TRANSLATING TECHNOLOGY AND INNOVATION INTO CAPABILITY  
- SOME LESSONS FROM BETWEEN THE WARS

All the ascendancy of the Hurricanes and the Spitfires would have been fruitless but for this system which had been devised and built before the war. It had been shaped and refined in constant action, and all was now fused together into a most elaborate instrument of war, the like of which existed nowhere in the world.

Winston Churchill referring to Dowding’s air defence system

While the experience of warfare reflects the many attempts to gain that decisive advantage over the adversary through better technology, it also shows that the introduction of new technology will not necessarily produce the desired advantage. For example, while the tank first appeared on the battlefield as early as 1916 in World War I, it was not until it was integrated into new and innovative operational concepts and tactics that it really became a decisive element in manoeuvre warfare during World War II. The development of air power between the two world wars provides outstanding case studies of nations both successfully and unsuccessfully learning from operational experience and transforming the technology offered by aircraft into military capability.

With some exceptions, World War I is largely remembered for its devastating quagmire of trench warfare. While air power in World War I provided a glimpse of what it could provide, it did not fundamentally change the dominating trench warfare. However, there was sufficient evidence to demonstrate that reconnaissance and surveillance, control of the air, strike and close air support were going to be critical capabilities in future wars. Strategists in several nations identified lessons from which they could develop new concepts and capabilities that would avoid the stalemate that was World War I. Remarkably, some of these major lessons were either forgotten or discarded in the lead-up to World War II.

The notion of strategic strike promised the capacity to strike deep into the adversary’s territory, while bypassing static defences and avoiding the risk of degenerating into trench warfare. Although Britain and the USA actively pursued a strategic bombing capability between the wars, their attempts were hampered by factors such as poor appreciation of the actual accuracy and capacity of aircraft at the time. While Britain had bomber aircraft with the range to reach German targets, they lacked sufficient defences to fight off German fighters and carried only a small bomb load. Unable to achieve control of the air over enemy territory during daylight raids, the RAF bombers suffered heavy losses on initial raids, forcing the RAF to adopt night bombing strategies. However, the bomber crews initially lacked the navigation equipment and training to find and bomb their targets at night.

Meanwhile, the US Army Air Service did exhibit some ability to analyse aircraft and tactics through establishments like the Air Corps Tactical School, which was established in 1920 and was largely responsible for developing the Army Air Force’s doctrine of daylight precision bombing. However, such analysis was undermined by the desire to sell air power and the concept of independent strike forces. This resulted in blinkered thinking that too easily dismissed other key lessons such as the need for control of the air when conducting strategic bombing missions. The first USAAF bombing
missions conducted over Europe, without control of the air, resulted in devastating losses and the postponement of the daylight bombing campaign. It was not until 1944 that daylight bombing missions over Germany were resumed when long-range fighters, such as the P-51 Mustang, became available to escort the bombers and protect them from German fighters. In reality, both the Americans and the British failed to fully capitalise on the promise of strategic bombing by failing to understand and effectively integrate technology, strategy, and tactics.

Interestingly, the same issues tended to overshadow the British and American development of the effective employment of air power in ground support between the wars. Despite World War I highlighting that air power had an important role in supporting ground operations, both Britain and the USA entered the war with limited ground support capability. Although both services had light and medium bombers at the start of the war, there was no doctrine for air/land cooperation and the squadrons’ headquarters lacked the staffing, communications lines and organisation structure to coordinate close air support.

In contrast, Germany recognised the value of air power to ground operations and successfully integrated air power into its continental manoeuvre warfare strategy. The Luftwaffe was developed as an operational air force that could not only operate closely with ground forces at the tactical level but could also successfully conduct interdiction behind the front line after having achieved control of the air over the battlefield. While the Junkers 87 Stuka dive bomber may be perceived as the front line of the Luftwaffe’s ground support capability, it was actually their integration of medium-level, twin-engined bombers and modern fighters into a more balanced operational force closely aligned with robust tactics and doctrine that ensured German air power delivered the effects their mechanised warfare strategy required.

Although Britain had problems in translating air power technology into effective strategic bombing and close air support capability between the wars, it did successfully integrate fighter aircraft and radar into an effective military capability by creating the air defence system. Many nations, including Germany and the United States, had been developing radar but it was Britain, largely through the drive of Air Chief Marshal Hugh Dowding, that successfully integrated radar with fighter aircraft, observers, and command and communication systems into an operational, integrated air defence system (the Dowding System). While the popular histories of the Battle of Britain tend to highlight the achievements of the fighter pilots, the Dowding System was a force multiplier that was decisive in the RAF defeat of the Luftwaffe. In this respect, the radar and the Dowding System provide the pre- eminent example of the successful translation of technology into military capability between the wars.

The development of air power between the wars highlights the maxim that technology alone may not deliver the war-winning edge. The countries that did successfully develop their air capabilities—Germany with its tactical air support and Britain with its integrated air defence system—did so over a period of years, testing and developing their equipment, tactics and doctrine until they formed an effective capability. This process will be essential for the Air Force to develop its new capabilities and become a 5th-generation air force. The Air Warfare Centre will be at the hub of Air Force’s efforts to ensure the lesson of “thorough operational analysis and the application of lessons learned” is not lost.

Key Points

- While aircraft promised much for warfare between the wars, various factors restricted the extent to which nations developed decisive capabilities by the start of World War II.
- The RAF demonstrated how the new technology of radar when combined with fighter aircraft, observers, and command and communication systems could be successfully translated into decisive capability.
- Experience has shown that new technology does not necessarily equate to new capability.