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Michael J. Neufeld. *The Rocket and the Reich: Peenemuende and the Coming of the Ballistic Missile Era*. New York: The Free Press, 1995. xii + 368 pp. \$25.00 (cloth), ISBN 978-0-02-922895-1.

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This impressively researched narrative provides a significant addition to the extensive literature on the Peenemuende rocket development center and the A-4 (or V-2) rocket developed there. Existing accounts such as Frederick Ordway and Mitchell Sharp's *The Rocket Team*, Ordway and Ernst Stuhlinger's *Wernher von Braun*, and David Irving's *The Mare's Nest*, while still useful in many ways, are much more anecdotal. The same is true of memoirs by figures like Dieter Huzel and Walter Dornberger. Even the account by Heinz Dieter Hoelsken, *Die V-Waffen* is much broader in its coverage and does not provide the detail available in Neufeld's book. It stands alone in the literature for its thorough coverage, extensive research in archives on both sides of the Atlantic, and specific citations of sources for virtually every paragraph. Moreover, in many areas Neufeld provides completely new information and interpretations.

Following a prologue recounting Huzel's recollections from the summer of 1943, Neufeld offers chapters on "The Birth of the Missile"; "The Founding of Peenemuende"; "Breakthrough in Key Technologies"; "Peenemuende's Time of Troubles"; "Hitler Embraces the Rocket"; "Speer, Himmler, and Slave Labor"; "The Move Underground"; and "Rockets, Inc." An epilogue on "Peenemuende's Legacy" completes the book. Neufeld argues convincingly that under the leadership of Dornberger and Wernher von Braun, the Peenemuende organization achieved a working rocket by developing three key technologies: large liquid-propellant engines, supersonic aerodynamics, and guidance and control. He describes systematically how, under the brilliant leadership of Dr. Walter Thiel, the propulsion engineers developed improved injection, an 18-pot pre-chamber system, a spherical combustion chamber, a combination of

film and regenerative cooling, and a shorter nozzle than previously used. These developments made the unprecedentedly powerful 25-ton-thrust engine for the V-2 possible. Neufeld discusses in similar detail the work of Drs. Rudolf Hermann and Hermann Kurzweg plus other aerodynamicists in resolving problems with fin design, stability in the transonic region, heat transfer, and drag to ensure the rocket's stability in flight. The third technology Neufeld highlights, guidance and control, was the greatest problem. He provides a thorough account of the work under Dr. Ernst Steinhoff, who was "less brilliant than Thiel and Hermann" but a good manager and administrator. The topic is technologically complex, but Neufeld successfully presents to the general reader the development of gyroscopes, Helmut Hoelzer's mixing device, hydraulic vane servomotors, engine cutoff devices, and a guide beam. Together they were not precise enough to make the V-2 a fully effective weapon. Still, they served as prototypes for guidance and control systems in subsequent rockets and missiles.

Among the interpretations Neufeld presents is an emphasis on the importance of Dornberger's and von Braun's leadership in designing and developing the V-2, the significance of Dornberger's in-house concept for keeping development centered at Peenemuende, and the two leaders' success in achieving lavish funding and support for the project from Army Ordnance, the Army High Command, and the Nazi state. Neufeld also shows that there is little evidence to support previous arguments that development was significantly delayed by sometimes comparatively low priorities for materials and Hitler's initial reluctance to support the missile. The author also refutes earlier apologies by asserting that Dornberger was an enthusiastic supporter of Hitler, that he

and von Braun were both significantly involved with the employment of slave labor, and that chief production engineer Arthur Rudolph “was not just the manager of slave labor [by concentration camp inmates at the infamous *Mittelwerk* underground production facility for the V-2s] but also an advocate of it.” These claims by Neufeld will obviously trouble admirers of these men, and his interpretations may not be the only ones possible. Yet those who wish to contest these points will need to consult the documents he cites, some of them from German archives, before they can offer plausible rejoinders.

Neufeld concludes by noting the twin legacies of Peenemuende: On the one hand he notes that “the German Army rocket program was greatly influenced by—and integrated into—the structures and practices of the Nazi regime.” On the other, he states that the “A-4/V-2 was and is the grandfather of all modern guided missiles and space boosters,” and that it led both to positive achievements in space and the threat of nuclear destruction. Obviously, there can and will be a variety of responses to this book by knowledgeable readers. Some are already outraged, but most cannot fail to be impressed by Neufeld’s research and his technical mastery of enormously disparate and scattered sources.

While many readers will disagree with some of his conclusions, my own research suggests only two criticisms. Although Neufeld is not wrong to stress the in-house nature of the A-4 development effort, and though he indicates many cases of contributions from outside universities and firms, the latter were more integral to development than Neufeld suggests. Second, while the technology developed at Peenemuende contributed significantly to later rockets and missiles, it is an exaggeration to call the A-4 *the* grandfather of all of them. For example, largely independent developments at the Jet Propulsion Laboratory in California during World War II and afterwards contributed significantly to later liquid- and especially solid-propellant rockets and missiles. These include the Aerobee, Scout, Pershing, Polaris, and Minuteman plus the solid rocket boosters of the Space Shuttle. Such criticisms aside, *The Rocket and the Reich* is an impressive achievement and essential reading for anyone interested in the history of rocketry and of the development of technology in Nazi Germany.

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