Ever since Italian Giulio Gavotti dropped grenades from his Albatros F-2 aircraft on 1 November 1911 during the Italo-Turkish War, there has been continuous and concerted efforts to improve the accuracy of air delivered weapons. In the early days of aviation, a reasonable degree of accuracy in dropping ordnance could be achieved as aircraft were relatively slow platforms but as aircraft became faster, the degree of accuracy waned. It was not until World War II that bombing moved from being considered an art to becoming a science.

The ‘precision’ of air delivered weapons is normally expressed as the ‘circle error probable’ (CEP). The CEP is normally described as the radius of a circle with the target at the centre. For example, if a group of aircraft dropping bombs were calculated to have a 100 metre CEP, it meant that there was a 50 percent chance of the bombs impacting within a circle radius of 100 metres with the target at the centre. However, even this degree of accuracy could not be achieved in World War II. It has taken decades of technological advances to obtain a level of accuracy which today can be expressed in metres rather than hundreds of metres or even kilometres from a target.

Prior to World War II, to place enough ordnance on a target to be effective, bombers were required to fly at low levels. This made the bombers vulnerable to anti-aircraft artillery and also made it easier for enemy fighters to intercept and shoot them down. In 1921, the United States Navy drafted specifications for a daylight bombsight that would allow bombing from high altitude. Carl Norden developed a gyro-stabilised bombsight in 1923 and delivered the Mk. 3 to the Navy for trials. The first model was effective only against stationary targets. The next model was a gyro-optical device delivered in 1924. This version had a timing device which indicated to the bombardier when to drop the bombs. By 1931 the Navy had achieved impressive accuracy during trials. The United States Army Air Force (USAAF) also took note and placed their own orders. By this stage a Mk. 15 version had been produced and it was literally a bombsight with a plane attached to it. The bombardier assumed control of the aircraft during the bombing run and directed the pilot to make corrections to line-up the sight with the target.

Early in World War II the Royal Air Force (RAF) experienced heavy casualties in daylight bombing raids and changed their tactics to bombing at night. Unfortunately, the dark also worked to the advantage of the target. However, the equation would change when the US entered the war with the Norden bombsight, which was regarded as a game changer by improving the accuracy of air delivered bombs. It was claimed that the Norden bombsight was so accurate that it could drop a bomb into a barrel from 30,000 feet (9144 metres) which was a tall order given that the bombardier would not have been able to see the barrel from this height let alone hit it. However, such statements ensured that the Norden sight was held in such high regard as cutting edge technology that aircrew were instructed to ensure that the bombsight never to fell into enemy hands.

In 1943, the Norden M-series was delivered to the USAAF and it was estimated that this version was 6 to 8
times more precise than the Mk 14 bombsight, then in use by the RAF. An analysis showed that the RAF was capable of putting only 5 per cent of its air-delivered ordinance within a mile (1.6 kilometres) of their aiming point under combat conditions. In contrast, the 8th Air Force of the USAAF was believed to be able to put 24 per cent of their bombs to within 1000 yards (912 metres) of their intended targets. By 1944 this figure had risen to 40 per cent to within 500 yards (457 metres). The Norden bombsight enabled B-17 Flying Fortress aircraft to fly above ground-based air defences and still hit their target. The daylight bombing strategy became a viable option to take the war to Germany.

While the introduction of the Norden bombsight clearly provided a technological advantage to the USAAF, the substantial improvements in the success of the bombing raids should also be attributed to other significant factors such as the introduction of long range allied fighters which extended air superiority into the enemy territory.

In World War II, it would take 108 B-17s dropping 648 bombs to get two bombs onto an intended target which by the 1991 Gulf War could be achieved by a single aircraft using precision guided munitions, if the prevailing conditions were right. The World War II figure could be explained, in part, by only certain aircraft having the Norden bombsight, which became the lead aircraft on a bombing run with the remaining aircraft following the lead aircraft. If the leader was off the target then the aircraft that followed would also be off the target. The Norden was touted as the most accurate bomb site of the era but in 1943 it only achieved a CEP of 1200 feet (370 metres). By way of comparison, Word War II ‘precision’ dive bombers could put 50% of their bomb load within a 1000 foot (304 metres) radius of their target. Similarly, Germany also achieved some success with the Fritz x radio guided missiles as early as 1943, sinking the Italian battleship Roma (after Italy had changed sides) but no other targeting apparatus could match the Norden.

After World War II, the Norden bombsight underwent improvements and was last used in the Vietnam War. Vietnam heralded a significant change in targeting which was highlighted by the United States efforts to destroy the Thanh Hoa Bridge which was a vital link providing materiel support to the Viet Cong in South Vietnam. From 1965 until 1972 hundreds of mass bombing attacks on the bridge failed to neutralise it. However, in May 1972 the United States Air Force deployed 14 Phantom (F-4) aircraft with 26 air-delivered laser guided bombs that finally destroyed the bridge. This was made possible through the development of a laser designator pod fitted to the aircraft termed 'Pave Knife' which enabled the delivery of precision guided munitions.

In turn, this set the scene for the future delivery of air-delivered weapons. Greater precision has resulted in less mass being employed to neutralise a target. Greater precision meant less collateral damage through avoiding the unnecessary destruction of enemy infrastructure and the loss of innocent civilian lives while ensuring the greater survivability of attacking aircraft and crew.

Key points

- Accuracy of air-delivered weapons has always depended on advances in technology.
- The accuracy of air-delivered weapons have improved since World War II but is still not 100%.
- Less mass bombing and greater targeting precision leads to better chances of survivability for attacking aircraft and fewer incidents of collateral damage.