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Katherine C. Epstein, *Torpedo: Inventing the Military-Industrial Complex in the United States and Great Britain*. Cambridge: Harvard Univ. Press, 2014. Pp. 305. ISBN 978-0-674-72526-3.

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In 1961, President Dwight D. Eisenhower, in his Farewell Address, warned Americans of the baleful potential of “the military-industrial complex.”¹ He and his speechwriters were probably thinking of companies like General Dynamics, which made supersonic fighters and nuclear submarines, and Boeing, reputed to have its own senator, Henry “Scoop” Jackson. He almost certainly believed it to be a product of the Cold War. Katherine Epstein (Rutgers Univ.) claims in *Torpedo* that the complex originated eighty years earlier, when a handful of private firms competed with government factories in the United States and Great Britain to create the first effective torpedoes.

Epstein argues that the technology of torpedoes, among the most complex weapons in use in 1900, was evolving so quickly that the British and American governments were forced to invest, for the first time, in corporate research and development. This created a nexus of shared interests: because gyroscopes, turbine engines, superheaters, and depth-keeping devices were all being incorporated into torpedoes simultaneously, manufacturers could not afford the R&D needed to stay at the cutting edge; government torpedo factories, for their part, lacked the engineers who could invent and perfect such machinery.

Epstein begins with an introduction describing how torpedoes were first created in the late 1860s and the state of the technology that went into them by the 1890s. She then situates her argument intellectually:

My book draws out three implications of McNeill’s thesis.² First, command technology put a premium on the development of a kind of technology—which I will call servant technology—that could generate information needed to improve command technology. Second, the information generated by servant technology was itself a commodity because it had the power to affect market relationships by offering insight into the value of command technology. This commodified information was a distinctive kind of property. Third, the collaboration between the public and private sectors required to develop command technology raised fundamental and complex questions about the nature of property in relation to invention. When more than one party helped to invent a piece of technology, how could ownership of the intellectual property rights be established? (15)

As we see in this passage, Epstein is concerned with the intersection of military, technological, and legal history and uses the language of the social sciences—including a certain amount of jargon—in presenting her ideas.

There follow six chapters on the evolution of torpedo technology in the United States and Great Britain from roughly 1890 to the outbreak of the First World War in 1914. The US Navy at this point was both young and weak, with little experience as a blue-water force. It was playing catch-up with the Royal Navy, which was backed by the world’s dominant industrial plant. The British, however, needed to stay on top of torpedo technology, lest the new weapon render their huge fleet of battleships obsolete. Complicating matters for both navies, several private firms, led by the Whitehead company in Fiume (Austria-Hungary), were making torpedoes and selling them to all comers—eventually fourteen navies around the world.³

1. See “Guest Post: James Ledbetter on 50 Years of the ‘Military-Industrial Complex,’” *NY Times* (25 Jan 2011) – www.miwsr.com/rd/1413.htm.

2. William McNeill, in *The Pursuit of Power: Technology, Armed Force, and Society Since A.D. 1000* (Chicago: U Chicago Pr, 1982), maintained that late nineteenth-century governments began to “command” industry to develop new technologies that they could not afford to develop alone.

3. See, to start, *Wikipedia*, s.v. “Whitehead Torpedo.”

The technical advances of this period yielded rapid improvements in the speed and range of torpedoes. Because the earliest models were powered by a tank of compressed air that filled most of the torpedo, as air was released and pressure fell, the “fish” swam ever more slowly. One way to rectify this was the “superheater,” a burner fueled by alcohol or kerosene that heated the air and so kept the pressure up as the tank emptied. Several engineers who designed and patented superheaters demanded royalties if government or competitors’ factories utilized “their” devices. Some of the ensuing lawsuits over this issue went all the way to the US Supreme Court. Another innovation Epstein describes in some detail is the gyroscope, which kept torpedoes on course toward their targets over longer distances. She uses such material to advance the thesis stated in her introduction:

It was not mere coincidence that [US Navy Bureau of Ordnance official Joseph] Strauss looked to the private sector as a model for the type of experimental department he wanted to establish at the Torpedo Station. The late nineteenth and early twentieth century witnessed the birth of the private-sector industrial research lab. This new institution emerged partly in response to some of the same forces behind the emergence of McNeillian command technology. Much industrial technology was so sophisticated and expensive, and required such careful testing before it could be sent into large-scale production, that lone inventors increasingly lacked the resources to develop it by themselves. Just as private firms needed the help of governments in developing industrial weapons, so did some inventors need the help of firms in developing industrial technology. On the firms’ part, the creation of industrial research labs was in part an attempt to control and strengthen an otherwise unpredictable and unreliable inventive process. Relying solely on new ideas to bubble up from outsiders might have worked in a preindustrial age, when inventors could bring well-developed inventions to firms, but in the industrial era, firms had to “command” inventions from the top down and from within, in much the same way that governments came to “command” weapons technology from the private sector and to treat firms as quasi-state agents. Industrialization had changed the nature of invention, and it evoked similar responses from both the public and private sectors. (175–76)

Ultimately, British and American torpedoes became formidable weapons, able to cover thousands of yards at speeds over thirty knots. This led to new challenges, as Epstein observes: scoring hits at long range while both the attacking vessel and its target were in motion required the solving of multiple equations simultaneously—no easy task before the age of computers. The mere threat of such attacks forced navies to rethink their tactics. The Royal Navy’s well armored battleships, though able to outshoot any enemy afloat, were suddenly vulnerable to attacks by mere torpedo boats. Epstein enters here into the realm of the history of naval tactics, drawing on several important recent studies of just what the Royal Navy, in particular, was planning to do about torpedoes when the Great War came (4–5).⁴

Does Epstein succeed in showing that developments in torpedo technology around 1890 marked the beginnings of the military-industrial complex? She is well aware that establishing “firsts” is very difficult and that some historians prefer earlier dates, in one case even before the American Civil War. But she makes a convincing argument for the unique confluence of technological, legal, and commercial forces that made torpedo development more transformative than that of other naval weapons.

Torpedo will not appeal to students of military history interested in combat, for Epstein deliberately ends with the onset of World War I and never mentions performance in combat. Even readers primarily interested in the history of torpedoes generally may prefer a broader overview⁵ to Epstein’s restricted focus on two decades. In addition, she covers only certain aspects of torpedo design, omitting, for instance, the increasingly powerful warheads devised during her period of concentration. And, oddly, she is chiefly interested in torpedoes launched from surface ships, not from submarines. Almost all the ships sunk by torpedoes in World War I, of course, fell victim to submarines. At the Battle of Jutland, the only major naval

4. See Matthew S. Seligmann, *The Royal Navy and the German Threat, 1901–1914: Admiralty Plans to Protect British Trade in a War against Germany* (NY: Oxford U Pr, 2012), with my review at *MiWSR* 2013-064. See also Epstein’s helpful overview of the relevant scholarship in her introduction to *H-Diplo Roundtable Reviews* 15.18 (2014) 2–10 – www.miwsr.com/rd/1414.htm.

5. E.g., Thomas Wildenberg and Norman Polmar, *Ship Killer: A History of the American Torpedo* (Annapolis: Naval Inst Pr, 2010), with my review at *MiWSR* 2011-027.

clash of the war and the subject of much recent work, only three capital ships were hit by torpedoes and only one of those, the German pre-dreadnought *Pommern*, sank. Though the menace of torpedo attack—the obsession of most of the actors in Epstein’s book—greatly influenced German and British admirals, the weapon’s actual impact was small.

Readers fascinated by “big ideas” of the sort discussed by William McNeill and others⁶ will enjoy and learn from Katherine Epstein’s suggestive new book on the origins of the military-industrial complex.

6. E.g., David Edgerton, in *Britain’s War Machine: Weapons, Resources, and Experts in the Second World War* (NY: Oxford U Pr, 2011)—see Jeff Rutherford’s review at *MiWSR* 2012-001.