Autonomous warfare in Operation Sindoor

In the recent India-Pakistan war, over four days of hostilities, both sides effectively rewrote their rules of engagement, ushering in a 'new normal' of airborne deterrence without pilots, but with autonomous platforms, armed drones and loitering munitions

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A soldier looks at a drone at the Akhnoor sector near the Line of Control (LoC) in the Jammu region on May 19. | Photo Credit: AFP

Launched in early May, in retaliation to the April 22 Pahalgam terror attack, Operation Sindoor marks a historic milestone, in which Unmanned Aerial Systems (UAS) played a primary role in direct military combat between two nuclear-armed neighbours, signalling an uncharted era of drone-centric warfare in South Asia.

Over four days of hostilities, both sides effectively rewrote their rules of engagement, ushering in a 'new normal' of airborne deterrence without pilots, but with autonomous platforms, armed drones and loitering munitions, all operating below the threshold of a full-scale war, and shaping a calibrated, escalation-managed conflict.

In the 48 hours preceding Operation Sindoor, Israeli Heron MK-II and indigenously designed TAPAS-BH-201/ Rustom-II-Medium-Altitude Long-Endurance (MALE) Intelligence, Surveillance and Reconnaissance (ISR) Unmanned Aerial Vehicles (UAVs) are believed to have flown deep into Pakistani airspace to gather electronic and signals intelligence and thermal signatures of suspected Islamist terror camps.

Thereafter, from May 7 onwards, after the Indian Air Force (IAF) attacked nine targets inside Pakistan, both sides employed a broad spectrum of UAS — from ISR UAVs to armed drones, kamikaze loitering munitions, electronic decoys and quadcopters — as dual-purpose tools for real-time intelligence gathering

and precision strikes. And as this drone war intensified, both countries sought to dominate the battlespace through persistent aerial surveillance by mapping out enemy air defences, missile batteries, command centres, troop clusters and logistical nodes. Decoy drones too were widely employed to spoof radars, 'bait' air defence systems and exhaust interceptors, minimising risk to manned assets, before ceasefire ensued on May 10.

India's array of aerial systems

In the intervening period, India claimed to have downed some 600 Pakistani drones, releasing intercepted footage and wreckage to reinforce its assertions in a high-stakes information war, paralleling the kinetic exchanges. Pakistan, in turn, alleged that 300–400 Indian drones had unsuccessfully targeted its military and strategic infrastructure, before being shot down. India has neither confirmed nor denied these avowals, citing Operation Sindoor's enduring operational status for its silence.

Open-source intelligence and drone-tracking data, meanwhile, revealed that India's offensive against Pakistan featured a diverse UAS inventory. It was spearheaded by indigenously developed loitering munitions like the GPS-guided Nagastra-1 and Israeli-origin Harop drones, capable of autonomously homing in on enemy radar systems.

To overwhelm Pakistan's air defences, India also deployed swarm drone formations developed jointly by the Defence Research and Development Organisation and private contractors to create radar clutter, trigger premature defensive responses and saturate surveillance networks. Priority targets included ammunition depots, Surface-to-Air Missile (SAM) batteries, radar sites, and forward operating bases.

The strikes were delivered in carefully sequenced waves. Initial sorties deployed decoy drones and electronic warfare payloads to saturate radar coverage and provoke early, albeit futile SAM launches. These were followed by precision loitering munitions and armed UAVs, guided in real-time by Heron MK IIs and TAPAS-BH-201/ Rustom-IIs. Quadcopters and micro-UAVs played a critical role in relaying live ISR feeds and target acquisition data via the Army's Integrated Battle Management System (IBMS) to forward units, ensuring dynamic targeting and reaction.

Notably, media reports claimed that India's drone strikes disrupted a cricket match in Rawalpindi, forcing a stadium evacuation due to air defence alarms. Another significant Harop strike, reportedly destroyed a Chinese-supplied HQ-9 air defence system near Lahore, delivering both a psychological blow and a strategic setback to Pakistan's layered air defence shield.

Consequently, military analysts noted that India's overwhelming use of varied UAS to deliver calibrated, cross-border strikes without risking manned aircraft, represented the emerging regional model of

deterrence. They said it also visibly showcased India's growing competence in autonomous, cost-effective, and networked warfare, demonstrating a significant shift in the balance of aerial power in South Asia.

Pakistan's retaliation

Pakistan, for its part, in its reactive Operation Bunyan-um-Marsoos (wall of lead), deployed a range of UAS, including its indigenously developed Shahpar (feather)-II MALE UAVs, armed Burraq (lightening) drones, Turkish-origin Bayraktar TB2s, and Chinese-supplied CH-4 and Wing Loong II platforms. These assets were complemented by CH-901 and WS-43 loitering munitions from China and domestically produced kamikaze drones, launched at multiple targets across a 1,500-kilometre expanse, stretching from Kashmir in the north to Bhuj in the west.

While the Shahpar-IIs, TB2s, and Wing Loong IIs primarily conducted ISR missions — streaming real-time imagery of Indian troop concentrations, artillery positions, and logistics depots — Pakistan's loitering munitions targeted radar stations, forward operating bases and critical Army and IAF command nodes in the northern and western sectors. However, these attacks were effectively neutralised by India's robust, multi-tiered air defence grid, inflicting minimal or no damage at all.

Strategic urban and military infrastructure hubs — including Jammu, Pathankot and Amritsar in Punjab, Bikaner and Jaisalmer in Rajasthan, and Bhuj in Gujarat — too were frequently targeted. But despite the density of these assaults, India's integrated air defence network —comprising layered radar coverage, SAM batteries, automated threat-response mechanisms, and upgraded Cold War-era legacy platforms and systems — mitigated damage, preventing disruption.

India's multi-layer air defence system

Pakistan repeatedly sought to probe and bring to heel India's Integrated Air Command and Control System (IACCS) — its air defence nerve centre — by launching drones via varied routes, altitudes and diverse timings, to disrupt its communication nodes and forward-deployed command centres, albeit unsuccessfully. The IACCS fuses surveillance inputs from ground-based radars, airborne early warning and control platforms, satellites, and other sensors into a centralised but distributed command-and-control network. It integrates with SAM systems and fighter aircraft, enabling the rapid detection, tracking, and interception of low-altitude threats, including UASs. Its built-in mechanisms ensured continuity of operations, even if any individual nodes were damaged, jammed or destroyed.

Pakistan attempted to overload the IACCSs radar coverage, confuse response loops, and expose vulnerabilities for follow-on drone or missile strikes. However, military officials confirmed the IACCS's

core network remained intact, with all and any temporary disruptions swiftly mitigated through alternate data links and pre-positioned mobile radars.

Analysts further noted the system's 'mesh' architecture allowed seamless failovers when nodes were hit, with satellite uplinks and mobile platforms sustaining full situational awareness. The IACCS also displayed its Directed Energy Weapons (DEWs) capability in which high-powered lasers or microwaves, via a real-time network, detected, tracked and neutralised airborne threats like drones speedily.

Complementing the IACCS at the tactical level was the Akashteer (Sky Arrow) air defence control and reporting system, developed by Bharat Electronics Limited, which provided a digitised command layer for Army Air Defence units, enabling seamless coordination between sensor units and weapon platforms. Designed to rapidly disseminate targeting data and manage low-level threats — including UAVs — it ensured that frontline SAM units could engage targets with minimal delay, even under electronic warfare or communication stress.

The accompanying air defence shield was built around a layered architecture combining retrofitted legacy Low-Level Air Defence (LLAD) systems with advanced missile platforms in an unparalleled innovative mix that remains a hallmark of the Indian military's improvisation.

Ingeniously upgraded with radar-directed fire capability and electro-optical sights, Cold War-era systems from the early 1960s, comprised the LLAD network for close-in protection against drones. These included Pechora and OSA-AK SAM systems and ZSU-23-4 Shilka, ZU-23-2 twin barrel 23mm anti-aircraft (AA) guns from Soviet times, and the L/70 Bofors 40mm AA platform dating back to the 1940s. Army and Border Security Force snipers too were part of the LLAD structure, shooting down numerous incoming drones in Jammu, Punjab and Rajasthan.

These 'heirloom' LLAD platforms were supplemented by the Israeli SPYDER short and medium-range air defence missile system using Python-5 and Derby missiles for point defence against UAVs, cruise missiles, and aircraft.

A new kind of war

The domestic Akash and Akash-NG (New Generation) missile system provided medium-range coverage, while the long-range Barak-8, jointly developed with Israel, defended high-value assets and strategic nodes from aircraft, drones, and ballistic/cruise missiles. These were all backed by Russia's Almaz-Antey S-400 'Triumf' self-propelled surface-to-air missile system — renamed Sudarshan Chakra — one the world's best, of which India had acquired five units for $5.5 billion in October 2018 and, so far, taken delivery of three.

All these systems were centrally integrated through the IACCS, enabling coordinated, real-time responses and full-spectrum aerial threat mitigation.

In conclusion, Operation Sindoor was not merely a skirmish; it was a seismic shift in which two nuclear-armed rivals stepped into the age of autonomous warfare, where deterrence is digital, and dominance is algorithmic. And as the smoke subsides, one truth remains: the next war will not begin with a soldier's charge, but with the silent whir of drones in the sky.

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