# AIR DEFENCE

## SHINING JEWEL OF OPERATION SINDOOR

The dastardly attack on innocent civilians on 22 April 25, by terrorists in Pahalgam, set into motion a series of events that almost led to a nuclear war between two hostile neighbours, India and Pakistan. With the killing of 26 innocent civilians on religious lines, India had reached her limit of tolerance and needed to respond tellingly. The pressure from the populace was rising by the day, and tempers were running high. The Resistance Front (TRF), believed to be an offshoot of Lashkar-e-Taiba (LeT), initially claimed responsibility but later denied it.

### Formidable Air Defence (AD): A Critical Necessity to Launch Offensive

To launch any military offensive into enemy territory, a foolproof Air Defence (AD) is a must to safeguard against retaliation and also to protect own offensive platforms from enemy AD. With advancements in military hardware, particularly air-launched beyond visual armament, it is very challenging to launch any offensive deep into enemy territory. Another complexity has arisen due to the extensive usage of unmanned platforms for all kinds of air operations. The increasing usage of low-cost drones in warfare has added to the complexity of providing AD against such platforms.

*DRDO Netra Mk1 AEW&CS in flight deploying flares (credit IAF)*

The Indian response had to be calibrated with this backdrop. This was also the first opportunity for the Indian military to synergise its operational capability and execution after a very long time. Having drummed up support at the international level and domestically, India finally launched **'Operation Sindoor'** on the night of 6-7th May 25. The preparation for Civil Defence and announcing that it will be practiced simultaneously in all 244 districts on 07th May was a great diversion. It also oriented the population for any eventuality and to be prepared to assist in minimising the impact of an enemy attack.

### Own AD: Strength, Capability and Integration

To keep the Indian skies safe, a formidable AD is set up by the Indian Air Force (IAF), who are entrusted with this responsibility. This task is on a 24x7 basis, even during peacetime. The four major functions of AD are Detection, Identification, Interception and Destruction. AD is organised through **Air Defence Identification Zones (ADIZ)** within which the responsibility of all AD Functions is allocated to various Command and Control Centres established for this purpose. In peacetime, the interception and, if required, the destruction part is generally undertaken by fighter aircraft. During wartime or on activation, however, the missiles and guns of all three services are used for the purpose, which are seamlessly integrated into the overall AD System.

The IAF undertakes these AD Functions through **Integrated Air Command and Control System (IACCS),** an indigenously developed system which integrates all ground and air-based radars of the military, weapon systems including the aircraft, civil radar network, communication grid to all sensors and shooters and other networks like Akashteer of Indian Army, similar systems of the Navy and even the Ballistic Missile Defence System. With the acquisition of the S-400 AD Missile system, capable of intercepting long-range to medium-range threats (40-400 kms), the already potent AD system comprising MRSAM (approximately 70 km range) and the Akash Missile system (approximately 25-70 km) has been bolstered further. In addition, legacy systems like Pechora SAM, OSA-AK, and shoulder-fired Igla provide a layered AD shield.

In war and active operations scenarios, the AD systems of the Army are also integrated, comprising Akash Missile Systems, L-70 guns, Zsu-23 Schilka guns, Igla and other QRSAMs, as was evident in the present conflict. Akashteer, under development for quite some time, was finally contracted by the Army last year, and the system was fielded for the first time. According to the reports, the system proved its mettle by integrating all Army AD weapons and radars, providing a clear air picture and the requisite information to all Army AD Control Centres, Control Posts, and Missile/Gun positions promptly. The fusion of data, dissemination of information through the vertical chain of command, and integration with mother systems like IACCS in real-time were key to successful engagements of enemy drones, missiles and other projectiles.

The newly acquired S-400 proved a successful deterrent to enemy air power and an effective interceptor to enemy missiles targeted at our strategic assets. With a detection capability of 600 km and an effective kill range of 400 km, its deployment threatened Pakistan Air Force (PAF) aircraft even deep inside their territory. This gave India an offensive defence capability like never before and thus was a game-

*Akash Prime Surface to Air Missile (Credit DRDO)*

*The Russian SA-3 Pechora Surface to Air Missile, Deployed 5P73 four rail launcher (images © 2009, Miroslav Gyűrösi). (representational image)*

changer. Indigenously developed Akash missile system was another shining jewel in the hands of the IAF as well as the Indian Army. The MRSAM added punch to the overall AD capabilities of India. Thus, a multilayered AD system, effective from ground level to the stratosphere, was ensured.

The two most important components were the IACCS and the fleet of multi-role / AD fighters like Rafale, SU-30, Mirages and MiG-29 UG, which remain active even during peacetime. Besides the formidable platforms, the enhanced capability of the recently acquired and inducted air-to-air missiles made the AD of the country impregnable. The air-to-air missiles in the Indian inventory include Meteor and Astra class with ranges over 150 km. IACCS is the brain of the complete AD system, controlling the entire airspace of the country on a 24/7 basis, even during peacetime. The system integrates all AD elements, including ground-based radars, AWACS/AEW&C, airbases, weapon systems, civil radars, Ballistic Missile Defence systems, and the networked systems of other services like Akashteer of Army and similar systems of the Navy. All these entities are connected through a robust communication grid. The IACCS are manned by professional crew, like Fighter Controllers, who undertake all the functions of AD, including controlling all air missions and the Missile Liaison Teams from various missile systems like S-400, MRSAM etc. While IACCS is responsible for the entire country and works on the area defence concept, systems like Akashteer provide all-around cover for point defence or for limited areas in the designated Tactical Battle Areas. All these AD systems worked in a flawless manner in **Operation Sindoor.**

### Offensive AD: Fierce Air Battle

On the night of 06/07th May, when the civilian populace in India was trying to figure out their role, responsibility, processes and procedures of civil defence, Indian Armed Forces launched an aerial offensive to neutralise nine carefully chosen terrorist infrastructure and training centres. The air strikes on nine targets hit the training camps and infrastructure of terrorist groups Jaish-e-Mohammed (JeM) and Lashkar-e-Taiba (LeT). The targets included Markaz Subhan Allah, Bahawalpur, JeM's main centre for training and indoctrination, and operational headquarters. The facility included the residences of JeM chief Maulana Masood Azhar, and other family members. Another important target was Markaz Taiba, Muridke, the main training centre of LeT, which provided arms training and religious indoctrination for recruits from within and outside Pakistan. Sarjal/Tehra Kalan, Punjab, was the launching facility of JeM's and was used for tunnel construction, drone operations, and smuggling of arms and narcotics. Similarly, Mehmoona Joya Facility, Sialkot, belonged to Hizbul Mujahideen (HM), Markaz Ahle Hadith, Barnala, Bhimber, was one of the important Markaz of LeT in Pakistan Occupied Jammu & Kashmir (PoJK), Markaz Abbas, Kotli, was a JeM facility led by Hafiz Abdul Shakoor and Maskar Raheel Shahid, Kotli, an HM facility, was capable of housing 150-200 militants. This camp specialised in arms training, sniping, Border Action Team actions, and survival skills in hilly terrain. Other targets included Shawai Nallah Camp, Muzaffarabad, which was a LeT

camp, where the 26/11 attackers trained and Markaz Syedna Bilal in Muzaffarabad, which was JeM's main centre in PoJK.

The terrorist groups were equipped by the Pakistan Army with military-grade weapons and communication equipment and training. The Indian attacks were *"focused, measured, and non-escalatory"*. These attacks were reportedly carried out by IAF aircraft using SCALP missiles and AASM Hammer glide bombs, over a 23-minute duration. Reportedly, BrahMos cruise missiles as well as the Indian Army's Indo-Israeli Sky Striker loitering munitions were also used in the operation. A large number of terrorists, including 14 members of the Masood Azhar family, were killed in these attacks. No Pakistani military facilities or civilians were targeted.

Pakistan acknowledged that the strikes were conducted without any of the Indian aircraft entering Pakistani airspace. However, in their hurriedly called briefing to international media and diplomats on 7th May, a PAF official explained in great detail that India had amassed more than 70 aircraft for the attack, and many of India's aircraft were lost to the action of PAF through air-to-air engagements ably supported by the AEW&C aircraft. The briefing, however, was more for narrative building and as a face saver than factual on any count, as no evidence was there to support it. It is, however, possible that a large number of aircraft would have been involved in the attack, as many would be decoys and supporting missions to ensure the deception and safety of our offensive missions. Similarly, in all likelihood, PAF would certainly have activated their AD to the highest level and would also have scrambled a large number of aircraft, considering their good AEW&C fleet and the number of ground radars that would have been scanning their airspace.

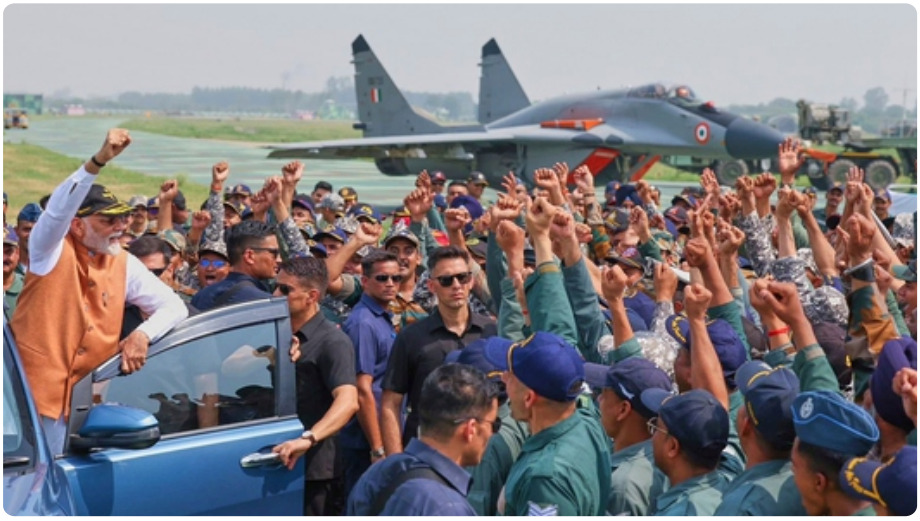
But the formidable Indian AD provided by long-range AD missiles and excellent radar coverage at all levels integrated into IACCS, probably kept the PAF at bay. In any case, PAF would not have dared to commence a war by firing first at IAF aircraft. The PAF did fire the air-to-air missile, as was evident from the unexploded PL-15 missile which was found nearly intact in Hoshiarpur. These probably could have been fired once the targets were already attacked inside Pakistan. It was possibly against such fired and misfired missiles that the PAF would have counted its success. In addition, the decoy drones imitating the electronic signature of Su-30 and MiG-29 must have also been targeted by the Pakistani AD units. These Decoy Drones reportedly were used to deceive the PAF AD and also to expose its disposition of AD assets, which were then taken down in the next wave of the IAF attack.

### Attack on Enemy AD Capabilities: Clearing Path for Offensive Missions

Since Pakistan attacked Indian military installations and civilian targets the next night, India launched an offensive in the morning hours of 09th May on PAF AD units, including the HQ-9 Surface to Air Missile, Command and Control Centres and its ground radars. This was in response to Pakistan's relentless drone/artillery attacks on Indian positions and to neutralise PAF AD assets to clear the way for a subsequent offensive mission, if needed. The IAF launched a massive air strike using the Israeli Harop Loitering Munitions to neutralise the AD systems near Lahore. It included the main radar and the Chinese HQ-9 SAMs. Destruction of HQ-9 Battery at Lahore was of critical importance as it was close to the border, and with its approximately 120 km range, it was a major threat to our aircraft operating deep inside our territory. In another important raid, the anti-stealth YLC-8E radar at Chuniyan was targeted. The AD assets were destroyed at the following places in Pakistan:

- Pasrur, Sialkot district, Punjab

*Akashteer System - Integrating Army radars and weapons(Credit PIB, India)*



*Prime Minister Narendra Modi greets Indian Air Force personnel during a visit to Air force station Adampur, 13 May 25 ((Indian Prime Minister's Office on X via AP)*

- Sialkot, Punjab
- Chunian, Kasur district, Punjab
- Lahore, Punjab
- Malir Cantt, Karachi, Sindh

In subsequent attacks by IAF on PAF airfields on 10 May 25, there were significant attacks on AD assets, which included a Hangar housing SAAB 2000 Erieye AEW&C aircraft at Bholari Airfield. In this attack, one Squadron Leader (an AD Controller) and five airmen also died, and at least one AEW&C aircraft was damaged. At Nurkhan airbase, two shelters were specifically targeted, which were supposedly the Mobile Mission Control Centres. Thus, the AD of PAF took quite a beating in this conflict. In addition to the physical attack, the PAF AD systems were rendered inoperative during the main offensive on 10 May through very successful electronic warfare against the radars and missile systems of Pakistan.

### Final Assault on PAF Airfields

After causing a heavy dent on the PAF AD systems the previous night, IAF now launched a major assault on all major airfields housing the nuclear-capable aircraft. Operation centres, aircraft hangars, runways and many other critical assets at these airfields were also targeted. Reportedly, 15 indigenously made BrahMos missiles were launched at 11 PAF airfields, which included Nurkhan, Sargodha, Bholari, Rafiqui, Jacobabad, Murid, Rahimyar Khan, Sukkur, Pasrur, Chuniyan and Skardu. The attack on Nurkhan, Bholari and Sargodha, particularly, impacted the PAF psyche the most. All these airfields, besides housing critical military assets, had major command and control establishments of repute. The attacks were precise, targets were carefully chosen, and execution was perfect. A panic was created that some of the nuclear assets had been damaged. The result was devastating, beyond the imagination of the Pakistan leadership. It immediately scrambled to seek US intervention. In a flurry of activities that ensued, the US suggested that the Director General of Military Operations of Pakistan should request his Indian counterpart to stop further attacks. This was a classical Counter Air Operation (CAO) by the IAF, well assisted by effective AD that ensured that the PAF was pinned down. The constant airspace monitoring by various airborne and ground-based radars, and aircraft, and missiles on full alert under the overall architecture of IACCS ensured that all the offensive missions attained their objectives without incurring any loss to their own assets.

### Indigenisation: The Key to Success in Establishing Formidable AD

One of the key factors in setting up a formidable AD was the indigenously developed sensors, systems and weapons used for the AD of the country. At the centre of this was the IACCS, the brain of the Indian AD System, an indigenously developed system integrating every element of AD, to facilitate effective protection. Akashteer is another networked solution for integrating the sensors and weapons of the Army in the 'Tactical Battle Area', developed indigenously. It was the Akashteer and its integrated guns and radars that saved the day for India in forward areas. It is a containerised system, highly mobile, which provides command and control to Army weapons at the 'Joint Air Defence Centres' established for the purpose. These centres are connected back to IACCS, which coordinates the overall AD of the

country. Most of the radars of the Indian Army and the IAF are indigenously developed and thus easily integrated. Even the airborne command and control system, AEW&Cs of the IAF, Netra I, is indigenously developed. While the main AD weapon of India, S-400, is of Russian origin, other equally potent missile systems, which played a key role in this conflict, have been developed indigenously. Out of these, the Akash Missile system is fully indigenous and was used in forward areas. The MRSAM has been co-developed by the DRDO with an Israeli company. Some of the QRSAMs and shoulder-fired missiles have also been developed indigenously and were effectively used. One of the most effective weapons against the swarm drone attacks employed by IAF and IA has been the indigenously developed non-kinetic counter-drone systems, comprising RF Jammers and Laser-based systems.

### Modernisation of Legacy Systems: Thoughtful Optimisation

One of the hallmarks of this conflict was the usage of legacy systems, which had long gone past their prime. The L-70 Guns of 1960s origin have been improvised with better radars and systems, and similarly, the Schilka and ZSU-23 twin guns. In classical air warfare of a few years back, where the targets were attacked with stand-off weapons/missiles, these point defence weapons had almost become irrelevant. These however, proved very effective against the drones. The Pechora or SAM III would have been phased out a long time back since Akash had replaced them, but the IAF persisted with these weapons with a bit of upgrade. Similarly, the OSA-AK or SAM-8 missiles were retained, upgraded and used effectively in this conflict. The IAF also innovatively used some of the old air-to-air missiles and converted them for the surface-to-air role and used them effectively in this conflict.

### To Sum Up: AD, the Shining Jewel of the Conflict

This conflict will be remembered for various reasons: for just 23 minutes of coordinated firepower that rained down on terrorist infrastructure deep inside Pakistan, shocking the terror network; for the shock and awe created in just 90 minutes to target all major airfields of the PAF, unsettling that country; and for the precise, carefully chosen targets and well-crafted political signaling. However, above all, this conflict will leave an everlasting memory of thousands of drones, projectiles, and missiles flying in all directions and being neutralised consistently by our AD. The AD of the country served its nation exceptionally well, saving thousands of civilian lives as well as critical military and civil infrastructure. Even sweeter was the fact that most of the weapons used were indigenously developed, and the personnel operating those weapons and systems were entirely Indian, unlike some Turkish and Chinese personnel involved with Pakistan on the other side.

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*Air Marshal VPS Rana, PVSM, VSM (Retd) served in many important operational as well as administrative appointments. He commanded an AD Radar unit during "Kargil Operations" and was instrumental as Director (Operations), in the development and operationalisation of IACCS. A Category 'Aye' Master Fighter Controller, he has been an instructor at Defence Services Staff College, Wellington and also at Defence Services Command and Staff College Lusaka, Zambia. He also served as Director Air Staff Inspection (C&R) and later assumed the command of 'Air Force Administrative College'. He was Air Officer-in-Charge Administration (AOA) during the COVID crisis and coordinated the overall IAF effort in supplies, administration and medical response. His academic qualifications include Post Graduation in Plant Breeding & Genetics and Defence Studies, PG management diplomas in public administration and business administration and M Phil. He is presently working as Chief Advisor, Himalay Unnati Mission (HUM), a movement to preserve, protect and resurrect the ecological, economic, cultural and spiritual heritage of the Himalayas. He is the author of 'Invisible Warriors', a book on the Air Defence of India. Besides writing on service matters, he has also published works on water security and environmental issues.*

**Air Marshal VPS Rana**