Throughout history social commentators have claimed that war is inevitable and societies have gone to great lengths to seek victory or resolution by investing in military hardware to protect their national interests. Since its inception, air power has been at the forefront of conflict, being used in a range of roles from deterrence to delivering kinetic effects when diplomatic efforts have failed. The measure of the effectiveness of kinetic effects has not only been costed in terms of neutralising an adversary but also the attrition rate of one’s own aircraft and the loss of aircrew. These calculations have led to the mass application of air power giving way to fewer aircraft creating the desired effect, facilitated by advances in technology.

Calculating the cost versus benefit equation of warfare is not new. It has been calculated that to kill one enemy soldier cost Caesar 75 cents and Napoleon $3,000. The World War I cost of a fatality was $25,000 which had doubled to $50,000 in World War II. The Word War II costing also saw a significant jump in the cost of aircraft manufacture, with the unit cost of a Lancaster bomber going up from 45 to 50 thousand pounds.

However, even in wars of necessity, treasure and other resources to expand on military equipment will be scarce. For this reason, during Word War II, Germany, Britain and the United States closely monitored the attrition rate of aircraft. There are a number of examples of unsustainable attrition rates, especially in World War II. In late 1943, the strategic bomber offensive against Germany was starting to take its toll and in early 1944 Germany responded by launching a series of bombing raids around the greater London region, termed the ‘Baby Blitz’. Germany assembled and employed a fleet of 474 bombers but lost 329 of these aircraft over a five month period. This high attrition was because Britain had learned from its experience in the earlier Battle of Britain and invested in improved ground-based air defence systems which reportedly included using anti-aircraft rockets for the first time. They had also developed better tactics to enhance counter air capabilities.

In retaliation to the German offensive, Britain launched a raid on Nuremberg on the night of 30/31 March 1944 which ended in a great loss for the Royal Air Force (RAF) and achieved only marginal results. The attrition rate of aircraft and aircrew in this raid was the highest for RAF Bomber Command during the entire war. Of the 779 bombers that took part in the attack, 106 aircraft were either shot down or written-off after landing with the RAF suffering a loss of 545 aircrew.

The United States Army Air Force suffered a similar fate in 1943 in the attack on the Schweinfurt ball bearing plant. Lacking adequate fighter cover, only 62 of the 260 aircraft that took part were left unscathed and over 600 aircrew
were either killed or taken prisoner. The P51 Mustang would later provide the much needed fighter escort duties.

The cost versus the effect arguably reached the zenith of its return with the development of the atomic bomb which was seen as a technological marvel at the time. However, the dropping of the bombs on Japan to conclude World War II would not have occurred had it not been for the heavily modified B29s that dropped the bombs. Ironically, the development and production of the B29 aircraft was more expensive than the development of the atomic bomb itself. Furthermore, of the total 3943 B29s produced, 562 were destroyed, thereby incurring a huge loss.

Such losses were unsustainable and the concept of large numbers of aircraft dropping inaccurate weapons had to change. The Vietnam War became a watershed moment in the application of air power not only in terms of improved accuracy of targeting but also in catering to the need to arrest the escalating cost of air power.

Early in the Vietnam War it was seen that the World War II strategic bombing concept did not work as this was a different type of war. Rather than relying on mass to achieve a mission outcome, advances in technology such as the introduction of precision guided munitions (PGMs) and modified targeting techniques improved the application of air power. As an example and to explain this progression, in World War II it would take a hundred B-17 aircraft to neutralise a ground target because poor targeting techniques resulted in very high miss rates. By the 1960s it took four F-4 Phantom fighter-bombers to successfully hit the same target. By the 1980s, a single F-117 stealth fighter employing PGMs could obtain the same success rate while achieving an excellent self-survivability rate. It is now estimated that an F-35 could achieve the same success rate as the F-117 but at a much lower unit cost. The average cost of the F-117 variants was $111 million compared the average cost of the F-35 variants being $100 million and this price is predicted to come down. Essentially, more accurate targeting with its attendant support technology together with updated concept of operations and doctrine has meant that it takes fewer aircraft to neutralise a target. Employment of fewer platforms also means that greater planning is required in allocating these limited assets through an Air Component Commander in an Air Operations Centre exercising centralised control of all air assets in a theatre while permitting decentralised execution through a local commander.

While the cost of modern aircraft and associated weapon systems consumes a large portion of the Defence budgets of countries that seek to have credible air forces, it seems that this is less than the cost of operating a larger fleet of aircraft employing lower technology weapons in an effort to create mass. Mass of attack has been replaced by precision and stealth; both products of sophisticated technology. Modern aircraft and aircrew have a much greater survivability rate than World War II and this in itself is a significant saving to a nation. A comparative study of the cost-benefit analysis and efficiency of the application of lethal force between World War II and the current operations is not readily available in the unclassified domain. However, it would seem that 21st century air power is more cost-effective in the creation of ‘unit effect’, when considered in terms of resources expended and lives put at risk.

**Key Points**

- Throughout history governments have protected their national interests through the investment in military hardware.
- Mass aircraft delivering inaccurate weapons has given way to fewer aircraft delivering more accurate precision weapons with a greater survivability rate for aircrew.
- The cost of the technology behind fewer aircraft delivering the desired air power effects will continue to challenge governments in maintaining a credible air force.