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Gary E. Weir. *Forged in War: The Naval-Industrial Complex and American Submarine Construction, 1940-1961.* Washington, D.C.: Naval Historical Center, 1993. 314 pp. $14.00 (cloth), ISBN 978-0-945274-15-5.

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For those of us born after World War II, it is hard to remember that the United States did not always have a military-industrial complex. I recall *Scientific American* in the late 1950s, thick with ads–for Hughes Aircraft, Sperry, Raytheon, Boeing, and, not least, the Electric Boat division of General Dynamics.

But, as Gary Weir reminds us in *Forged in War*, very little of what he calls "the naval-industrial complex" existed in 1940, when the war was already on in Europe, and the United States Navy began building the submarines that would fight World War II. The American submarines of World War I and the 1920s had not been impressive vessels, and one of the two private yards–Lake Torpedo Boat Company–that had made subs for the Navy during World War I had folded in 1924 for lack of orders. Fortunately, the Electric Boat Company and the Portsmouth Naval Shipyard had developed the *Gato* class–the "fleet" submarines–that would turn out to be a key weapon in defeating Japan. The problem in 1940, when Weir begins his story, was building enough subs, and after Pearl Harbor the Navy's Bureau of Ships, or BUSHIPS, was under tremendous pressure to increase production.

The Navy's problem was not easy: it needed to increase production just when skilled labor was in short supply, and only a handful of yards could possibly make such specialized ships. Some components that went into submarines were problems, too: there were never enough of the big batteries that powered subs underwater, and only one company–Kollmorgen Optical–could make periscopes. In addition, although the fleet submarine proved to be an admirable design, a constant stream of intelligence about such German innovations as electric torpedoes put pressure on the Navy to improve its own submarine technology.

Weir tells the story of the Navy's success by combining a chronological approach with chapters that focus on issues. He starts with the companies involved in the expansion program beginning in 1940 and shows how Washington balanced the need to keep private builders in business with the Navy's desires to concentrate on its own submarine-building yards in Portsmouth and Mare Island. Some of the most interesting material here deals with industry and government worrying about peace amid war: with bitter memories of 1918, both Franklin Roosevelt's administration and Electric Boat were concerned with over-investing in facilities that would soon be unwanted. I was surprised to learn that the War Production Board *finished* its first study of demobilization of war industries in June 1943.

Electric Boat (EB) was especially worried. With government money, it had built a whole new submarine facility–the Victory Yard–in Connecticut that would be surplus when war orders stopped. The Navy, remembering how difficult and expensive it had been to scale up production in 1941, wanted to mothball the Victory Yard with EB's help. Pressure from Connecticut politicians who feared unemployment in the cities around the yards and from EB itself forced the government to sell the Victory Yard to Pfizer pharmaceuticals soon after the war ended.

To the surprise of EB officials, the end of the war did not mean an end to work. EB and Navy yards were both soon busy modernizing subs in the GUPPY program, and building new boats, too. The discovery of the superior underwater performance of the German Type XXI and XXVI U-boats–and the realization that the USSR had captured this same technology–meant that existing fleet subs were suddenly obsolete. Scientists in and out of uniform went to work adapting to new standards.

These scientists form the other pillar of Weir's naval-industrial complex. During World War II oceanographers developed a submarine bathythermograph that helped submariners hide under layers of cold water that reflected sonar pings. By 1945 dozens of physicists and other experts had worked for the submarine program. Some of them stayed after the war to examine German technology, while others began work on nuclear propulsion, which would be the key to our Cold War submarine force.

Forged in War takes the story of Electric Boat (now a part of General Dynamics, and the only private player) and the Navy through the success of the Polaris program. The Navy's submarines had transformed themselves from part of the fleet to the most reliable component of America's nuclear arsenal.

Weir's previous book was *Building American Submarines, 1914-1940* (1991), and he knows design and technology well. Perhaps the best section is on the *Nautilus*, the first nuclear sub, which was not just "noisy," meaning easy for destroyers to locate, but was initially so plagued by vibration that at any speed over 8 knots officers had to shout orders, and listening devices were useless. The Navy's current attack submarines may "run silent, run deep," but this has been a result of learning from mistakes.

Unfortunately, Weir steers so clear of controversy that his book ends up being painfully bland. President Dwight Eisenhower, not a politician who sought controversy, left office warning the nation about the dangers of "the military-industrial complex." A handful of corporations, thanks to the Cold War, grew into immensely profitable giants dominating the politics and economies of such regions as Connecticut, Southern California, and New Orleans. The fact that there is a *USS Carl Vinson* is no accident; some consider it an outrage. But Weir deals with excessive profits only in the 1940s, when, for example, wartime laws forced EB to swallow $160,000 in costs on the *Trigger* project. "This type of problem did not disappear until the company became involved in the nuclear submarine program and national priorities led to increased funding and more careful accounting on both sides," Weir comments. This strikes me as completely inadequate for a book with such a highly charged title.

Weir is similarly muted when it comes to Admiral Hyman Rickover, the "father of the nuclear submarine," and a man both widely admired and widely hated. He makes it clear that Rickover was hard to work for, or with, but reports on this in such gray, bureaucratic language that the reader does not realize that the admiral was the Navy's most controversial postwar figure.