

# NINE DECADES OF AIR WARFARE

**B.K. BISHNOI\***

## **INTRODUCTION**

Air power has a wide-ranging and fascinating saga of air combat machines in action throughout the minor and major wars of the century. The success and failure in the mortal battle, where both machines and their pilots strained to unbelievable limits, was a tribute to technology and human endeavour. Warfare is as old as the history of mankind but air power came on the scene just about 90 years ago.

However, to develop the necessary bite and obtain air superiority, the pilots needed ever-improved machines in which to fight. Aircraft design, weapons, support systems, force structure, and organisations strained to evolve to fill their needs. Thus, began the race for the best, culminating in the modern combat aircraft and its associated hi-tech weaponry and support systems. After the cessation of the Cold War, while the danger of a major war in the foreseeable future had receded, a series of regional crises erupted in Bosnia, Kosovo, Afghanistan and twice in Iraq, a trend that is likely to continue in the 21st century. Here, the role of large ground forces had comparatively reduced, while the need for potent, precise, effective and rapid-response air power had increased manifold. The fascinating progress made by air power over a short span of 90 years, as it fought wars and drew lessons in stages from these, makes an absorbing study.

## **PERIOD 1914 TO 1918**

Even before the breakout of World War I, the potential of the aeroplane for reconnaissance had been recognised. When in the late summer of 1914,

---

\*Air Vice Marshal (Retd) B.K. Bishnoi, AVSM, VrC and Bar.

German Armies swept across Belgium and France, its value was proven. Now, the air units began to take over the functions of light cavalry. When the German advance was finally stopped and the war came to a halt in the trenches, there was no better alternative but to use the aircraft for

**The role of large ground forces had comparatively reduced, while the need for potent, precise, effective and rapid-response air power had increased manifold.**

reconnaissance behind the enemy lines. However, on wanting to deny the same facility to the enemy planes, fighting in the air became an inevitable outcome. But the problem was: how? There was no precedence for air combat

between the planes. The year also saw a great deal of trial and error, mainly the latter.

On October 15, 1914, an observer of the Royal Flying Corps (RFC) reconnaissance aircraft stood on his seat and fired 70 rounds from his rifle at a German aircraft, which fired back too—no hits were scored. Better weaponry was obviously needed. The first kill in air-to-air firing was claimed high over Belgium when a French Voisin 3 reconnaissance bi-plane shot down a German Aviatik-B1. However, what was needed was an aeroplane with the performance to challenge and force a battle on the enemy aircraft, able to carry a machine gun and fire directly forward at the fleeing opponent. The German Fokker Einderkar was the first true fighter. The RFC found it difficult to defend itself against this adversary, and to see it in the sky was mortal peril. During the last two months of 1915, the RFC lost 25 aircraft to the Fokker. This spurred the British to action.

A feature of air fighting from 1917 onwards was the “dog-fight.” Huge multi-bogey encounters, with 50 or more participants, took place. It usually started with five or six but then others in the vicinity joined in—all on their own as there was no radio in those days.

### **PERIOD 1919 TO 1939**

World War I had made the advanced nations air minded and the two decades that followed saw tremendous advances in engine and airframe

design. The accent was on reliability, range and load carrying, but the orientation was towards civil use of the planes. At the same time, for many nations, the greatest problem was of deciding what the balance of their air force should be. Should it be purely tactical to support their ground forces in battle, or should it have a significant element of strategic force? It depended on the world-role of the nation, its treaty commitments, vested interests, geography and, the hardest of all, its ability to identify the threats. What confused the issue further was the predicted future of strategic bombing. Use of air in this form had started during World War I and while it had been far from decisive, it influenced the post-War thinking to a disproportionate extent.

In the early 1920s, Giulio Douhet, an Italian, and William Mitchell, an American, were among the first theorists to realise the full implications of air power and thought it could prove to be a significant factor in the winning of future wars. Both shared the vision of using long-range strategic bombers to strike deep into enemy territory so as to destroy both the enemy's resources and its will to resist. Douhet believed the aeroplane, with "complete freedom of action and direction," had revolutionised warfare and that airplanes would win wars quickly and decisively, without first defeating enemy surface forces. He stated that the army and navy performed essentially defensive roles in war and the only weapon suitable for an offensive was the aircraft. Mitchell, in 1930, wrote that the hostile main army in the field was a false objective and the real objectives were the enemy's vital centres. Further, the theory was that the bomber would always get through and if directed against the war-making potential of the adversary, its destructive potential made it a war-winning weapon. The theory was quite correct, only assuming that the postulated levels of destruction could be achieved. In Douhet's time, the perceived enemy had no worthwhile defence against any ensuing air attacks. The radar had yet to be invented and the air defence systems, including surface-to-air weapons and air defence fighters, were not effective in targeting air threats.

The bomber performance of World War I had been less than that of fighters; even then, interceptions had been problematic. The engine and airframe technology of the 1920s and 1930s improved bomber performance to a point where interception became very difficult, if not impossible. The result was that it appeared a far more decisive weapon of war to many. The development of fighters languished.

When in the 1930s a resurgent Germany began to pose a possible threat, Britain took two active measures. One, it allocated a great deal of the defence budget to building up a strategic bomber force as a deterrent; the second, was to find a way to make fighter defence effective. With the bomber as the primary target, the priority of fighter design changed. Its performance now became all-important; maximum speed, rate of turn, climb and ceiling all were increased at the expense of manoeuvrability. Two guns became the norm, which was further improved, and better gun sights were provided.

#### **PERIOD 1939 TO 1945**

In 1930, it became increasingly clear that Germany was bent upon a policy of aggressive expansion. The new Luftwaffe had become a larger and more effective force. A major European war had become just a matter of time. The pot came to boil on September 1, 1939, when Poland was invaded; Britain and France honoured the guarantee of Polish sovereignty and declared war on Germany.

Britain had the Royal Air Force (RAF) busy building the strategic bomber force, while fighter squadrons were reequipped with eight gun monoplanes, the Hurricanes and Spitfires. The Fighter Command had, in fact, equipped and trained for the wrong war. The projected threat consisted of a large fleet of unescorted bombers heading in over the North Sea, and virtually all fighter command tactics and training had been planned to counter this.

The first theory to be disproved was that close formation of bombers could defend them against fighter attacks. On December 14, 1939, 12 Wellington bombers fitted with powered gun-turrets attacked German shipping and were intercepted by German fighters; 5 aircraft were lost.

Similarly, two days later, 22 Wellingtons were intercepted and 12 were shot down. The loss rate became unsustainable and the RAF, thereafter, changed over to night bombing.

### **BATTLE OF BRITAIN**

In July 1940, Britain stood alone. A few miles away across the gray waters of the English Channel lay the world's mightiest air force, flushed with victory. The pre-War Fighter Command and RAF had prepared to meet an onslaught by massive formations of unescorted bombers. This was no longer the case; single-seat fighters could and did escort the bombers. The odds lengthened immeasurably. But the RAF had one last card to play. Well before the war, an integrated detection, command and control system had been set up; it formed a chain of radars around the coast, and an invisible electronic beam searched the air far out to sea, and where the channel was narrow, deep into France. They could pick up targets 100 miles away and give accurate range, height and number of raiders. Behind the radars, lay observers reporting visual sightings to the control centres. They enabled the British fighters to scramble and effectively engage the intruders. By modern standards, the reporting was crude and inaccurate but proved good enough.

The Battle of Britain was actually an air campaign, with minor skirmishes on one day and major fights on others. The aim of the Luftwaffe was to force Britain to surrender with intensive bombing; failing that, to create conditions suitable for a sea-borne invasion by gaining and maintaining air superiority over the landing areas. The initiative lay with the Luftwaffe. All the RAF did was to respond to each threat as best as it could. For the RAF, the saving grace was that the Me-109, the first most potent German jet fighter, had only a limited radius of action, while the long range Me-110 had proved no match for the Spitfires and Hurricanes. To avoid interception, German reconnaissance aircraft flew ever higher, to such a stage that definition of their cameras was compromised. They could still see which British airfields were in use, but not what was using them. Consequently,

heavy attacks were mounted against airfields of coastal or training commands, targets that were irrelevant to defeating the RAF fighter force. German losses for the six days amounted to 244, of which 125 were bombers; nor were the losses of RAF fighters light at 100 for the same period. Subsequent hard fighting and continued German attacks on the British bases took an increasing toll of British fighters. Similarly, raids on London by the Luftwaffe also resulted in heavy losses to the Germans, and the day assaults were terminated. They conceded that the RAF had wrested the daylight air superiority from the Germans over Britain, and Hitler's dream of invading Britain had shattered. The first night interception by the RAF, with the airborne interception radar, was attempted during this period.

This was the first air campaign in which ground forces played no part. The Battle of Britain remains a landmark in air combat history.

#### **PERIOD 1946 TO 1958**

A truism of both World Wars was that the one who had height control had control of the battle. Height depended largely on the engine's available power. By 1946, piston engines had reached their final limit, and the future lay with the jet engines.

#### **WAR OVER KOREA**

In fighters, the trend of "ever higher" reached its peak in the Korean War. In June 1950, opposed by the Far Eastern Air Force of the United States, the small and obsolete air force of North Korea was swept off the sky; American fighters and bombers were able to give their full attention to close air support (CAS). The ground campaign was successful and by November, UN troops had advanced almost to the borders of the People's Republic of China.

At this point, the Chinese joined the war in overwhelming numbers and thrust the UN troops back. At the same time, the Russian swept wing fighters rose from the air bases in China to join the fray. For many years, it was neither known nor admitted that most of the MiG-15 pilots who flew in

Korea were Russians, since the MiG-15 had only begun to equip the Soviet units in 1949–50. The first jet-to-jet air combat in history took place on November 8, 1950, and an F-80C shot down a MiG-15. On the following day, a US naval fighter downed another. Consequently, B-29s, which were bombing the north so far in relative safety, became vulnerable, and the escorting F-80s were unable to protect them adequately. The US inducted the F-86, Sabre, at this juncture. A few of these arrived in December 1950 and encountered MiG-15s for the first time on December 17, 1950. Ahead lay almost 31 months of incessant fighting in a battle for air superiority which became legendry.

At the armistices in July 1953, the USAF claimed a victory rate of 14:1, but these were officially amended to 7.5:1, the actual figures being 757 kills to 103 losses. However, the Russians denied this and claimed that 1,097 UN planes were shot down by them, 651 of them being F-86, for 335 losses on their side. The Korean War conclusively demonstrated the importance of aircraft performance. The straight wing fighters were outclassed.

### **INDUCTION OF ANTI-BOMBER WEAPONS**

Atom bomb attacks on two Japanese cities during World War II had ushered in not only a new weapon but also a dimension of mass destruction and catastrophic consequences associated with it. This made the world stand up and think of a counter, or a viable deterrent. The USSR responded to the nuclear threat by 1950, by demonstrating that it had both the nuclear weapons and the fast jet fighters. And the West followed suit.

Advancement of aircraft technology in 1950 had reached a tempo as never before, but the fear that the bombers carrying a nuclear bomb were, by and large, unstoppable by the conventional fighter cannons, led to the next step, that was to develop homing missiles which would follow the target and destroy it. Thus, the beam riding, semi-active radar homing (SARH), infra-red homing (IR) and active radar homing (AR) methods of missile guidance came into vogue. These finally emerged as operational

AIM-7 (SARH) and AIM-9 (IR) air-to-air missiles (AAMs). However, the British Fire Streak and Red Top were superior to these.

As interception became automated, a fighter became less of an aeroplane and more of an integrated weapon system. The first fighter designed as such was the F-102, which entered service in 1956 and carried six Falcon missiles internally. Later, the F-106 entered service with autopilot and fire control system linked to the semi-automated ground environment system (SAGE), which could control interception directly from the ground.

The first supersonic fighter that entered service in 1953 was the F-100, Super Sabre, capable of Mach 1.26. It was followed by the MiG-19 at Mach 1.35 and F-104, Star Fighter in 1954 with Mach 2.2. Meanwhile, the British introduced the Hunter aircraft, a day fighter armed with four 30 mm cannons, and Golster javelin with delta wing as an all-weather fighter. English Electric Lightning, developed from a high speed researched design was capable of Mach 2, as a short-range point-defence interceptor. In France, Dassault had produced a range of post-War jet fighters, culminating in Mirage-III, a tailless delta. This later became famous in Israeli service in the 1960s as the home defence interceptor.

#### **ADVANCEMENTS AND COMBATS AROUND THE GLOBE, 1958 TO 1997**

The 1950s saw maximum speed of fighter aircraft more than double; the climb rate nearly tripled; and the ceiling rose at least by a quarter. It also saw a new breed of dedicated and extremely specialised interceptors, peaking with the F-106, Delta Dart and the Russian MiG-25, Fox Bat. But these could do no more than attempt to achieve a 100 per cent kill rate, with little prospect of success.

To prevent the uneasy peace, deterrence looked a better prospect. Resources were poured into bigger and better bombers, largely at the expense of developing fighters. The F-108 and F-103, the latter capable of Mach 3.7 and due to fly in 1960, were cancelled at this stage.

Meanwhile, other factors had crept into the calculations. Surface-to-air missiles (SAMs) were making enormous strides. These were believed to have a very high probability of kill and were more affordable than the manned fighters. As SAM systems improved and proliferated, the survival prospects of the manned bombers at high altitudes looked slim. The electronic counter measures (ECM) offered a hope, but little else. The bombers then did the obvious; between 1960 and 1963, they switched from high-level to low-level mode, training to deliver the weapon from below the radar cover.

Another advance at this stage was miniaturisation of nuclear weapons. This gave the much-neglected tactical fighter a new lease of life as an atomic bomb truck, using a low level delivery. It is, of course, true that as fighter performance expanded, guns became less effective. The greater speed and reduced turning ability of supersonic fighters made it ever more difficult to bear it on the target. A fashion of gunless fighters arose to which even the pragmatic Russians subscribed. The MiG-21 came to India without a gun, and the gun pod was optional.

### **ARAB-ISRAELI WARS**

An incident in 1967, which resulted in the loss of six Syrian MiG-21s to the Israeli fighters, triggered a war between the Arabs and Israel, which could no longer be delayed. The combined Arab forces of Egypt, Syria, Jordan and Iraq could muster over 200 modern MiG-21s and 400 older jet fighters, plus about three dozen TU-16 bombers. Opposing this, Israel had just 72 Mirage-III, 18 Super Mysteres and 80 other assorted old types of aircraft. The odds were heavy. To counter it, on the morning of June 6, Israel launched preemptive strikes in quick succession on most airfields in Egypt, Syria, Jordan and Iraq. The Egyptian Air Force was reduced to manageable proportions by the simple expedient of blowing holes in the runways, and destroying a high proportion of its aircraft on the ground. It was a carefully rehearsed action which secured a brilliant victory for the Israeli air power in a classic manner. The Arab nations, in the first 48 hours, lost an estimated 451 aircraft on the ground and 58 in air combat. Israeli losses were 46, ten

in air combat. Surprisingly, all the Israeli victories were claimed with guns, even though AAMs were not only available but were used. Homing missiles exposed their serious limitations in hard-maneuvring low-level air combat. Besides, the Arabs lost 650 tanks against 100 of Israel.

The next Arab-Israeli War in October 1973 opened with the Egyptian Air Force air strike on Israeli targets in Sinai. In this war, for the first time, missiles of all types i.e. surface-to-air, air-to-air and air-to-ground were extensively used. These missiles were found highly accurate due to precision guidance, causing a very high attrition rate. One of the significant impacts of this was that the Israeli Air Force (IAF) no longer enjoyed the air superiority over the tactical areas of the Suez Canal zone, so far enjoyed by it. This weaponry was ably supported by effective use of a large number of Egyptian ground based radar controlled anti-aircraft (AA) guns and SAMs. The IAF was rendered inadequate against the new weapons. It was only after the crucial elements of Arab AA guns and SAMs were effectively silenced by the advancing Israeli Army formations that the IAF regained its offensive image and control of the skies. The precision guided munitions (PGMs) of different types took a heavy toll of aircraft, tanks and ships on both sides. The Arabs lost around 450 aircraft (370 in air combat), 2,000 tanks and 13 ships against the Israeli 105 aircraft (4 in air combat), 800 tanks and 3 ships. In air combat, 75 per cent of Arab aircraft which were shot down were by air-to-air missiles, and 30 per cent by guns. The Israeli centralised surveillance, command and control organisation, responsible for planning and control of all air operations, made it possible to coordinate and switch forces, when the situation demanded, from one front to the other.

#### **VIETNAM WAR**

Meanwhile, the Americans had become deeply embroiled against Vietnam. The USAF F-105 Thud assumed the role of a strategic bomber, using iron bombs. It was initially escorted by the F-100 and F-104, and later the role passed onto the Phantoms, originally carrier fighters with the USAF. The air war over North Vietnam differed considerably from every other

conflict of the era. Here, sea-borne air power played a vital role. The USAF assets, based in South Vietnam, were mainly engaged in what came to be known as the country war. Units based in Thailand, some 600 miles away from Hanoi, mounted attacks against North Vietnam. US Phantoms and Thuds, thus, were dependent on air refuelling to obtain necessary range. Most refuelling was carried out over Laos, in full view of North Vietnam radars. This made it impossible to conceal the approach of such strikes. The North Vietnam Air Force had insufficient strength to oppose the combined might of the USAF and US Navy; they decided to use their fighters in penny pockets to disrupt and harass American formations to force them to jettison their bombs short of the targets. Often they did not attempt to intercept at all; this made the American escorts a waste of effort and present extra targets for the Vietnamese SAMs and anti-aircraft guns.

North Vietnamese MiG-17s and MiG-21s were theoretically outmatched by the Phantoms and medium range Sparrow AAMs. The major problem with the AAMs was their rather long "minimum range." Once a MiG slipped into a position and remained closer than 2,500 feet from the Phantom, it was safe. Bombers carried the guns but the Phantoms escorting them did not, thus, the Phantoms became highly vulnerable in close air combat with gun bearing MiGs. Gun pods were hurriedly put in operation by mid-1967. These and some other factors, not mentioned for brevity, combined to ensure that the kill rate of 7.5:1 achieved in Korea was not even remotely reached. Fighting was of a low level of intensity and kill or loss ratio was at times adverse. The war eventually ended in a stalemate.

#### **GULF WAR: "OPERATION DESERT STORM"**

On August 2, 1990, Iraqi military forces, on orders from President Saddam Hussein invaded and occupied the small country of Kuwait. On January 17, 1991, a Multinational Coalition Force, led by the United States and mandated by the UN, mounted a 43-day campaign to vacate that aggression. Coalition objectives were to liberate Kuwait and destroy as much of the Iraqi military might as possible. In the process, own losses and civilian casualties were to be kept at minimum. Adequate time was made available for planning.

### ***Joint Operations and Air Campaign***

The Operation Rooms at the bases of the Coalition, specially the ones in Saudi Arabia and the American aircraft carriers, assorted ships and submarines in the Gulf, Red Sea and the Mediterranean, were agog with activity as the time to launch "Operation Desert Storm" closed in. It was culmination of planning and coordination of the highest order in the history of air warfare, employing such a variety and number of high-tech equipment, specialised types of aircraft, nationalities and air bases as far as the USA. The key application involved the theatre battle management close system (TBMCS), which planned 47,000 air missions flown during the war.

The air war began on January 17, 1991, with simultaneous and intensive Coalition air strikes with stealth F-117A and Tomahawk cruise missiles against Iraqi airfields, air defence installations, ground forces, oil industry, bridges and leadership. From the start, the US planes and cruise missiles were able to penetrate Iraqi air defences with near impunity and strike their targets with remarkable accuracy. During the initial phases of the war, the devastation caused by sheer weight, volume and precision of attacks induced a systematic shock and paralysis from which the Iraqi political and military leadership never recovered. Iraqi logistic and ground movement in selected areas was almost stopped. Within four days of the start of the counter-air campaign, the Iraqi Air Force went into hiding. Air strikes effectively knocked down the Iraqi air defence system and freed the air for Coalition use. The early attainment of air superiority enabled Allied forces to isolate the battlefield by interdicting enemy supply lines, denying Iraqi commanders the intelligence they needed from aerial reconnaissance, and degrading command and control links. To mount a genuine and credible air assault on Iraq, the Allied Coalition air forces flew 109,876 sorties and employed 2,430 fixed wing combat aircraft of several types like the F-117A stealth bomber, electronic warfare aircraft like the EF-111A and EA-68, F-4G SEAD aircraft, strike aircraft like the F-15E, F/A-18, F-111F, B-52, A-6E and Tornado GR1, and air superiority fighters like the F-15A/C, F-14A, F-16 and Tornado F3. There were also tanker aircraft and air-borne early warning, command and

control system aircraft (AWACS) like the E-3B AWACS and E-2C. Coalition forces also displayed some of the new weapon systems and technologies hitherto not seen in operation, such as laser guided bombs and missiles, electro optical guided bombs, PGMs, GLU-109/B, 2,000 lb bombs that could penetrate 28.8 feet of reinforced concrete, Maverick missiles which obtained catastrophic kills 80 per cent of the time when fired, satellites for weather, surveillance, navigation, guidance to targets, communications, and the global positioning system (GPS). However, the PGMs used during this operation formed only about 6.5 per cent of all weapons released from the air. In all, approximately 109,876 sorties were flown; out of these, 40,000 were strike missions that dropped 265,000 weapons.

The Iraqi Air Force response was very feeble, their radar and communication systems were largely wrecked in the first few hours of the war, and the few Iraqi aircraft to seek action flew unsupported. They were tracked soon after they got off the ground and were hunted down. The fact that the Iraqi Air Force lost only 34 aircraft during the war, most of those at night, was due to lack of opportunity for the Coalition pilots to find more targets in the sky. When the MiG-29s finally escaped for shelter to Iran, it was the final surrender of air supremacy to the Coalition air force.

Shortly after "Operation Desert Storm," Centcom Commander Norman Schwarzkopf said that the Republican Guards was destroyed and over 2,000 Iraqi tanks were killed from the air; the chief of staff of the air force announced that the F-117 stealth bomber had an 80 per cent hit rate; the navy secretary said that the Tomahawk cruise missile was 60 per cent effective, which many thought was low; and senior Pentagon bureaucrats declared "one target, one bomb" precision. However, when data was finally collected and assessed months later, it emerged that the Republican Guards had only 30 per cent of their tanks immobilised from the air and, in fact, only 17 per cent were actually hit. Of the 2,271 strikes tasked for F-117s, just 1,142 (50.3 per cent) were verified as hit target. Half of the Tomahawks failed to arrive at their intended targets. Instead of "one target, one bomb," it required 10 bombs to be successful against bridges, all of them precision guided ones.

This was a rather prolonged and intense Coalition air campaign to soften the Iraqi military forces and secure the battlefield. The main ground campaign occupied only the final 100 hours of the war. It turned out to be an unequal match though it had prospects of a keen contest on paper.

**BALKAN AIR CAMPAIGN: “OPERATION DELIBERATE FORCE,” 1995**

This was a UN sponsored operation against Bosnian Serbs to coerce political and military compliance; they had no air force. The UN multinational air force involved about 270 fighters and 76 support aircraft. During the 15 days of operation, a total of 3,515 aircraft sorties were flown to deliver 1,026 weapons against 48 targets, mostly the Serbs’ command-and-control structures. From its limited scale and the operational one-sidedness of this campaign, it emerges that the execution phase of the operation offered many insights into the application and usefulness of air operations in a complex regional conflict. Because the North Atlantic Treaty Organisation (NATO) commanders were concerned about getting the fastest possible results from the operations, while minimising collateral damage and casualties, exceptionally close control over the tactical events was maintained. Targets were carefully scrutinised and only PGMs became the overwhelming weapon of choice for air strikes.

We can describe the key characteristics of this campaign with some precision as a strategically limited, tactically intense, high technology Coalition air campaign, conducted under tight constraints of time and collateral damage. Commanders were free to make their plans and execute them within the limits described. It was a strong campaign, which had psychological benefits of the use of air power. A series of about 1,000 carefully placed explosives and a few seconds of cannon fire delivered the goods. Serb leaders acceded to the UN demands.

**KOSOVO CONFLICT: “OPERATION ALLIED FORCE,” 1999**

In the spring of 1999, the NATO Coalition again went to war against the Serbs. This time they faced the main forces of Yugoslavia, in Kosovo. The

attack was waged entirely by air, and employed 1,055 aircraft from fourteen countries, with the US handling 80 per cent of workload in 13,000 air strikes over the course of 78 days of air campaign. The Allies delivered 23,000 bombs and missiles, including 329 cruise missiles against 490 fixed targets and 520 mobile ones.

The campaign destroyed or severely damaged most of Yugoslavia's industrial and communication infrastructure, wrecked its economy, destroyed a large measure of its armour assets, inflicted 5,000 to 10,000 casualties, drove Serb forces from Kosovo and led to the toppling of Yugoslavia's government. Unlike in the Gulf War, NATO forces in Kosovo used an increasing number of unguided weapons. When this got combined with poor target information, caused by the absence of own ground forces, it induced significant collateral damage and civilian casualties, inviting severe criticism from the international community.

### **AFGHANISTAN WAR**

The campaign in Afghanistan followed the model of the previous three, and advanced over them. It was built around weapons operating at extremely long ranges, hitting targets with unprecedented precision, and relying as never before on gigabytes of targeting information gathered on the ground, in the air, and from space. US planes flew over 24,000 sorties, delivering 22,000 bombs, missiles, and other ordnance. Over 60 per cent of these weapons were PGMs. In Afghanistan, the old B-52s, that had carpet-bombed Vietnam, were guided by satellite-fed data from ground troops to drop bombs in designated 1,000-yard-long areas. The joint direct attack munitions (JDAM) kit that uses the GPS system to convert a dumb bomb with a 1,000 or 2,000-pound warhead into a smart one, most often supplied the precision. Of 6,650 JDAMs dropped in Afghanistan, the air force reports that less than 10 per cent missed their targets. The Taliban government fell in a few months, with only 4,000 US troops on the ground. It was evident that ever since the 1999 NATO bombing over Kosovo, it has refined its bombing capability.

### **GULF WAR II: “OPERATION IRAQ FREEDOM” (OIF), 2003**

This war was largely a United States and British invasion of Iraq. In many ways, it was an unfinished campaign of the earlier war in 1991. The event arose, in part, because the Iraqi government failed to cooperate fully with UN inspectors, who were searching for the suspected Iraqi nuclear facilities, and biological and chemical weapons of mass destruction, in the years following the first conflict. The main objective was to decapitate President Saddam Hussein’s regime and establish a democratic government in Iraq.

To realise the above aim, the doctrine emphasised, the war was to be kicked off with thousands of satellite-and laser-guided bombs dropped by airplanes, and Tomahawk cruise missiles fired from navy ships, hitting more targets per hour than the Allied air campaign hit in 43 days of the first Gulf air war. The use of such intense and enormous force in the right places was to breach the will of the enemy and make it ‘fold’ early. It was possible for that level of shock to be applied with modern hi-tech conventional mass destruction weapons. Since 1991, Iraq’s war-waging capacity had eroded considerably, and at the commencement of OIF, there was very little resistance that it could offer.

At the heart of the US plan was to attack the leadership, and draw the main bulk of the Republican Guards, the elite body forming the protective defensive ring around Saddam Hussein at Baghdad, into battle. Further, through intensive air strikes, to make them wilt, surrender or perish, to engender “psychological fracture” in the regime. Once that happened, the population and mass of the regular army would lose heart and give up the fight. Unlike in 1991, when the strategic air campaign had focussed heavily on infrastructure targets such as bridges, oil refineries and power stations, this time only presidential palaces, government ministries, command bunkers, air defence, military and police headquarters, sites associated with the weapons of mass destruction programme, and individual leaders were to be targeted. Emphasis was laid on giving the US Air Force the capability of effectively achieving these objectives. A cell to manage such attacks on

'time-critical' targets was set up inside the US Air Headquarters in Saudi Arabia.

The US Air Force began its assault on Iraq at 0305 hours, local time, on March 20, 2003, with an opportunist attempt to kill President Saddam Hussein and other leaders, with a salvo of some 40 cruise missiles, followed by smart bunker buster bombs EBGU-27 launched from two F-117A aircraft. Though stealth aircraft were used, as a measure of extreme precaution, the Coalition supported them by the EA-6B "Prowler" jamming aircraft and Tornado GR-4 suppression of enemy air defence (SEAD) strikes. Iraq responded six hours later by firing six Scud missiles into Kuwait. Coalition air power concentrated more on "regime" targets, Iraqi military, Republican Guards and anything else that could threaten the advancing Coalition ground forces. It was made a great success through 'networking' of surveillance, targeting, communications and the ability to execute compressed operations cycles and launch extended range precision strikes in response to 'real-time' demands.

The response of the Iraqi Air Force was non-existent, with their runways having been holed earlier and aircraft grounded years before this war broke out. The Coalition air power had complete air supremacy and dominance over the Iraqi skies, which allowed its ground forces to operate with much greater impunity than they enjoyed in 1991. Fighters, bombers, refuellers, AWACs, UAVs (unmanned aerial vehicles) and reconnaissance drones circled over target areas non-stop and unhindered to support ground forces. The combination of unrelenting reconnaissance, observations from the air and use of precision standoff weapons with devastating effect, presented the Iraqi land forces with a Hobson's choice. If they massed to take on the Coalition ground forces, they were clobbered and destroyed by air power, and if they tried to disperse to avoid aerial bombardment, the ground forces destroyed them with ease. A total of 1,801 combat aircraft of the US, UK, and Australia took part in this campaign and flew approximately 15,500 sorties delivering 27,000 weapons, 68 per cent of which were PGMs.

Air tasking orders (ATO) had a high proportion of pre-planned strikes prepared by the Air Operation Centre. The execution of that was undertaken by the combat operation section, which included the time-critical targeting (TCT) cell. This cell played a pivotal role in the air campaign, by managing an increasing number of air-borne platforms that did not take off with pre-planned targets. It had a full range of specialists, who, besides designating the targets, also worked out the potential collateral damage from the strike, and minimised that through selection of the safest weapon, and axis or angle of attack. However, in practice, the tenet of the standing rule of engagement of Western militaries that “above all other considerations, the soldier has the right to self-defence,” took precedence. The results were highly published incidents of collateral damage and friendly fire.

#### ***Role of Hi-Tech Weapons and Systems***

The underlying key factor for such great success in this air operation was employment of high technology weapons such as PGMs, JDAM, BGM-109 Tomahawk ship launched cruise missiles guided by GPS, master ordnance air blast bomb (MOAB), BLU-82 “Daisy Cutter,” BLU-118/B thermobaric weapon (FAE), guided bomb unit (GBU), wind corrected munitions dispenser (WCMD) CBU-103 to 105, GBU-37, to mention a few. Besides these, the use of the GPS for navigation and guidance of cruise missiles and bombs ensured accurate delivery of explosives on the designated targets. Even though the aircraft used by the Coalition to carry these weapons were mostly 20 plus years old, except for the B-2 Spirit and F-18 Super Hornet, those were suitably updated, modified and fitted with the latest offensive and defensive avionics, radars, new generation computers, expanded ECMs and enjoyed full avionics compatibility with ground control and command systems. In addition, the UAV Global Hawk and Predator were used extensively for reconnaissance, air observation, and later for missile delivery.

While in the 1991 War a total of 109,876 sorties were flown, out which 40,000 were strike sorties dropping 265,000 bombs, it appears remarkable that in OIF, only a total 41,000 sorties were flown, out of which 15,500 were

strike sorties using 27,000 bombs. The proportion of smart weapons used was much greater at 68 per cent compared to 6.5 per cent PGMs used in 1991. New inductions in this category were many satellite-guided bombs and missiles. Their extensive use and enhanced accuracy caused a decrease in the number of sorties, aircraft and weapons required to nearly one-third of those used in 1991, with drastically less collateral damage. This saw a definite shift from tonnage to “effect based” bombing. The phenomenon of mass destruction coexisted with precision attacks with conventional weapons.

**The US conclusively demonstrated that air power with PGMs could target and strike with great effect even in cities, with minimal collateral damage.**

This war was also highly “net centric” on account of vastly improved means of real-time information, surveillance and target acquisition. The systems integration modern integrative technology has revolutionised air warfare. Information technology has become an integral part of virtually every air-borne platform, including the UAVs.

The US conclusively demonstrated that air power with PGMs could target and strike with great effect even in cities, with minimal collateral damage. It used various types of UAVs for surveillance and such targeting, including the Global Hawk and Predator.

### ***Asymmetric Potential***

The use of high technology by the Coalition or NATO forces against the low-tech or no-tech Bosnia, Kosovo, Afghanistan and Iraq forces had been unilateral. The demonstrated impact of technology, thus, could be misleading. The same equipment used against an opponent of comparable potential would perhaps bring out the pitfalls in otherwise spectacular capabilities. Moreover, the extent of sophistication and heavy dependence on electronics renders most of the modern day systems prone to counter-measures, which in the case of Iraq were virtually non-existent or not put to credible use. This war, to an extent, turned out to be a mere testing ground for new weapons and hi-tech systems against real life targets instead of firing ranges.

## CONCLUSION

The last 90 years saw the origin, evolution and maturing of air power. The current warfare is moving into an era of dramatic political, technological and doctrine change, and air power must keep pace with it. The offensive

**The emerging technologies and new air-fighting concepts offer innovative and transformational ways to solve the chronic and emerging problems, beginning with dramatically heightened battle space awareness.**

application of air power in “Iraqi Freedom” has made a far more significant impact than it did a decade ago, particularly its “effect based” and “time-critical” targeting. The key to the success of such a doctrine was quality intelligence; the ability to digest,

process and disseminate multi-source/sensor material accurately in as near real-time as possible; and the ability to dynamically target in real-time. The use of brute ground forces is a thing of the past. The focus is on precision air power combined with special forces as the deciding factor in the conduct of future wars.

The emerging new technologies such as stealth, increasing nature of PGMs, and standoff weapons have greatly improved the effectiveness of the air strikes and reduced the risk associated with CAS missions to the air crew as well as to the friendly ground forces. Moreover, improved accuracy of weapon delivery means that the air force needs fewer weapons and fewer aircraft to achieve the same effect. But what has been significantly demonstrated is the importance of integrated communication, command and control systems, and intelligence system for opportunity and time-critical targeting.

The emerging technologies and new air-fighting concepts offer innovative and transformational ways to solve the chronic and emerging problems, beginning with dramatically heightened battle space awareness. Warfare itself, and the adversary’s clever moves and adaptations require continued refinement of air and ground abilities, in both the technical and creative realms. Today’s short, swift, rapidly moving air warfare and its tight time schedule demands that when war breaks out, those in the saddle are found on the ball. ■