Electronic Countermeasures in the British Air War over Europe during World War II

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ABSTRACT

World War II was the first war where electronics paid a large role in the conduct of the war. Electronic countermeasures were used by the British throughout the air war over Europe during the Second World War. Electronic Intelligence (ELINT) was used by the British as a foil to German navigation systems used during their bombing raids on the U.K. The British in their offensive air war with Germany adopted active and passive methods of countermeasures to nullify the German attempts to detect the attacking RAF aircraft.

Keywords: Airborne Electronic Warfare, Airborne Radar, Electronic Countermeasures, ELINT, Wizards War

INTRODUCTION

Sir Winston Churchill described the Second World War as the Wizards War (Lerner, 2001, p. 539). Churchill paid homage to electronic warfare, in his historical written series on the Second World War, declaring:

During the human struggle between the British and the German Air Forces, between pilot and pilot, between anti-aircraft batteries and aircraft, between ruthless bombing and fortitude of the British people, another conflict was going on, step by step, month by month. This was a secret war, whose battles were lost or won unknown to the public, and only with difficulty comprehended, even now, to those outside the small scientific circles concerned. Unless British science had proven superior to German, and unless its strange, sinister resources had been brought to bear in the struggle for survival, we might well have been defeated, and defeated, destroyed. (Churchill, 1949, p.337)

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This article will discuss the topic of how electronic countermeasures were used by the British throughout the air war over Europe during the Second World War. The study will be divided into three parts. The first part will examine the use of Electronic Intelligence (ELINT) by the British as a foil to German navigation systems used during their bombing raids on the U.K. The second section will look at passive methods of countermeasures used by the British in their offensive air war with Germany. Lastly the use of active countermeasures will be discussed.

ELINT

In 1935, the British scientist Robert Watson-Watt had developed a radio location technology that used radio pulses and the corresponding reflections from aircraft as a means to locate the range height and bearing of approaching aircraft (Rankin, 2008, p. 323). Britain, in anticipation of an aerial assault from Germany’s air force, the Luftwaffe, built a series of radar stations that provided early warning of aircraft approaching the country.

The Luftwaffe took an active role in the Spanish Civil War and the lessons learned in Spain proved the inefficiency of strategic bombing without accurate bombing aids. The Germans pursued radio and radar aids for bombing and navigation to assist their offensive bombing force. The Germans anticipated the problem of target finding and developed electronic navigation and bombing aids. Because of these systems, the Luftwaffe was able to switch from day to night bombing without the loss of accuracy that British RAF Bomber Command later experienced (Devereux, 1991, p.139).

Initial German airborne electronic warfare research was of a more offensive nature and they developed radio navigation systems that were used to assist blind-bombing at night. One system used by the Luftwaffe was known as Knickebein (crooked leg), and was based on a ground transmitter broadcasting a radio beam (see Figure 1). The beam would be received by the aircraft radio receiver with Morse code dashes when the aircraft was to one side of the beam and Morse dots to the other side (Price, 1984, p.12). When the aircraft was positioned in the center of the beam the pilot would hear a steady tone. Knickebein was originally developed in the 1930s as an aircraft blind landing aid. The system was theoretically accurate to within a kilometer and was susceptible to cockpit sounds and noise jamming (Clark, 1997). Germany continued to develop their navigation systems and the X-Gerät system worked along the same principles, but introduced several improvements. It operated at a higher and more accurate frequency of 65 to 75 MHz, used a mechanical indicator that was less susceptible to noise jamming, and provided an extra beam to calculate ground speed and determine bomb release (Clark, 1997). The final system Y-Gerät was the most sophisticated yet, but suffered from its own complexity. This system combined a radio beam with a modulated signal which measured distance. This system was reasonably accurate, pin-pointing the exact location of the bomber and commanding the precise moment of bomb release (Clark, 1997).

The British suspected that the Germans had developed a radio navigation systems and Dr. R.V. Jones of the British Air Ministry presented his findings to Winston Churchill at a meeting on June 21, 1941 (Churchill, 1949, p. 338). Dr. Jones said the British had reconnaissance photographs of radio towers in occupied Europe, which did not appear to be configured for radar or other radio communications. They had also examined a Luftwaffe bomber that had crashed in England and concluded the radio reception equipment onboard was more elaborate than a simple night landing navigation system. British airborne radio operators intercepted the radio beams used to guide the Luftwaffe bombers and note the frequencies of operation of the German system (Whitten, 1976). The British had even obtained a description of the system from a
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