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Takashi Nishiyama, *Engineering War and Peace in Modern Japan, 1868–1964*. Baltimore: Johns Hopkins Univ. Press, 2014. Pp. xii, 264. ISBN 978–1–4214–1266–5.

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Nearly all modern consumers, especially of cars and electronics, know firsthand the high quality of Japanese engineering. After World War II up to the mid-1970s, however, most Japanese goods sent to the United States were poorly engineered, cheap knockoffs. Very few people, consumers or otherwise, know much about the nineteenth-century birth and early development of Japan's engineering establishment. Takashi Nishiyama (SUNY Brockport) has now cast needed light on that period in *Engineering War and Peace in Modern Japan*.[1]

The book consists of seven chapters arranged chronologically. Chapter 1[2] concerns the founding of schools to train native Japanese engineers. Chapters 2 and 3[3] examine Japanese post-World War I aeronautical engineering through the Second World War, including the use of kamikaze aircraft and its associated ethical questions. The fourth chapter[4] describes the elimination of military engineering in Japan after 1945 and the concomitant assimilation of former military engineers into civilian fields. The remaining three chapters[5] cover developments in postwar engineering up to 1964, highlighting the famous Japanese bullet train—the Shinkansen—a technological advance made possible by engineers who applied skills acquired during their wartime work to peaceful projects.

When Japan begin to industrialize after the Meiji Restoration, the leading industrial powers had a technological lead of almost two centuries. The Japanese government, Nishiyama writes, began by building an infrastructure for the education of engineers in the 1870s, with the aim of ending its dependence on imported western engineers. But Japan had failed to achieve that goal even six decades after establishing its first engineering school. Nishiyama reveals the incomplete synergies and systemic inefficiencies that plagued the Japanese in the 1930s and 1940s as they tried to create a large cadre of professional engineers while fighting a war for national survival.

For example, the author illustrates the damaging lack of coordination between naval and army aviation engineering establishments. Though presumably subordinate to some form of cabinet or government oversight, each service engaged in stealing the engineering talent of the other. This was extremely shortsighted and bespeaks an absence of competent higher-level planning to meet the requirements of modern warfare. Still worse, the army did not even use all its engineers *as engineers*, assigning many to other duties.

Another problem was the government's lack of critical oversight of engineering programs and its toleration of unrealistic designs. When engineers worked on the P1Y navy bomber (Allied codename "Frances"), its designer, Miki Tadanao, tried hard to "minimize the structural weight, frontal area, wing area, and the amount of equipment on board and to integrate all the components in the smallest" aircraft possible (56–57). However, at a time when mass production was essential, little effort was made to ensure that the bomber could be rapidly produced or even maintained once in service. The P1Y design team "had no idea that its creation would be produced later in a large quantity. Converting this experimental machine to a mass-producible, mass-serviceable one was a daunting task that seemed impossible at first, given the com-

1. The book is based on his 2005 Ohio State Univ. doctoral dissertation.

2. "Designing Engineering Education for War, 1868–1942."

3. Respectively, "Navy Engineers and the Air War, 1919–1942," and "Engineers for the Kamikaze Air War, 1943–1945."

4. "Integrating Wartime Experience in Postwar Japan, 1945–1952."

5. Respectively, "Former Military Engineers in the Postwar Japanese National Railways, 1945–1955," "Opposition Movements of Former Military Engineers in the Postwar Railway Industry, 1945–1957," and "Former Military Engineers and the Development of the Shinkansen, 1957–1964."

plicated mechanics of the aircraft" (70–71). Only about eleven hundred P1Ys were built, a remarkable failure of management and oversight in an important wartime program.

Nishiyama stresses that Japan lacked the time needed to create an integrated engineering and management culture to carry out higher level functions. The nation's accelerated efforts to train new engineers in the 1930s came too late. As a result, in the crisis year 1943, many of Japan's newly-minted engineers had only a basic undergraduate education. By 1944–45, the situation was even worse: formal educational programs had to be abridged, facilities were by now damaged or destroyed, and students were simply drafted into an army desperate for manpower, despite some attempts to safeguard them.

No matter how impressive their classroom performance, the raw, new engineers did not possess the necessary experience in practical engineering, teaching, or administrative functions to sustain and advance a national technology program; this shortcoming was not shared by Japan's principal wartime enemy, the United States. A mature and robust engineering culture required an existing industrial base, sufficient financial and human resources, adequate raw materials, and a spirit of innovation; Japan acquired these essentials only after the war.

In the immediate aftermath of the Pacific War, the Supreme Commander for the Allied Powers, Gen. Douglas MacArthur, banned Japanese naval and military engineering and all research and development for military applications. "According to one estimate, 100,000 engineers and technicians were jobless in the spring of 1946" (90). Stigmatized for their wartime service, engineers were forced to find jobs in other fields to support themselves and their families. "To make ends meet…, the chief designer of the Mitsubishi Zero Fighter, Horikoshi Jirō, worked on machinery and tools such as the lawnmower, thresher, and refrigerator.… [The] accumulated knowledge of aeronautics for war seemed painfully useless in peace-loving society" (91). One path unemployed engineers might follow led into the automobile manufacturing industry in firms like Toyota, Subaru, Nissan, and Mitsubishi. Some of them reached the upper management levels by the 1970s and 1980s.

Nishiyama also follows the "thousands of able military engineers" who joined the Japanese National Railways (JNR): "This development during the occupation (1945–1952) was a blessing in disguise for Japan. Only in these years did various engineering groups mingle with one another, setting the stage for the successful marriage between former military engineers and preexisting rail engineers for the postwar development of high-speed rail service" (105). Japan's railroads were in terrible shape after years of neglected maintenance and American bombing. Though the JNR needed the new engineers, the railroad engineering community did not welcome them with open arms. One new engineer was labeled a "'*kokuzoku*'—a traitor to the country" and many others were treated as "outsiders" (115).

Despite these snubs, eventually over two-thirds of JNR engineers had experience as military engineers. The benefits of employing them simply outweighed the initial tension that was created. Their particular experiences in solving problems of vibration, materials, communications, weight reduction, and production streamlining for aircraft development proved to be immediately applicable to railroad engineering as well.

Nishiyama describes at some length the research program launched by former aeronautical engineers in developing the Odakyū Romance Car SE Model 3000, a start-of-the-art high-speed train—"essentially a wingless airplane in design and construction" (124)—that broke the world speed record on 28 September 1957. Roughly "80 percent of the subsequent high-speed train development in the field stemmed from the Romance Car project" (150). This product of the application of military aeronautical engineering to railroading was the direct forerunner of the Shinkansen, the fruit of the imagination of Miki Tadanao, who had been the lead designer of the P1Y bomber:

> [his] experiences, ideas, and activities epitomized the railway industry's and, to an extent, Japan's conversion from wartime to peacetime. In a way, he exemplified the technological and psychological effects of defeat on Japan.… This former navy engineer with an unforgettable "sinful" past found consolation in creating a series of technologies that signified the importance of peacetime culture.… [H]is design[s] … affirmed his and the nation's commitment to peace. (155–56)

The book concludes with a discussion of the final phase (1957–64) of the integration of earlier postwar efforts into the larger rail system and the national economy, which culminated on 21 October 1964 with the inaugural run the Shinkansen bullet train from Tokyo to Osaka. The author discusses the success of engineers in answering the technical questions relating to the braking system, rail construction, traffic signaling, electromotive power transmission, and system operations, among other challenges. The train's emergency braking system was based on the air resistance brakes Miki had developed for his bombers during the war.

Takashi Nishiyama's study of the birth and evolution of military engineering in Japan and its later contributions to the civilian automobile industry and the development of a national high-speed rail system offers valuable insights into the problems a technologically unsophisticated society faced and overcame. For this fascinating story previously untold in English-language histories, *Engineering War and Peace in Modern Japan* should be read by anyone interested in a complex aspect of the Pacific War and its consequences.