Exploiting enemy weaknesses
DARWIN ZIMMERMAN

In World War II, five vital technologies allowed the Allies to defeat the Axis submarine offensive against shipping in the Atlantic. Four of the technologies—radar, sonar, decoding, and very long-range aircraft—have come in for much study by the Battle of the Atlantic historians. High-frequency direction-finding (or Huff-Duff) has not. Yet, as Kathleen Williams lucidly explains, Huff-Duff was vital because of the insistence of Admiral Dönitz, the commander-in-chief of the U-boats, on directing the Wolf Pack attacks on Allied convoys from his headquarters in France and Germany.

German submarines reported to base Huff-Duff system, the FH3. Though hard to use and maintain, the FH3 gave the convoy escorts a powerful new weapon with which to suppress and sink U-boats gathering around a convoy. The British had realized that while short-wave radio, by bouncing off the ionosphere, had a very long transmission range, it was possible to distinguish between these sky waves and the unreflected ground waves of a nearby transmission source. Ground waves could be detected up to 40 km away, more than three times the range of early microwave radar.

A U-boat on sighting a convoy would transmit lengthy contact reports back to Dönitz’s headquarters. It would then continue to track the convoy out of sight of escorting warships, sending periodic updates on any changes in course or speed of the target. Meanwhile, Dönitz would vector in all the nearby submarines for a massive night hunt, designed to overwhelm the defenders. With Huff-Duff, the escorts could determine the location of submarines around the convoy. A fast escort vessel, usually a destroyer, or an aircraft was then sent to the location in order to force the submarine to submerge and, therefore, lose contact with the convoy. The convoy could then change course and escape a U-boat attack.

Most of Williams’s book examines the story of Huff Duff development for the U.S. Navy. This story is unusual because the Navy’s high-frequency direction finders were developed from technology that was smuggled out of occupied France by a group of scientists and engineers employed by the International Telephone and Telegraph Co. (ITT). The leader of the French research team was Henri Bougain, a brilliant inventor of electronic devices. He worked against heavy odds to perfect a high-frequency direction-finder that was both more accurate and easier to use than comparable British equipment. Among the factors working against the French scientists were the U.S. security services, which doubted the loyalty of any French citizen to the Allied cause. The Navy and ITT overcame these security concerns because of the desperate need for Huff-Duff in the hundreds of escort vessels then being mass-produced by U.S. shipyards.

Especially valuable is Williams’s appreciation that the simple invention of a device is not enough to ensure its successful introduction into combat. She provides fascinating accounts of how the Bougain direction-finder was manufactured and how training procedures were introduced so that the new technology could be utilized at sea.

American Huff Duff was introduced into service just after the decisive convoy battles fought between March and May of 1943, which broke the back of the German U-boat offensive. But, as Williams demonstrates, that U.S. high-frequency direction-finding helped ensure that U-boat packs would never again pose a serious risk to shipping. Huff-Duff was particularly useful to U.S. Navy hunter-killer groups, centered on a small escort carrier and a number of destroyers and destroyer-escorts. A great many U-boats were sunk by aircraft and ships that were initially directed by a Huff-Duff fix.

Williams has done a remarkable job in tracing the story of American Huff-Duff. It is a readable and entertaining book that should be appealing to anyone interested in the history of naval warfare, electronics, science, or engineering.


A crucial dénouement
COLIN LATHAM

Except for those too young then to take notice, no one who lived in Britain through the Second World War could have failed to be impressed by the signs of active support from the armed forces of the Allied nations. Foreign servicemen, especially from Canada and the United States, were to be seen in large numbers almost everywhere, together with vast quantities of their fine vehicles, aircraft, and ships.

Yet this outward evidence was but one aspect of the great co-operation between Britain and its allies in North America. Behind the scenes, in the vital back rooms of science, technical experts were working closely together, and the industrial might of the United States and Canada was being harnessed not only to the manufacture of munitions for use in Europe, but to the building of secret equipment, including radar.
The background to this unprecedented state of affairs is described in detail in this fascinating book. The author tells how, in spite of months of deep controversy and argument about its terms of reference, a British technical mission to Canada and the United States was finally set up and led by Sir Henry Tizard in August 1940. Of course, the United States was still a neutral power at that time, and so, until the mission was finally authorized by an uncharacteristically wavering Winston Churchill, opinions were divided: was U.S. security to be trusted? Would the United States release to Britain details of its advanced Norden bombsight that the Royal Air Force desperately desired? Would it have much else of value to offer in exchange? The extended discussions of quid pro quo are described in detail and at length.

In the event, the risk of security leakage through U.S. channels was boldly discounted and the mission went ahead without preconditions on trading secrets. History has shown that Tizard’s policy of free and open exchange paid off. Both sides gained from it, the secret developments of both countries being shared to their mutual advantage. It is often said that without radar England would have lost the Battle of Britain and the war, it may be equally certain that without the technical co-operation engendered by the Tizard mission, Britain would have been defeated later on.

Many who study the history of radar development will have read Dr E.G. (Taffy) Bowen’s *Radar Days*, in which he recounts his experiences as the radar expert in Tizard’s mission team. While, in parts, Zimmerman’s book clearly leans heavily on Bowen’s account, it goes very much more deeply into the whole affair, including its eventual consequences and the events that led up to it. We learn, for example, of a previous technical exchange (geared mainly to research on submarine detection) in 1917 between, on the one hand, Britain and France, and, on the other, the United States, and we read of Professor A.V. Hill’s March 1940 technical mission to assess U.S. knowledge of radar and attitudes among U.S. elites toward the war. We are told much of the background and personalities of leading technical and political figures in Britain in the early part of the World War II and of their conflicting attitudes towards the planning of the Tizard mission.

Altogether, 21 technologies were considered. Chief among them was radar and, in particular, the new British cavity magnetron, which was to have such a profound effect upon radar design and performance. Years later Bowen expressed the hope that, because of the important results of the mission, somebody would one day, by writing up the whole story and its complex background, add to his own personal accounts of his work as a member of it. He may rest in peace on this score. David Zimmerman has done a magnificent job in researching the entire subject and in compiling this scholarly account.

The last few chapters and the epilogue deal with the immediate and the long-term effects of the mission, not only in radar but other areas, as well, including the successful U.S.-designed Rolls-Royce-powered P-51 Mustang fighter aircraft and the joint nuclear research that led to the development of the atomic bomb. The mission had a permanent effect on the subsequent structure of research and manufacturing facilities in both Canada and the United States.

Although this is virtually a textbook on an important subject, it is by no means dry or dull to read. The style is light and easy-going so the reader with a general interest in the technical history of the war—or of the views of the leading personalities involved—will find it satisfying not only as a complete read from end to end, but as a book to dip into again and again.

The book is well made within hard covers with just over a dozen good photographs of significant people and equipment. The printing is clear and the very few uncorrected typographical slips do not detract from the clarity of the text. So much information is included about numerous organizations and personalities, about what was said and done and what was debated and decided, that it might have been helpful to the reader if each of the chapters had carried, beneath its title, a very brief summary of the topics to be covered (for example, as in Churchill’s *The Second World War*). However, these are but minor criticisms of a first-rate book.

The comprehensive research that must have gone into this book is evidenced by the extensive references, bibliography, and index. For the serious student of the history of technology or the application of science in war, it surely will be essential reading and is highly recommended.


**William Sweet, Editor**

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