Book Review

The Science of Bombing: Operational Research in RAF Bomber Command

Reviewed by Mr Bob Gordon

Colonel Randall T Wakelam (RMC 1975) is Director of Research and Symposia at Canadian Forces College in Toronto. He is also an assistant professor of Defence Studies with the Royal Military College. *The Science of Bombing*, his first book, reflects this combination of academia and the military. Thoroughly researched, drawing on previously unexamined files, it is concise, tightly argued and well-organized.

The research question at the core of this text is the relationship between the Operational Research Section (ORS) of Bomber Command - staffed primarily by civilian scientists commonly referred to as 'Boffins' - and the actual performance of the flight crews and effectiveness of the bombing campaign against occupied Europe and Germany.

Interestingly, Wakelam confesses to an initial bias against the value of operational research. Describing himself as "someone who has had a career of some three decades in the air force including over three thousand flying hours, experience in command and staff appointments, and over a decade providing education programs for mid-level staff officers and senior commanders.... my opinion of the worth of operational research was not high."

Demonstration of the effectiveness of operational research requires, according to Wakelam, establishment of a feedback loop linking performance and research, "a sort of a continuum which started with a problem and led to the adoption of an ORS developed solution. Schematically, he outlines this feedback loop as a five-link chain:

1. *Problem defined by Commander or key staff.*
2. *Problem passed to ORS.*
3. *ORS develop research plan and conduct research.*
4. *ORS submit conclusions and recommendations.*
5. *Commander or key staff accept and implement solution.*

The key aspect of this inquiry is the identification of problems by the Air Staff, their analysis by the ORS, and the implementation of ORS generated recommendations and solutions by the Air Staff.

Organizationally, *The Science of Bombing*, commences with an assessment of the status of Bomber Command's operations in the summer of 1941, prior to the establishment of the ORS. Lord Cherwell (Frederick Linemann), chief scientific advisor to the Cabinet, directed David M Butt, a civil servant

in the War Cabinet Secretariat, to assess 650 target photos taken between June 2 and July 25, 1941 and compare the results with the aircrews' after-action reports. The resulting report was first circulated on 18 August 1941. It asserted that the bomber offensive was shockingly ineffective. Two-thirds of the crews reported having attacked the target: Hitting the target being defined as within a five mile radius of the aiming point. The Butt report concluded that under a full moon and in excellent weather conditions only two in five of the crews hit the target,"but in thick haze the ratio dropped to one in fifteen" of aircrews that reported hitting the target. In other words, in excellent conditions 26% of the attackers came within five miles of the target and in poor conditions that dropped to less than 5%. Butt concluded that only a miniscule fraction of the bombs being dropped, were hitting the target.

Many senior officers rejected the report outright. However, Sir Charles Portal, Chief of the Air Staff was not one of them and on September 11 he minuted Churchill recommending the establishment of an operational research section at Bomber Command. By the end of the month there were seven scientists under Dr Basil G Dickins in Bomber Command's ORS. Interestingly, Wakelam notes that Bomber Command, despite the obvious problems, possessed an organizational culture that facilitated solving these problems using operational research. As the newest branch of the military it was least tradition bound. It was founded on a scientific (aerodynamics) basis. Finally, the application of radar to air defence had already introduced the RAF, specifically, Fighter Command, to operational research.

The ORS had an immediate impact on Bomber Command although the results can only be described as mixed. Initially, it focused on improving the concentration in time and space of the bomber stream. Its efforts were greeted with success when the Shaker technique was introduced. The Shaker technique had the initial aircraft drop flares to illuminate the target, succeeded by aircraft dropping incendiaries. Then 'followers' dropping heavy explosives bombed on the fires burning. Concentration improved immediately. However, the accuracy of the leading waves did not and frequently analysis of raids revealed that a concentration of bombs had been achieved, but the target had been misidentified with the result that raids were often densely concentrated but off target. In essence, Bomber Command became very good at missing the target.

Realization of this problem, ironically revealed by further operational research, led to increased attention to navigation and target identification, and, eventually, the development of the pathfinder force (PFF). The progress of Bomber Command's improving efficacy and the development of operational research within the command was not a story of uninterrupted progress as the previous example plainly demonstrates. It was, rather one of "of trial and error in defining work and assigning resources." On the whole, however, it was a story of overall improvement. The application of Gee, Oboe H2S and a host of other technical improvements was

greatly facilitated by operational research. The body of *The Science of Bombing* details this process and clearly demonstrates the existence and functionality of the feedback loop that Wakelam set out to assess. Operational research had a profound and positive effect on the performance of Bomber Command during the last four years of the war.

In the course of this analysis Wakelam offers an interesting, revisionist perspective on Sir Arthur Harris. Many historians have portrayed Harris as an automaton or worse. A man equally unconcerned about the casualties among his aircrews and the deaths of German civilians. Wakelam offers a more balanced view of a man open to technological and tactical innovation. A man stoically accepting Kitchener's dictum, 'We must wage war as we must; not as we would like.'

There remains one significant criticism of this volume. Admittedly, Wakelam pored over records largely neglected and offers detailed analysis of the documents produced by the ORS of Bomber Command. However, on the other hand, he demonstrates an excessive reliance on one secondary source: A source that, inevitably, is prone to a bias particularly favourable to the ORS. I refer to "Operational Research in Bomber Command", a document produced by the ORS under the signature of the Section head, Dr Basil R Dickins.

Chapter 4, "Sorting Out Process and Producing Results": September 1941-February 1942" serves to illustrate this over-reliance on a single source. Twenty-one of the first thirty footnotes in this chapter are from "Operational Research in Bomber Command". The first half of this chapter is little more than a précis of the document ORS produced assessing its own performance. In Chapter 3, "Boffins at Bomber Command: September 1941 25% of the footnotes reference this same document. One cannot avoid wondering about the objectivity of a document produced by an agency evaluating its own performance. However, this shortcoming is trumped by the original research in primary sources that figures highly throughout. The result is a volume that provides a valuable contribution to the history of Bomber Command and is essential reading for anyone wishing to understand the contribution that operational research can make to combat effectiveness.