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CUAS and Air Defence Triumph in Operation Sindoor

Squadron Leader Sriram Rajan

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In early May 2025, after a brutal terror strike in Pahalgam, India launched Operation Sindoor – a precise, measured retaliation against nine terror camps in Pakistan and PoK (Pakistan-occupied Kashmir). Pakistan responded immediately with a massive aerial offensive. Hundreds of drones swarmed Indian airspace. Pakistan also fired rockets/missiles at military bases and airfields across the western border. Official briefings reported 36 intrusion attempts involving approximately 300–400 UAVs spread between the Himalayas and the state of Gujarat.[1] [2] In this high-stakes clash, India's integrated Air Defence network – combining modern CUAS (Counter UAS) and upgraded legacy systems besides modern weapon systems held firm and countered the assault. All Pakistani UAVs and munitions were detected and neutralised with no breach of Indian airspace.[3]

The Pakistani strike package was multi-dimensional. Preliminary sources indicated that many hostile drones were Turkish-built Kamikaze UAVs (Asisguard Songar), designed to destroy radars and Air Defence assets.[4] [5] Missiles and rocket salvos also targeted forward bases in the states of Jammu & Kashmir and Punjab. These nighttime swarms, including smaller UAVs, that are invisible to radars, represent a classic swarm drone threat. [6] By sea and land, Pakistan has amassed low-cost aerial threats to saturate defences.[7] In this context, India's CUAS strategy, which integrates innovations with guns and missiles, has been thoroughly tested.

Integrated C2 and CUAS

At the heart of India's response was its networked command and control (C2). The IACCS (Integrated Air Command and Control System) of the Indian Air Force (IAF) and the Army's new Akashteer ground-based C2 system combined all radar and sensor data into a single, common air picture.[8] IACCS integrated airborne and ground-based sensors, handing a Recognised Air Situation picture (RASP) to every weapon system. Akashteer (linked to both Army and IAF radars) automatically detected and classified every threat over the tactical area and then allocated the appropriate weapon system.

Sources report that during Operation Sindoor, "not a single drone completed its mission", wherein every hostile UAV/drone was picked up by the Integrated C2 network and eliminated. This level of automation is similar to the integrated Iron Dome and Iron Beam, which has proven its capabilities in fast-paced drone battles.

Hard-Kill Solutions: Missiles and Guns

Modern Indian hard-kill weapons played a pivotal role in Operation Sindoor. The indigenous Akash Missile System (AMS) was deployed extensively by the Army and the IAF, effectively neutralising drones and missiles.[9] The MRSAM (Medium Range Surface-to-Air Missile), jointly developed by the Defence Research and Development Organisation (DRDO) and Israel Aerospace Industries (IAI), provided robust protection against aerial threats.[10]]The modern S-400 missile system, with its extraordinary range, decimated high-altitude threats, thereby adding strategic depth to the Air Defence network.[11]

In addition, the DRDO's D4 CUAS and laser gun systems, equipped with advanced detection and neutralisation capabilities, countered swarm drone infiltrations.[12] [13]

The upgraded legacy systems also performed well during the operation. Pechora, a legacy SAM system, demonstrated its reliability post upgradation, thereby reinforcing the Air Defence capability.

Artillery guns, such as the 40mm L70 (integrated with Flycatcher radars) and the 23mm Shilka guns, enhanced the low-altitude defence capability. Reports confirm the critical role played by these artillery guns in neutralising threats.

This combination of advanced indigenous systems, upgraded legacy assets, and cutting-edge technologies ensured the decimation of over 50 enemy drones and missiles during Operation Sindoor, with no Indian losses.[14]

Soft-Kill Solutions: Jammers and Electronic Warfare (EW)

Indian anti-drone jammers and Radio Frequency (RF) countermeasures further strengthened the Air Defence setup. The Army and the IAF employed indigenous CUAS jammers that could deny control links (Drone with Controller) and delink GPS signals of drones. These systems, developed by the DRDO and industry partners provided adequate asset protection. Electronic Warfare rifles were also used to counter drones.

While soft-kill does not destroy UAVs, these systems neutralised many threats by disrupting signals intercepted.[15] Although these systems currently operate independently, their integration into IACCS and Akashteer's network could enhance drone warfare capabilities in the future.

Operational Success and Lessons Learned

The result has been a confident Air Defence posture for India. Official statements confirm that all air intrusions from Pakistan involving missiles and drones, were thwarted using hard-kill or soft-kill options.[16] [17] The Armed Forces reported "no casualties or material losses". Operation Sindoor demonstrated the efficacy of India's self-reliant Air Defence network by blending modern systems, such as AMS/MRSAM/SPYDER/S-400, with innovative systems like SAMAR (expired R-73 missiles converted into AD SAM), and upgraded legacy systems, including Pechora/L70.

Key lessons from Operation Sindoor include:

(a) Enhanced Night Operations: Smart systems with thermal image sensing and night vision capabilities, as well as the integration of CUAS, can mitigate vulnerabilities at night.

(b) Layered Defence Strategy: The present integration of systems has proved to be successful. However, the inclusion of CUAS in the network will fulfil the strategic needs.

(c) Indigenous Development: The integration of indigenous systems, such as IACCS, Akashteer, and AMS, has proven to be battle-ready. Modern indigenous CUAS systems designed to counter such threats are to be inducted and integrated into the existing network.

(d) C2 Systems: The implementation of automated C2 catering for real-time updates in terms of threat analysis and resource allocation, in conjunction with existing network background, can enhance the efficiency of the Air Defence network.

Conclusion

Operation Sindoor proved to be a testament to India's air defence strategy. It demonstrated the capabilities of indigenised weapons in an integrated Air Defence network while also proving its lethality.[18] As the future of warfare constantly evolves, lessons from Operation Sindoor will enhance the capability of the armed forces to maintain India's sovereignty over its airspace.[19]

Notes:

[1]"Turkish Drones used in Operation Sindoor," *Business Today,* May 20, 2025, https://www.businesstoday.in/india/story/after-celebi-asisguard-next-turkish-drone-maker-linked-to-golden-temple-attack-faces-probe-in-mp-476927-2025-05-20. Accessed on May 21, 2025.

[2]"Operation Sindoor Analysis," *Al Jazeera,* May 07, 2025, https://www.aljazeera.com/news/2025/5/7/operation-sindoor-whats-the-significance-of-indias-pakistan-targets. Accessed on May 20, 2025.

[3] "Sindoor's Layered Defence," *Economic Times,* May 17, 2025, https://economictimes.indiatimes.com/news/defence/operation-sindoor-indian-air-defence-units-thwarted-more-than-600-pakistani-drones/articleshow/121228543.cms. Accessed on May 21, 2025.

[4] "India's D4 CUAS in action," *NDTV,* May 10, 2025, https://www.ndtv.com/india-news/indias-home-built-d4-system-is-killing-pakistani-drones-all-about-it-8379576. Accessed on May 23, 2025.

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[7] Asif Shahzad, Shivam Patel, "Pakistan's response to Operation Sindoor," *Reuters,* May 08, 2025, https://www.reuters.com/world/asia-pacific/multiple-loud-explosions-heard-pakistani-kashmir-reuters-witness-2025-05-06/. Accessed on May 20, 2025.

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[9] Press Information Bureau, India, "Operation Sindoor – National Security innovation," May 14, 2025, https://www.pib.gov.in/PressReleasePage.aspx?PRID=2128746. Accessed on May 15, 2025.

[10]ibid.

[11] Press Information Bureau, India, "Forging India's unified defence grid," May 18, 2025, https://www.pib.gov.in/PressReleasePage.aspx?PRID=2129453. Accessed on May 21, 2025.

[12] Arzan Tarapore, "Layered Defence in Sindoor," *War on the Rocks,* May 19, 2025, https://warontherocks.com/2025/05/operation-sindoor-and-the-evolution-of-indias-strategy-against-pakistan/. Accessed on May 22, 2025.

[13]"SPYDER and SAMAR in Operation Sindoor," *The Times of India,* May 12, 2025, https://timesofindia.indiatimes.com/india/s-400-spyder-akash-indias-air-defence-systems-explained-amid-soaring-tensions-with-pakistan/articleshow/121017889.cms. Accessed on May 23, 2025.

[14] Arzan Tarapore, "Layered Defence in Sindoor," *War on the Rocks,* May 19, 2025, https://warontherocks.com/2025/05/operation-sindoor-and-the-evolution-of-indias-strategy-against-pakistan/. Accessed on May 22, 2025.

[15] "SPYDER and SAMAR in Operation Sindoor," *The Times of India,* May 12, 2025, https://timesofindia.indiatimes.com/india/s-400-spyder-akash-indias-air-defence-systems-explained-amid-soaring-tensions-with-pakistan/articleshow/121017889.cms. Accessed on May 23, 2025.

[16] Asif Shahzad, Shivam Patel, "Pakistan's response to Operation Sindoor," *Reuters,* May 08, 2025, https://www.reuters.com/world/asia-pacific/multiple-loud-explosions-heard-pakistani-kashmir-reuters-witness-2025-05-06/. Accessed on May 20, 2025.

[17] Press Information Bureau, India, "Operation Sindoor- National Security innovation," May 14, 2025, https://www.pib.gov.in/PressReleasePage.aspx?PRID=2128746. Accessed on May 15, 2025.

[18] Arzan Tarapore, "Layered Defence in Sindoor," *War on the Rocks,* May 19, 2025, https://warontherocks.com/2025/05/operation-sindoor-and-the-evolution-of-indias-strategy-against-pakistan/. Accessed on May 22, 2025.

[19] "SPYDER and SAMAR in Operation Sindoor," *The Times of India,* May 12, 2025, https://timesofindia.indiatimes.com/india/s-400-spyder-akash-indias-air-defence-systems-explained-amid-soaring-tensions-with-pakistan/articleshow/121017889.cms. Accessed on May 23, 2025.