CSFO LESSONS FROM MAJOR INTERNATIONAL WARS/ CAMPAIGNS

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There are no secrets to success. It is the result of preparation, hard work, learning from failure.

— Colin Powell[1]

The character of the air-land battle has changed with time. Counter-Surface Force Operations (CSFOs) have continued to play a major role in conflicts since World War II. Wars become de-facto testing grounds for the test of many concepts and the evolution of further ones. The character of air-land battles changes as per the situation, and adapts accordingly. An analysis of modern conflicts such as in Korea, Vietnam, Arab- Israel conflicts, Iraq, Kosovo and Afghanistan has brought out such trends, where differing local conditions and political restraints have had an enormous effect on how such battles were conducted and the degree to which they were successful. In Vietnam, for example, the strategic interdiction campaign known as Rolling Thunder (1965–68), was largely unsuccessful. The dense jungle terrain, poor intelligence on enemy movements, and political restrictions on targets made US air interdiction efforts largely futile. In contrast, coalition air

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1. Colin Powell, Joseph E Persico, *My American Journey, 1996.* Accessed at https://www.goodreads.com/author/quotes/138507.Colin_Powell.

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interdiction efforts in the 1991 Gulf War were extremely successful in isolating frontline Iraqi units from their bases in the rear. Intelligence derived from space and airborne sensors gave an unusually clear picture of enemy locations and the open desert terrain similarly facilitated air interdiction operations.

This paper seeks to analyse the major international conflicts in the context of CSFOs in support of the air-land battle and draw relevant lessons from them. The wars sought to be examined are those in which CSFO operations were extensively carried out. Only the wars post World War II are being examined, as these are more contemporary to the trends and concepts prevalent today, which can be related to the Indian Air Force (IAF) environment. These also bring out the evolution of relatable concepts and technological advancements which shaped the conduct of the air-land battle.

1973 ARAB-ISRAELI WAR

Narrative

The Yom Kippur War, Ramadan War, October War or the 1973 Arab–Israeli War, was a war fought by a coalition of Arab states led by Egypt and Syria against Israel from October 6 to 25, 1973. Egypt and Syria wanted to regain the Sinai and Golan Heights respectively, which had been captured by Israel in the 1967 Six-Day War and also avenge the humiliation inflicted as a consequence of the massive defeat suffered during that war. The war began after a sustained period of preparations and capability build-up, when the Arab coalition launched a joint surprise attack on Israeli positions on Yom Kippur, the holiest day in Judaism, which also occurred that year during the Muslim holy month of Ramadan. Both the

United States and the Soviet Union initiated massive resupply efforts to their respective allies during the war.

The 1973 Arab–Israeli War, was a war fought by a coalition of Arab states led by Egypt and Syria against Israel from October 6 to 25, 1973. Egypt and Syria wanted to regain the Sinai and Golan Heights respectively, which had been captured by Israel in the 1967 Six-Day.

The war began with a massive and successful Egyptian crossing of the Suez Canal. After crossing the ceasefire lines, the Egyptian forces advanced virtually unopposed into the Sinai peninsula. After three days, Israel had mobilised most of its forces and managed to halt the Egyptian offensive, settling into a stalemate. Likewise, the Syrians coordinated their attack on the Golan Heights to coincide with the Egyptian offensive and initially made threatening gains into Israeli-held territory. Within three days, however, the Israeli forces had managed to push the Syrians back to the pre-war ceasefire lines. They then launched a counter-offensive deep into Syria. Within a week, Israeli artillery began to shell the outskirts of Damascus. Likewise, the Israelis counter-attacked at the seam between the two Egyptian Armies, crossed the Suez Canal into Egypt and began slowly advancing southward and westward towards Suez, in over a week of heavy fighting that inflicted heavy casualties on both sides. Offensive air support and surface-to-air guided weapons played major roles in shaping the outcome of the war and also in large attrition of surface and air forces.

On October 22, a United Nations brokered ceasefire was initiated but it quickly unravelled, with each side blaming the other for the breach. By October 24, the Israelis had improved their positions considerably and completed their encirclement of Egypt's Third Army and the city of Suez. As a result, a second ceasefire was imposed cooperatively on October 25 to end the war.

The war had far-reaching implications. The Arab world, which had been humiliated by the lopsided rout of the Egyptian–Syrian–Jordanian alliance in the Six-Day War, felt psychologically vindicated by the early successes in the conflict. In Israel, despite impressive operational and

tactical achievements on the battlefield, the war led to the realisation that there was no guarantee that it would always dominate the Arab states militarily[2]. This war also exemplified and brought out a lot of lessons on the conduct of CSFO missions in a dense Air Defence (AD) environment and the emergence of the concept of Suppression of Enemy Air Defence/ Destruction of Enemy Air Defence (SEAD/ DEAD) operations as the prerequisite for the conduct of CSFO. The situation is similar to the current Indian scenario for both the northern and western fronts.

Inferences and Lessons

This war saw a maturity in the conduct of CSFO in a dense AD environment. It also brings out very valuable lessons *on the conduct of aerial warfare against well trained and well prepared forces*. The major inference and lessons pertaining to CSFO are the following:

- The close air support role was commenced from the eighth day onwards. Ground offensive and interdiction, however, started from day one.
- The campaign showed the vulnerability of aircraft to Surface-to-Air-Missiles (SAM), Anti-Aircraft Artillery (AAA) and enemy air. There were losses to the tune of 16-20 aircraft per day from each attacking side versus 04- 06 AD aircraft.
- The campaign showed the vulnerability of helicopters in the battlefield.
- The campaign showed that the air defence had to be neutralised prior to undertaking CSFO missions. CSFO could only progress fruitfully after air defence was neutralised and enemy air was put out of action.
- Towards neutralising the enemy AD, dedicated DEAD missions were carried out along with surface troops, to blast or create a corridor. Once an opening in the air defence corridor was created, ground and air action was progressed through that opening.
- Good, integral AD was a must for the ground troops. There was a lot of attrition suffered when the troops ventured out of the cover of integral SAMs.

2. "Yom Kippur War", (2015) Accessed from https://en.wikipedia.org/w/index.php ?title=Yom_Kippur_War&oldid=683423898.

- The mobility and munition holdings of ground AD systems is limited. This aspect could be exploited by opening up more fronts and by saturation ingrained with decoys.
- The efficacy of cluster bombs fitted with varying time delays was seen, which disrupted a larger area for a longer period of time.
- Interdiction sorties were aimed at cutting off the resupply.
- The war saw innovative use of passive AD measures such as burning of tyres and barrels to create heat and for smoke generation to degrade thermal and TV pick-up of the air munitions.
- Multi–tiered and very high air defence density proved to be very effective in preventing enemy air action. Considerable delays and losses had to be suffered before overcoming AD.
- The SAMs could also extend their influence to cover the Tactical Battle Area (TBA) across the borders.
- There was fratricide to the tune of 40 aircraft, caused due to a lack of awareness and coordination with Army AD.
- The primacy of Counter-Air Operations (CAO) including SEAD/ DEAD as a facilitator for CSFO, was clearly established.
- Lack of night strike capabilities facilitated resupply and replenishments, allowing an opposing AD and surface force build-up.
- Efficacy of enemy AD was overcome through low altitude, high speed and single pass runs and also through terrain masking, where applicable.
- Deeper targets were found to be defenceless. Hence, air interdiction against deeper targets by routing through the created AD gaps proved to be very effective.
- There was a critical requirement of escort and SEAD aircraft to provide cover from air and ground threats to CSFO aircraft in the TBA.

1982 LEBANON WAR

Narrative

The 1982 Lebanon War by Israel began on June 6, 1982, when the Israeli Defence Forces (IDF) invaded southern Lebanon. This was after a period

which saw repeated attacks and counter-attacks between the Palestine Liberation Organisation (PLO) operating in southern Lebanon and the IDF, which caused civilian casualties on both sides of the border. The military operation was launched after PLO gunmen attempted to assassinate Israel's ambassador to the United Kingdom. This was treated as a *casus belli* for the invasion. Israel's publicly stated objective was to push the PLO forces back 40 km to the north. The Israeli forces pushed in from Southern Lebanon in a three-pronged offensive. They captured strategic positions throughout the country, with some of the fiercest fighting taking place at Beaufort Castle, Nabatieh and the Syrian-held town of Jezzine.

In an effort to establish air superiority and greater freedom of action, the Israeli Air Force launched the air operations with an intensive DEAD campaign. In the first attack on June 9, 1982, the Israeli Air Force destroyed 17 of the 19 Syrian SAM batteries and their radar sites as well as 29 Syrian Air Force (SAF) fighters, without any loss.[3] During the course of the operation, the Israeli Air Force scored a dramatic victory over the Syrians, shooting down more than 80 Syrian planes and destroying 30 Syrian anti-aircraft missile batteries, with no air-to-air losses of its own. The Israeli Air Force thereafter conducted successful ground attack missions against Syrian and PLO targets in the battlefield as well as in urban areas. Israeli attack helicopters inflicted heavy losses on Syrian armour, including some of the modern Soviet T-72 main battle tanks and destroyed a majority of the Syrian anti-aircraft batteries stationed in Lebanon.

Inferences and Lessons

The major inference and lessons pertaining to CSFO operations are the following:

- The conflict brought out that the attainment of control of air was achieved through neutralising *both* the air and ground AD threats. This was achieved by carrying out dedicated DEAD and Counter-Air Operations (CAO) under intensive offensive Electronic Warfare (EW) cover.

3. Matthew M. Hurley, "BEKAA Valley Air Battle, June 1982: Lessons Mislearned?", *Airpower Journal,* Winter 1989.

- As a lesson learnt from the 1973 War, where ground AD systems reduced the effectiveness of CSFO, this campaign showed how the ground AD environment could be overwhelmed by employing superior tactics and decoys, to neutralise enemy Command and Control (C2) systems and technology concurrently through a dedicated DEAD campaign, prior to undertaking CSFO missions.
- Technology asymmetry played a major part in achieving control of the air in a swift manner.
- Attack helicopters were used effectively against tanks by employing anti-tank munitions.
- The Bekaa Valley battle was the first combat involving the use of modern Airborne Warning and Control System (AWACS) aircraft for vectoring fighters to their targets and managing the overall air battle situation.[4]
- The Israelis also demonstrated considerable technical prowess in efficiently managing own Command, Control and Communication (C3) systems while working to obstruct Syrian C3 systems.
- This war saw the emergence of the Remotely Piloted Vehicle (RPV) for extensive intelligence gathering for months preceding the invasion and as decoys to trick the Syrians into activating their SAM target acquisition and tracking radars.
- The war also introduced the overwhelming importance of winning the war in the fourth dimension (i.e. electronic warfare and C3) for undertaking successful air-land battles.
- The Bekaa Valley air battle also demonstrated the need for an effective doctrine, organisation and for an understanding of joint operations.

1991 GULF WAR

Narrative

The Gulf War, also known as the Persian Gulf War, First Gulf War, Gulf War I, Kuwait War, First Iraq War or Iraq War, was a war waged by coalition forces from 34 nations, led by the United States, against Iraq, in response

4. Ibid.

By the time the ground war began, the Iraqi ground forces had been hit by more than 40,000 attack sorties. Coalition air power caused the desertion of as many as 84,000 Iraqi personnel and destroyed 1,385 Iraqi tanks, 930 other armoured vehicles and 1,155 artillery pieces.

to Iraq's invasion and annexation of Kuwait in August 1990. An array of nations joined the coalition, the largest military alliance since World War II. The great majority of the coalition's military forces were from the US, with Saudi Arabia, the United Kingdom and Egypt as leading contributors, in that order. Air power played a critical role during the war. This was a war which was covered live and has seen voluminous literature on the conduct of the campaign and lessons.

It consisted of two major phases, namely, **Operation Desert Shield** from August 2, 1990 to January 17, 1991, for operations leading to the build-up of troops and defence of Saudi Arabia; and **Operation Desert Storm,** from January 17, 1991 to February 28, 1991, in its combat phase. During the five and half months of Operation Desert Shield, US and coalition forces poured into the theatre to deter further Iraqi aggression and to set the stage for offensive actions. During Operation Desert Storm, the combined attack on Iraq began in the early hours of January 17, 1991, with an independent air campaign and ended on February 28, 1991, after a four day combined forces ground and air assault. This was a decisive victory for the coalition forces, who drove the Iraqi military from Kuwait and advanced into Iraqi territory. The coalition ceased its advance and declared a ceasefire 100 hours after the ground campaign started. Aerial and ground combat was confined to Iraq, Kuwait and areas on Saudi Arabia's border.

At the opening of Desert Storm, coalition aircraft faced extensive Iraqi air defences incorporated into a complex and fully Integrated Air Defence System (IADS). In addition to formidable radar SAM batteries, the Iraqi military possessed a wide range of Infra–Red (IR) guided missiles and air defence artillery. By the time the ground war began, the Iraqi ground forces had been hit by more than 40,000 attack sorties. Coalition air power caused the desertion of as many as 84,000 Iraqi personnel and destroyed 1,385 Iraqi tanks, 930 other

armoured vehicles and 1,155 artillery pieces. They severely damaged Iraq's nuclear reactor facilities, three chemical and biological weapons production facilities, 11 storage facilities, 60 per cent of Iraq's major command centres, 70 per cent of its military communication, 125 ammunition storage revetments, 48 Iraqi naval vessels and 75 per cent of Iraq's electric power generating capability. It cut Iraq's flow of supplies to the theatre by up to 90 per cent. One Iraqi prisoner of war stated later that his brigade suffered more losses under 30 minutes of air attack, than it had during the entire Iran-Iraq War.[5]

The air campaign objectives that were formulated are given below:

- Isolate and incapacitate the Iraqi regime, namely, leadership command facilities, crucial aspects of electricity production facilities that power military and military-related industrial systems, telecommunications and C3 systems.
- Gain and maintain air supremacy to permit unhindered air operations by targeting strategic IADS assets, including radar sites, SAMs, IADS control centres, air forces and airfields.
- Destroy Nuclear, Biological, Chemical (NBC) warfare capability, namely, the known NBC research, production and storage facilities.
- Eliminate Iraq's offensive military capability by destroying major parts of key military production, infrastructure and power projection capabilities in the form of military production and storage sites, Scud missiles and launchers, production and storage facilities, oil refining and distribution facilities, naval forces and port facilities.
- Render the Iraqi Army and its mechanised equipment in Kuwait ineffective, causing its collapse by targeting railroads, bridges connecting the military forces to means of support, and army units to include the Republican Guard Forces in the Kuwaiti Theatre of Operations (KTO).

Based on these 5 objectives, 12 target sets were created. The target sets were interrelated and were not targeted individually. These are given below:

- Leadership Command Facilities.
- Electricity Production Facilities.

5. *US Congress Report on 1991 Gulf War, GW-7 Air Offensive,* October 15, 1994, p. 481.

- Telecommunications, Command, Control, and Communication Nodes.
- Strategic Integrated Air Defence System.
- Air Forces and Airfields.
- Nuclear, Biological and Chemical Weapons Research, Production, and Storage Facilities.
- Scud Missiles, Launchers, and their Production and Storage Facilities.
- Naval Forces and Port Facilities.
- Oil Refining and Distribution Facilities.
- Railroads and Bridges.
- Iraqi Army Units including Republican Guard Forces in the KTO.
- Military Storage and Production Sites.

The total air effort in terms of sorties and types of targets engaged is tabulated below:[6]

Table 1: UN Coalition Air Strikes by Mission during Desert Storm

Type of Mission or Target	Number of Strikes Flown	Percent of Total
Strategic - Largely Civilian		
Leadership	260	0.6
Electric Power	280	0.6
Oil/Refinery/Fuel	540	1.3
Telecoms/C4	580	1.4
LOCs	1,170	208
Total	2,830	6.7
Strategic - Largely Military		
Military industry	970	2.3
Nue/Chem/Bio	990	2.3
Scuds	1,460	3.5
Naval Targets	370	0.9
Total	3,790	9.0
Counter-Air		
Airfields	2,990	7.0
Air Defence (KARI)	630	1.5
Surface-to-Air Missiles	1,370	3.9
Total	4,990	11.8
Against Iraqi Ground Forces	23,430	55.5
Total Categorised by Mission	35,040	82.3
Uncategorised (largely against ground forces)	35,040	82.3
Total	42,240	100%

6. Ibid., p.483.

Inferences and Lessons

The major CSFO inferences/ lessons that can be derived are given below:

- Detailed analysis and targeting of the Iraqi IADS was a key element to coalition success. Advanced technology drove the plan; precision weapons, stealth technology and computer driven command and control allowed coalition forces to dismantle Iraqi defences.
- The method for producing the daily attack plan involved synthesising many inputs, namely, Battle Damage Assessment (BDA) from previous attacks, detailed intelligence guidance, weather, target set priorities, new targets, intelligence, and the air campaign objectives. The available aircraft, Special Operations Forces (SOFs) and other assets were then assigned on the basis of ability and the most effective use of force.
- One of the most tragic lessons was that fratricide was still a problem on the modern battlefield.[7] Of the 247 battle related deaths in Desert Storm, 35 of these casualties were the result of friendly fire despite measures such as markings on the top and sides of vehicles.
- Employing weapons in the midst of friendly ground forces requires pilot skills that must be practised on a continuing basis. The difficulty with multi-role strike aircraft is that they require pilot capabilities for a vast range of possible combat tasks.
- Despite the high technology and overwhelming air power, coalition forces never adequately controlled the low altitude environment below 10,000 ft due to the Man Portable Air Defence System (MANPADS).
- CSFO forces were still required to support ground manoeuvre units despite the relentless pounding of enemy positions prior to the ground war.
- Despite the success of air power, the introduction of ground troops was ultimately required to bring the war to a successful conclusion.
- The coalition flew a total of 1,170 strikes against Iraqi Lines of Communication (LOCs) during the Gulf War. Bridges were key targets in these attacks.

7. Leon E. Elsarelli, *From Desert Storm To 2025: Close Air Support in the 21st Century,* Research Report, Air Command and Staff College, USA, April 1998.

- Interdiction bombing severely damaged enemy's lines of communication; some forward deployed units had severe food problems; little maintenance took place and troops moved away from their equipment. Many of the units under heavy air attack, decided to surrender at the first opportunity.[8]
- A concept of demarcated kill box area was evolved to facilitate quick response, de-conflict and give responsibility amongst the coalition forces, once control of air was established. This comprised squares of 30 miles on each side. Each box was sub-divided into four quadrants and assigned to a flight for a given period of time. Forward Air Control (FAC) and attack squadrons were repeatedly assigned to specific kill boxes to improve their familiarity with an area.
- The surge in close air support and interdiction attacks before the land battle helped the coalition destroy or suppress much of Iraq's artillery in the forward area and to further weaken Iraqi forces in the path of the coalition advance.
- Aircraft were allocated according to "demand pull" in response to requests for air support from ground force commanders. It pushed forward sorties to support the ground force commanders at regular intervals based on the tactical situation. The air liaison officer in each ground corps would check in regularly with the ground commander.
- If a ground commander had targets, he would get air support. If not, the Airborne Battle Command and Control Centre (ABCCC) aircraft [AWACS, Joint Surveillance Target Attack Radar System (J-STARS)] could reassign the fighters to Advanced Tactical Fighter (ATF) based targets without wasting sorties. This system came to be called "flow Close Air Support (CAS)" and increased the responsiveness of air power to ground commanders.
- C-130s dropped BLU-82 15,000 pound bombs to create an overpressure that would detonate minefields and demoralise the Iraqi troops.
- The impact of the Gulf War in accelerating the transition to new offensive air technologies is an important lesson of the war.

8. n. 5.

- Post the war, a major effort was made to ensure that all aspects of the US Air Force (USAF), US Navy and US Marine Corps air, C4I/BM systems were fully interoperable, with quick-reacting communications, computer and intelligence support.
- Requirement of an effective and quicker BDA capability.
- Requirement of regular joint exercises to ensure familiarity and faster indoctrination during actual operations.
- Only 200 of the aircraft could attack with Precision Guided Munitions (PGMs) and only 7 per cent of all the munitions used were precision weapons.[9]
- Pertaining to weaponeering, there was a need to:
  - Develop methods of attack and delivery that are more accurate at altitudes about 10,000-15,000 ft.
  - Upgrade guidance systems on laser-guided bombs to increase their range and reliability.
  - Develop conventional deep shelter killing munitions that can be linked to the use of unattended ground sonars to "map" the shelter or underground facility before it is attacked to ensure an effective level of destruction.
  - Develop lethal and self-guiding sub-munitions.
  - Improve the fusing in many conventional bombs and sub-munitions.
  - Develop lower cost glide bomb conversions to provide cheap stand-off capability.[10]
- Precision weapons can only be effective if precise intelligence data is available.
- Aircrew need to have Air Tasking Orders (ATOs) at least six hours prior to take-off in order to plan interdiction missions properly.
- Attacks on Lines of Communications (LOCs) cannot be successful if limiting collateral damage is given a higher priority than effectiveness. Limiting collateral damage imposed additional constraints. There are problems in mixing politics with operational effectiveness.

9. Ibid., p.488.
10. Ibid., p.526.

Unlike the deserts of the Persian Gulf, Bosnia was a mountainous country with thick vegetation and rudimentary transportation infrastructure. Targets in Bosnia had the ability to hide in dense foliage, disperse in mountainous terrain and select from a variety of advantageous engagement areas.

- The war was marked by the introduction of live news broadcasts from the front lines of the battle, which brought in public and political opinions, which could be detrimental to, or influence, war-fighting.

KOSOVO WAR

Narrative

On the heels of Desert Storm, Bosnia-Herzegovina declared independence from Yugoslavia in 1992. The resulting civil and ethnic war resulted in 145,000 civilian casualties and an estimated two million refugees by mid-1995. Such widespread devastation prompted a U.S led coalition involvement in the crisis and eventual commitment of ground forces to stabilise a fragile peace agreement.

Unlike the deserts of the Persian Gulf, Bosnia was a mountainous country with thick vegetation and rudimentary transportation infrastructure. Targets in Bosnia had the ability to hide in dense foliage, disperse in mountainous terrain and select from a variety of advantageous engagement areas. In addition to radar guided SAMs, the Serb and Croat forces possessed a variety of IR guided SAM systems and a vast number of AAA pieces. These systems included the SA-6, -7, -9, -14 and –16 as well as air defence guns ranging in calibre from 20mm to 90mm. The planners of Desert Storm used the same target categories as in the previous wars.

Inferences and Lessons

This is an example of conducting aerial warfare using technology in mountainous regions. The CSFO inferences/ lessons are given below:

- As air defence systems (particularly surface-to-air missiles) have grown more sophisticated, SEAD has become the primary initial operation to be undertaken.

- Disabling the electric grid created a lot of effect in isolating the battlefield, communications and control.
- Lack of targeting data and target identification was the single greatest constraint on air operations.
- Coalition forces ran out of targets to be engaged by air.
- Targeting within Serbia was also limited by the reluctance of the North Atlantic Treaty Organisation (NATO) partners to inflict suffering on the civilian population.

The successful insertion of a small number of US SOF teams into Afghanistan after 11 days of bombing signalled the onset of a new use of air power in joint warfare, in which air force terminal attack controllers, working with SOF spotters positioned forward within line of sight of enemy force concentrations, directed precision air attacks against enemy ground troops who were not in direct contact with friendly forces.

OP ENDURING FREEDOM

Narrative

The attacks of September 11, 2001, thrust the United States into a no-notice war against Osama bin Laden, his Al Qaeda terrorist network and transnational terrorism across the board. The first round of this war was Operation Enduring Freedom, an air-dominated offensive conducted by the US Central Command (CENTCOM) against Al Qaeda forces in Afghanistan and against the Taliban theocracy that provided them safe havens. In less than a month and from a standing start, the United States commenced combat operations in a landlocked country half the world away.

The plan was to rely on air power and precision weapons, aided on the ground by US Special Operations Forces (SOFs), who would work alongside indigenous Afghan groups opposed to the Taliban and identify and validate targets for allied aircrew. On October 7, 2001, a joint war against Al Qaeda and the Taliban began at night with strikes against 31 targets, including early warning radars, ground forces, command and control facilities, Al Qaeda infrastructure and Taliban airfields. The successful insertion of a small number of US SOF teams into Afghanistan

after 11 days of bombing signalled the onset of a new use of air power in joint warfare, in which air force terminal attack controllers, working with SOF spotters positioned forward within line of sight of enemy force concentrations, directed precision air attacks against enemy ground troops who were not in direct contact with friendly forces. By December, many campaign goals had been achieved and the campaign moved to the high mountain caves at Tora Bora, where the dispersed Al Qaeda and Taliban fighters had fled.

Inferences and Lessons

This war is an example of evolving aerial warfare using technology in low intensity conflicts and terrorism. The CSFO inferences/ lessons are given below:

- This was the first time a country fought a war from land bases and aircraft carriers, positioned very far away from a combat zone, which is known as Out of Area Contingency (OOAC) operations. One B-2 mission lasted 44 hours from take- off to landing, becoming the longest air combat mission flown in history.
- The war saw a further improvement of some important trends that began during the Gulf War a decade earlier. Precision weapons accounted for nearly 70 percent of the munitions expended versus only 9 percent during Desert Storm.
- The war saw the first combat use of the new Global Hawk high-altitude, Unmanned Aerial Vehicle (UAV), the first operational use of Predator UAVs armed with Hellfire missiles and the first combat use of the highly accurate, all-weather Joint Direct Attack Munition (JDAM) by the B-1 and B-52 aircraft.
- For the first time in modern warfare, airborne and space-based sensors provided a constant flow of information about enemy force dispositions and activity.
- The greatest tactical innovation of the war was a unique air-land partnership that featured unprecedented mutual support between allied air power and ground-based SOF teams. Unlike traditional close air

support that entails concurrent air and ground schemes of manoeuvre, SOF units in Afghanistan enabled precision air strikes against enemy ground forces even when there were no friendly ground forces in direct contact.

- Global communications connectivity and common operating picture obtained by linking the inputs of UAVs and other sensors enabled a close partnership between airmen and SOF units and shortened the time from identification to successful target attacks. Such networked operations are now the cutting edge of CSFOs.[11]
- Once the air component became fully engaged, the concentration of aircraft over the embattled area required unusually close coordination among the many participants and controlling elements.
- In a surprising and negative trend, despite the success of joint operations seen previously, the ground operations phase saw a single Service centralised planning and execution that yielded undesirable consequences. The ground-oriented nature of the ground battle plan meant that before D-Day, neither US ground nor air forces had engaged in the kind of close, careful cooperation and joint planning that normally would have been deemed necessary to mount a major CSFO operation from the onset of the battle. The airmen were left in the dark and were requisitioned on emergency when the ground forces were under attack.
- The war saw the dominance of fused information from platforms and munitions as the principal enabler of the campaign's success in the end. That new dynamic made possible all other major aspects of the war, including the integration of SOFs with precision-strike air power, the minimisation of target-location error, avoidance of collateral damage and command from the rear.
- The war saw the need to give flexibility to the 72-hour air-tasking cycle as also to shorten it.

11. Benjamin S. Lambet, *Air Power Against Terror: America's Conduct of Operation Enduring Freedom* (RAND Corporation, 2005).

PLAUSIBLE LESSONS FOR CONTEMPORARY OPERATIONS

Plausible lessons that can be derived are given below:

- The Close Air Support (CAS) role was commenced from a later stage. The ground offensive and interdiction, however, started from day one.
- CAS forces were still required to support ground manoeuvre units despite the relentless pounding of enemy positions prior to the ground war.
- The campaigns showed the vulnerability of aircraft to SAM, AAA and enemy air. There were losses to the tune of 16-20 aircraft per day from each attacking side versus 4-6 AD aircraft. Despite the high technology and overwhelming air power, coalition forces never adequately controlled the low altitude environment below 10,000 ft due to MANPADS.
- Good integral AD is a must for the ground troops. There was a lot of attrition suffered when the troops ventured out of the cover of integral SAMs.
- The campaigns showed that the air defence had to be neutralised prior to undertaking CSFO missions. It could only progress fruitfully after all the air defence was neutralised and enemy air was put out of action. As air defence systems (particularly surface-to-air missiles) have grown more sophisticated, SEAD has become the primary initial operation to be undertaken.
- The wars saw innovative use of passive AD measures such as burning of tyres and barrels to create heat and smoke to degrade thermal and TV pick-up of the air munitions.
- The efficacy of cluster bombs fitted with varying time delays was seen, which disrupted a larger area for a longer period of time.
- One of the most tragic lessons from recent combat experiences is that fratricide is still a problem on the modern battlefield.
- The campaigns showed the vulnerability of helicopters in the battlefield.
- The Bekaa Valley war saw the emergence of the remotely piloted vehicle for extensive intelligence gathering for months preceding the invasion and as decoys to trick the Syrians into activating their SAM target acquisition and tracking radars.

- The Bekaa Valley battle was the first combat involving the use of modern AWACS aircraft for vectoring fighters to their targets and managing the overall air battle situation.
- The war also introduced the overwhelming importance of winning the war in the fourth dimension (i.e., electronic warfare and C3) for undertaking successful air-land battles.
- The concepts of the demarcated box area, "demand pull" and "flow CAS" were evolved to facilitate quick response, de-conflict and give responsibility amongst the coalition forces during the Gulf War. These were effective but were enabled only once 'control of the air' was established.
- Concepts such as AWACS reassigning CSFO targets in flight as per situation or dropping of heavy calibre bombs to create overpressure and detonate minefields could be looked into.
- Aircrew need to have Air Tasking Orders (ATO) at least six hours prior to take-off in order to plan interdiction missions properly.
- There is a need to shorten the existing Command Air Tasking Orders (CATO) cycle as also make it more flexible.
- There is a need to invest more resolutely in unmanned platforms such as Global Hawk high-altitude UAV and Predator type of UAVs armed with Hellfire missiles. This is the possible future of CSFO missions.
- In a surprising and negative trend, despite the success of joint operations seen previously, the ground operations phase of Operations Anaconda, a part of Operation Enduring Freedom, saw a single Service centralised planning and execution that yielded undesirable consequences.
- The later wars saw the dominance of fused information from platforms and munitions as the principal enabler of the campaign's success in the end.
- Precision weapons can be effective only if precise intelligence data is available. Lack of targeting data and target identification was the single greatest constraint on air operations.
- The method for producing the daily attack plan involved synthesising many inputs, namely, Battle Damage Assessment (BDA) from previous

A strategic group or an extra-government organisation like the Centre for Air Power Studies (CAPS) could be given the task of providing strategic long-term vision documents, White Papers and corresponding roadmaps.

attacks, detailed intelligence guidance, weather, target set priorities, new targets, intelligence, and the air campaign objectives. The available aircraft, SOFs and other assets then were assigned on the basis of ability and the most effective use of force.

- Net-centricity and ability to collate fused information in real-time from various platforms is the way forward. As seen from the recent wars, airborne and space-based sensors provided a constant flow of information about enemy force dispositions and activity. This would also solve the persistent problem of attaining timely and correct intelligence.
- The contemporary wars were marked by the introduction of live news broadcasts from the front lines of the battle which brought in public and political opinions which could be detrimental to, or influence, war-fighting.
- It can be seen that the unconventional threats may not require large forces or capabilities. Therefore, certain units could be earmarked for the different threat scenarios over and above the conventional threat and additional capabilities in terms of equipment and weaponry could be built up accordingly. In creating such specialised units, the IAF as an organisation would thereby be able to handle a larger spectrum of threats.
- From the perspective of long-term procurement plans towards capability enhancement, the IAF needs to look out for technologies that could enhance its capabilities in the future and must have a plan and roadmap to absorb such technologies. This tasking could also be supplemented to extra-government organisations in addition to specialised in-service directorates.
- A strategic vision, periodical review for relevance, progress on roadmaps, continuity of conceptual thought processes, capability build-up, etc. are facets of strategic military thinking that need to be delinked from active

Service Directorates which get fully involved in daily/ routine functions, which would cloud this long-term vision. A strategic group or an extra-government organisation like the Centre for Air Power Studies (CAPS) could be given the task of providing strategic long-term vision documents, White Papers and corresponding roadmaps.

The stunning effectiveness of offensive aerial operations has showcased air power as an increasingly powerful and flexible instrument for the pursuit of political objectives. In this dynamic environment, it is essential to have a clear understanding of the attributes, limitations and potential of air power to enable its optimum exploitation for furthering national objectives.

CONCLUSION

The contemporary global environment is characterised by change and the future is expected to be no different. Modern day wars are increasingly being affected by the fundamental changes taking place not only in the areas of technology, but also in the geopolitical environment. Political, social, economic and cultural factors are exerting an inordinate influence on the conduct of warfare. The role of military power has increased, as security concerns spread beyond national boundaries. By its nature, aerospace power is futuristic and increasingly utilitarian.[12] Air power, with its attributes of rapid mobility, reach and flexibility has, in the past, demonstrated the capability of being able to change the paradigm of warfare by ensuring that troops or marine vessels could be targeted regardless of their domains. The stunning effectiveness of offensive aerial operations has showcased air power as an increasingly powerful and flexible instrument for the pursuit of political objectives. In this dynamic environment, it is essential to have a clear understanding of the attributes, limitations and potential of air power to enable its optimum exploitation for furthering national objectives. The changing threat perception and military landscape of the future would,

12. Fali H. Major, "Indian Air Force in the 21st Century: Challenges and Opportunities" (Institute for Defence Studies and Analysis), *Journal of Defence Studies*. vol 2, Summer 2008.

however, require a certain degree of adaptability for air power to optimise in the expected threat scenario. In that light, it becomes important to constantly reevaluate existing concepts and methodologies in vogue and update them where necessary in order to stay relevant.