

1989

"A Race on the Edge of Time," "Winning the Radar War"

Frank C. Mahncke

David F. Fisher

Jack Nissen

A. W. Cockerill

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Recommended Citation

Mahncke, Frank C.; Fisher, David F.; Nissen, Jack; and Cockerill, A. W. (1989) "A Race on the Edge of Time," "Winning the Radar War," *Naval War College Review*: Vol. 42 : No. 4 , Article 25.

Available at: <https://digital-commons.usnwc.edu/nwc-review/vol42/iss4/25>

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140 drawings. A good number of photographs (and drawings) of major vessels are quite large, filling half a page each. Notes in the captions show that the photographs have been studied carefully. The data entries by ship type include both detailed tabular data and, in many cases, textual commentary. The treatment of key dates (construction orders, keel laying, etc.) is much more complete than *Almanacco*, which only gives years for three events: keel laying, launch and completion. Although fewer plans are provided than in the *Almanacco*, they are generally much more detailed than those in the Italian book.

Almanacco Navale is divided into two major parts: first, the coverage of the world's warships by country, and second, a set of six appendices that cover oceanographic and hydrographic research ships, naval aircraft, missiles, guns, torpedoes, and radar. The coverage of naval weapons and radars is tabular in format, and interesting; for example, an estimated maximum range (target type unspecified) is given for many radar systems. There are some 1300 photographs (22 in color), including 160 of U.S. Navy ships and 180 of Soviet ships. In addition, about 750 ship classes are illustrated by line drawings (66 of U.S. Navy ships and 126 of Soviet vessels); and there are 20 3-view drawings of aircraft, 13 summary pages of major combatant ship silhouettes for recognition purposes, and five color pages of national flags. Most information is

tabular with relatively little evaluation or comment.

Almanacco Navale has some information unavailable elsewhere. For example, it lists codenames—one presumes the NATO designations—for the various sonars carried aboard each class of Soviet submarines, such as "Shark Fin" and "Whale Tongue." What the average reader can make of this is unclear, but it does permit, assuming it is accurate, speculation about similarities and differences among classes.

Combat Fleets is readily available in the U.S. through the Naval Institute Press. *Almanacco Navale*, on the other hand, is not marketed in the U.S. and must be special-ordered. As a result, it is little known. It contains a full English language translation of the two-page key to reading the data tables, as well as an insert card with French, German, and Spanish equivalents for key terms. Assuming that one could obtain the book at close to its Italian price, it is a worthwhile investment. *Combat Fleets*, however, delivers much more information (including almost twice as many illustrations), more than commensurate with its somewhat higher price.

CHRISTOPHER WRIGHT
Baltimore, Maryland

Fisher, David F. *A Race on the Edge of Time*. New York: McGraw-Hill, 1988. 370pp. \$19.95

Nissen, Jack and A.W. Cockerill. *Winning the Radar War*. New York:

St Martin's Press, 1987. 224pp.
\$19.95

While their common assertion that radar won the war may be a little enthusiastic, Nissen and Fisher have both written important histories of the development of radar and of its role in World War II. They come from different backgrounds and therefore bring different perspectives to the radar war. Nissen was in the middle of it; Fisher is a postwar scientist and historian.

Before the war, Jack Nissen was a young radio-electronic engineer doing weekend volunteer work at the very secret Bawdsey manor house where the first Chain Home station was being developed. When the war began, he was swept into the technical services of the RAF, where he spent the war developing radar and its application to fighter defense. Later he commanded radar fighter control stations and joined the Dieppe raid to try to capture key parts of a German radar station.

David Fisher is an accomplished scientist and writer who brings a technical historian's perspective to the history of the development and application of radar. Unfortunately, his book is marred by many forward jumps and asides on his opinions of today's defense policies.

Both books give us important reminders for, and insights into, today's problems on the selection and development of complex weapon systems. Drawing on earlier works (C.P. Snow's *Science and Government* and R.V. Jones' *The Wizard War*), both Nissen and Fisher recount the

prewar controversy between Tizard and Lindemann over air defense and the application of radar. This controversy shows that able scientists may disagree profoundly, that political nexus is important, and that there is no guarantee that the optimal solution will be found. It *was* in this case, but it was a near thing. Fisher has written a good account of this time, and he shows the importance of some of the less well remembered players on the RAF staff.

Nissen's account recognizes the importance of an integrated system for air defense that includes radar, communications, plotting centers, aircraft and the tactics to knit it all together. Too often historians look on a single technology such as radar as the key to the whole problem. Through his own experience of commanding a radar direction center, Nissen demonstrates that all the pieces, especially the tactics, have to be in place and working together.

If we are to accept, as asserted by previous writers in the *Review*, that the development of a radar-based air defense system—the first Strategic Defense Initiative—was the salvation of Britain during the bombing attacks, the very curious question arises of why radar-based air defenses didn't protect the Germans later in the war. Nissen nibbles at this question in his description of German radar developments. While German radar was good and they understood and practiced ground-based fighter direction, they appear to have been vulnerable to jamming and decep-

tion. Also, they became overwhelmed by Allied saturation raids.

Nissen covers the selection and development of the first radar jamming and countermeasures by the British. His description of the delicate choice of technique so as to be effective without revealing enough to allow counter-countermeasures is relevant to today's electronic warfare and ECM problems.

After the Battle of Britain radar continued to be developed for night fighter interception, where it was not particularly successful, and for submarine hunting, where it was very successful. Fisher's account of these later developments is comprehensive. His scientific background is apparent in his good description of the technical problems and how they were solved.

For those interested in the development of technology and its application to warfare, or for those practicing it, both Nissen and Fisher are useful additions. Fisher is the technical historian; Nissen, the technical practitioner.

FRANK C. MAHNCKE
Naval Surface Warfare Center
Silver Spring, Maryland

Gorn, Michael H. *Harnessing the Genie: Science and Technology Forecasting for the Air Force 1944-1986*. Washington, D.C.: U.S. Government Printing Office, 1988. 209pp. \$9

This survey of scientists and engineers, in and out of uniform, defines their role in forecasting technological futures for the air force. It is important reading for those who would understand the processes that bear on the formation of technology policy in the military departments. As an individual who has been close to navy research and development for most of the period covered by the author (1944-1986), I note that, given changes in the names of some individuals and in the titles of the major study efforts, this could be a history of the decline of scientific advice in the navy also.

Michael Gorn traces the results of a series of major air force-sponsored technology forecasts. He also describes the repeated assaults on the freedom of the civilian and academic scientific community to contribute to or influence the results of these forecasts. This is a history of conflict between civilian and military, scientist and engineer, visionary and pragmatist—an intellectual game of "king of the mountain" with counterproductive results.

Dr. Theodore von Karman, in what became the USAF Scientific Advisory Board, established the model for air force science and technology forecasts. *Toward New Horizons* (1945) was the first such forecast. Others discussed in *Harnessing the Genie* are the *Woods Hole Summer Studies* (1957-1958), *Project Forecast* (1964), *New Horizons II* (1975), and *Project Forecast II* (1986). But after the Woods Hole studies failed to deal in a prescriptive way