in Epstein’s analysis of intellectual property rights. Yet her exploration of the role played

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by torpedoes in the evolution of naval tactics, a subject discussed in all six chapters, is an entirely different matter. For many military historians the topic of late-nineteenth century torpedoes will bring to mind the jeune école, an influential group of French naval thinkers who advocated distributing some of the capital ship’s capabilities among smaller vessels. The automobile torpedo was an indispensable element of the jeune école’s theories from the 1880s onward, and the improved operational performance of submarines around the turn of the century allowed for some widely publicized submarine-launched torpedo firings during French naval exercises. The point here is not to criticize Epstein for failing to conduct research in the archival records of France’s Ministry of the Marine, something seemingly beyond the scope of her study, but rather to point out that the absence of the French leaves a sizeable gap deserving of further investigation.

To be clear, Torpedo is an important monograph deserving of a wide readership. The book draws from a deep base of archival sources, and Epstein adeptly navigates the intersections of several historical sub-disciplines, including military and naval history, business history, legal history, and the history of science and technology. Technical details about torpedoes, their component parts, naval tactics, and government contracts abound, but the information presented is seldom superfluous and enables Epstein to provide a window into the past that sheds light on issues of the present.

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11 In contrast to France, Epstein spells out her reasons for not examining torpedo development in Germany (16-17). One wishes she had put forward a similar explanation, however brief, for her decision not to discuss the jeune école.