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OPERATION SINDOOR – TURKISH DRONES SUPPORT TO PAKISTAN: LESSONS FOR INDIA'S C-UAS GRID

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Operation Sindoor – Turkish Drones Support to Pakistan: Lessons for India's C-UAS Grid

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Abstract

Three global operations, within two months – SINDOOR, SPIDER WEB and RISING LION and the retaliatory strikes have shown the unprecedented employment of drones as an essential opening salvo of modern era combat force application along every rung of the escalation ladder. Whether stand alone or as a facilitator for pre-emptive for a larger follow-up combat application, small drones have gradually replaced the large size varieties. The Pakistan's military's daily employment of 300-500 drones, primarily Turkish Asisguard Songar drones, Baykar Yiha III loitering munition and Chinese DJI MAVIC series of quadcopters, despite holding larger Turkish and Chinese drones in its inventory, indicated four paradigm shifts in non-contact warfare on the Indian sub-continent. Firstly, there is a progressive shift towards cheaper miniaturisation and commercialisation of drones and space aptly summed up by the phrase "Big isn't Beautiful anymore" with a corollary that "No drone is too small to be ignored". Secondly, suppression of enemy air defences (SEAD) and Electronic Warfare (EW) are most aptly done by saturation and exhaustion tactics through

swarms of low-cost drones thus proving “Quantity has a Quality of its own”. Thirdly, Pakistan military’s gradual shift in preference for Turkish drones over Chinese drones evidentially proves the global view of poor quality of Chinese weapon exports. Fourthly, the combined failure of Turkish and Chinese drones-missiles campaign to cause any significant damage on Indian soil when placed against Indian trio of mainly indigenous, Israeli and Russian combat platforms, will Force Pakistan to look for other alternatives. Thus, in Indian context, ‘Modernisation through Indigenisation’ is the magic mantra.

With drones at the forefront of all conflicts, Counter-Unmanned Aerial System (C-UAS) grid is the one of the most essential pre-requisites for combat across all levels of not only military force structure but also critical civilian infrastructure spanning governmental, public and private assets. This monograph has thus examined the history of Turkish-Pakistan military cooperation particularly in drones’ sector over the last two years, analysed the Pakistan military’s employment of Turkish drones and identified the relevant lessons in Indian context especially for the C-UAS grid.

Key Words: Türkiye, Baykar, Unmanned Combat Aerial Vehicle (UCAV), Unmanned Aerial Vehicle (UAV), Unmanned Aerial System (UAS), Counter-Unmanned Aerial System (C-UAS), Electronic Warfare (EW), Air Defence (AD), Indian Army (IA), Indian Air Force (IAF), Army Air Defence (AAD), Integrated Air Command and Control System (IACCS), Pakistan Air Force (PAF), Surface-to-Air Missile (SAM), Short-Range SAM (SR-SAM), Medium-Range SAM (MR-SAM), Stratejik Insansiz Hava Araci (SIHA, Strategic / Self-Guided / Autonomous UAV)

Introduction

“Türkiye-Pakistan brotherhood, which only a few nations in the world are fortunate to have, is one of the finest examples of true friendship. We, as Türkiye, place great importance on Pakistan's peace, prosperity, and stability. We highly appreciate the prudent, patient policy of the Pakistani state, which prioritises dialogue and reconciliation in resolving conflicts. We will remain by your side in good and bad times, as we have done in the past. I extend my heartfelt greetings to you and the friendly and brotherly people of Pakistan. **Pakistan, Türkiye dosti zindabad**!”

- Turkish President Erdoğan to Pakistan's Prime Minister Sharif- 14 May 2025[1] four days after the agreement requested by Pakistan Army for cease fire.

Turkish President Erdoğan's son-in-law Mr Selcuk Bayraktar, is the Chief Technology Officer of Türkiye's prime UAV company Baykar. In addition to being the top Turkish taxpayer, he is also the architect of Baykar's most famous UCAV Bayraktar TB-2. TB-2 SIHA, the first indigenous Turkish UCAV, was hailed as the star performer for Azerbaijan in defeating Armenia in the second Nagorno-Karabakh war in 2022 which supposedly caused a paradigm shift in drone warfare. TB-2's acclaimed exceptional performance in Syria and second Libyan civil war led to an exponential increase in its exports particularly on Indian sub-continent to India's neighbours Pakistan and Bangladesh[2]. The same TB-2 facilitated initial Ukrainian setbacks to Russian mechanised assaults till the time qualitative and dense Russian EW and AD got TB-2 off the Ukrainian drones' attacks inventory. While TB-2 has performed exceedingly well against technologically weaker enemies, it has failed against countries with good AD and EW capabilities.

Pakistan military had learnt this lesson well from Russia-Ukraine War and employed Turkish Asisguard Songar drones, and Baykar's Yiha III loitering munition in its retaliatory strikes against India from 07 to 10 May 2025. However, Indian military's AD response, through resolute use of its AAD guns and missiles, integrated IAF's IACCCS and IA's Akashteer, negated these drones also to a great extent. While the Pakistan military's tactics of launching 300-500 drones in swarms every day could not cause significant damage, they surely managed to infiltrate some distance inside Indian territory in nearly 36 locations along India-Pakistan border.

While PAF had prepared for IAF's Rafael ambushes in air (acclaimed kill chain comprising Saab Erieye and Chinese ZDK-3, J-10CE, PL-15 BVRAAMs, and satellites' network) and as well as from ground (Chinese HQ9 and HQ16 SAMs), PAF had simultaneously prepared for retaliatory air-missiles-drones' strikes on Indian territory majorly based on Turkish drones. The significantly enhanced Turkish-Pakistani military cooperation over the last few years has spanned joint KAAN aircraft project, AD, naval frigates, AAMs, etc. However, the primary focus has been on the rapid-pace drones' technological cooperation and joint production between PAF and

Baykar with effect from August 2023. Pakistan military used mostly Turkish drones and multiple varieties of Chinese DJI MAVIC quadcopters to target India at an from 07 to 10 May 2025. This monograph will thus analyse Turkish support to Pakistan military to build its drones' capabilities; the methodology of employment during Pakistan's response to Indian Operation SINDOOR and identify key lessons for India particularly concerning the C-UAS grid.

History of Turkish-Pakistan Military Cooperation

Pakistan was always and will remain defined by Three 'A's – Army, Allah and America. US President Trump's Luncheon meet on 18 June 2025 with Pakistan's Army Chief Asim Munir clearly proves the depth of American government and Pakistan Army's everlasting close relationship. On 15 April 2025, the same General, thanking Allah, had disrespected Hindus community in his address to Pakistani diaspora just one week before the sponsored cowardly terrorist attack on 26 innocent civilians in Pahalgam on 22 April 2025.

However, three more 'A's have got added gradually- All weather friend China; Ally eternal – Türkiye; and Azerbaijan. The rapidly evolving relationship amongst the three eternal Islamic countries- Türkiye-Azerbaijan-Pakistan historically started with the strong Pak-Turkish friendship being guided by the three original 'A's- love and respect for Allah; American support for NATO-ally Türkiye and major Non-NATO Ally status for Pakistan through various diplomatic pacts like CENTO etc and supporting strong triangular Iran-Turkiye-Pakistan partnership till the Iranian revolution; and most importantly Pakistan Army's continued proximity and preference for Türkiye[3]. In a fresh American attempt at regime change in Iran, nearly after five decades after the Iranian revolution, America, Türkiye and Pakistan possibly may revive their trilateral bonding with Iran's new regime if the change happens.

The well-known idiom "birds of a feather flock together" thus suitably describes the relationship of the two allies Türkiye and Pakistan. Türkiye, as a founding member of the Organisation of Islamic Cooperation, has staunchly stood by Pakistan on the Kashmir issue by highlighting Indian Kashmir as Pakistan's "heart and soul". Pakistani governments, whether military or civilian, have in turn supported Türkiye on the Cyprus

issue.[4] However, it has been the Chinese collusive and Turkish military support to Pakistan which has facilitated Pakistan Army to exist and run the nation despite the worst possible state of Pakistan's economy.

Although Pakistan and Türkiye established a High-Level Military Dialogue mechanism in 2003 under Musharraf regime, the year 2016 was a turning point in the Turkish-Pakistan military relationship. On 15 July 2016, an unsuccessful coup attempt was made by a faction of the Turkish military to overthrow Erdoğan. Two Turkish AF pilots of F-16s had even locked their aircraft's air-to-air missile (AAM) on Erdoğan's plane but the pilots didn't fire the AAM at the last moment. The major fallout of the coup was that the Ankara government expelled 680 of 1,350 pilots in the Turkish AF which was already short of pilots. The Turkish AF's internal report of January 2016 emphasised an urgent need of 554 pilots including 190 combat pilots to attain the basic levels of combat readiness. Another reason for this critical pilot deficiency was the 2012 controversial bill by Erdoğan which allowed voluntary retirement. The bill had brought the ratio of pilots to aircraft in 2014 to 0.65 which is dangerously low for any AF. The expulsion of pilots, after the coup, aggravated the pilot shortage manifold which they could not resolve internally. Türkiye thus requested Pakistan for F-16 pilots and instructors. Despite Pakistan's eagerness, the US government refused Türkiye's request to allow F16 instructors from Pakistan to train Turkish F16 pilots. As per Chinese inputs, PAF did provide those pilots, much to the relief of Erdoğan. [5]

The Pakistan-Türkiye relationship was upgraded to a High-Level Strategic Cooperation Council in 2016 to strengthen bilateral cooperation particularly in defence. Amidst increasing suspicions of Pakistan aiding Türkiye's pursuit of nuclear weapons in 2021, Pakistan's National Engineering and Science Commission went on to sign a joint-production agreement with Turkish Aerospace Industries to jointly produce Anka combat drones in Pakistan. Türkiye sold four MİLGEM class corvettes in 2021 to Pakistan with the first ship, PNS Babur, being launched in 2022. Sharif then visited Ankara in May 2022 wherein he signed new military agreements with Erdoğan. Furthermore in 2023, Pakistan looked towards Turkey for anti-tank weapons systems to offset the growing asymmetry with IA's mechanised forces. The two militaries further organized Atatürk-X Land Forces joint exercises in 2023 to strengthen tactical coordination.[6]

Turkish Drones' Provision to Pakistan 2023- April 2025

The April 2025 SIPRI commentary shows that 10% of Turkey's total arms exports were for Pakistan from 2020 to 2024.[7] The most significant Turkish exports to Pakistan have been the drones. In fact, Indian security forces have regularly highlighted Pakistan's employment of Turkish drones for smuggling weapons and narcotics in Punjab. Similarly, Bangladesh has employed Turkish drones for surveillance regularly along its border with India.[8]

The UK-based International Institute for Strategic Studies' (IISS) annual editions of "Military Balance" publication from 2018 to 2025 highlight that the period from 2022-2023 was a turning point in Pakistan military's UAV inventory as PAF and PA both started procuring drones from its Ally Türkiye giving it preference over its iron brother China, as elucidated below in Table 1. Although the Military Balance data has many errors like Turkish Songar drones and Yiha-III loitering munitions used by Pakistan find no mention, the shift towards Turkish drones is amply evident in 2024.

Service	**Pakistan Army**		**PN**	**PAF**	
Year	**HALE**	**Light**		**Heavy**	**Medium**
2018		Bravo, Jasoos, Vector		**CH3**	Falco
2020		Same		**CH3 (Burraq), CH4**	Falco
2021		Same		**CH3 (Burraq), CH4**	Falco
2022	**5 CH4**	Same		**CH3 (Burraq), CH4**	Falco
2023	**5 CH4**	Same		**CH3 (Burraq), CH4**	Falco
2024	**5 CH4**	Same	**2 Luna NG**	**1 Akinci, >9 CH3 (Burraq), CH4, >2 Wing Loong-I, >1 Wing Loong-II**	**>3 Bayraktar TB2, >2 Shahpar-II, Falco**
2025	**5 CH4**	**Bravo, Jasoos, Vector**	**2 Luna NG**	**1 Akinci, >9 CH3 (Burraq), CH4, >2 Wing Loong-I, >1 Wing Loong-II**	**>3 Bayraktar TB2, >2 Shahpar-II, Falco**

Table 1: UAVs Buildup as per Military Balance Editions 2018-2025
(Data Source: Military Balance 2018-2025)

This shift to Turkish drones had raised many eyebrows amongst the Chinese netizens who even questioned the continuity of Sino-Pak “Iron-brothers” relationship. It has been known since long that Chinese equipment, particularly drones, helicopters and tanks have failed Pakistan military trials on numerous occasions but still Pakistan has procured Chinese equipment. An ideal case study is procurement of tanks. PA pursued many global vendors but despite failing its trials, it procured Chinese VT-4 tanks although only one battalion was equipped with 44 tanks from 2022 to 2024[9]. Thus, it’s important to answer this intriguing question as to why did Pakistan shift to Türkiye for its drones’ capabilities when Pakistan was already receiving latest drones from China.

A search of Chinese websites reveals the plausible reasons for the Pakistani preference for Turkish drones, from Chinese perspective[10]: -

- Türkiye has quoted much lower prices through discounts to advance their defence industry and products globally. A case in point is that most international customers have preferred Turkish Bayraktar TB2 over Chinese Wing Loong-II despite Wing Loong II having better acclaimed combat features.
- TB-2 UAV has presumably focussed on the weak link of Chinese UAV series, keeping its maximum take-off weight at 700 kg much lesser than the general Chinese concept of 1,000 kg. Even when compared to much faster CH-3 UCAV, TB-2 gains advantage in payload carriage, range and airborne endurance.
- A very high Pakistani debt from China, in conjunction with poor economic conditions of Pakistan resulting in Pakistan military looking towards Türkiye for immediate relief wherein Turkish procurement model has adopted loans approach of “use now, pay later”.
- Islamic brotherhood amongst both countries supporting each other’s diplomatic and foreign policy agendas.
- With Türkiye being a NATO ally, it has access to western technologies which are essentially required for Pakistan’s vintage American platforms which have still not been made obsolete. TB-2’s EO pod is Canadian

MX-15 making its detection distance, resolution and other performance much better than similar Chinese UAVs.

- Saudi Arabia, one of the most important financial backers for Pakistan, gains friendship with Türkiye, while Pakistan gets drones and Türkiye gets the money.
- American pressure to not import Chinese equipment.
- Turkey has outshined China in the development and production of small and medium-sized combat UCAVs.

Most importantly, Chinese articles accepted that:

> "***The reliability of domestic (Chinese) weapons and equipment is insufficient, which affects the user. From the feedback of the international market, there is a large gap between the reliability of domestic UAVs and Western UAVs, particularly maintenance. This is an area where we (China) need to make great efforts to improve***."

The two other contributory factors have been the combat performance of Turkish drones in the recent global conflicts as elucidated in the Figure 1 below and the push by Türkiye's President Erdoğan himself. In efforts to position Türkiye as a key defence exporting nation, Erdoğan has provided major investments to his son-in-law Bayraktar's firm Baykar. While Baykar started UAV development in 2000s, it gained prominence in the 2010s with the rise of Erdoğan. The company's signature Bayraktar-TB2 drone displayed Turkish military power particularly in drones and attracted numerous nations like Pakistan and Bangladesh to not only import Bayraktars but many other varieties too. The President's Directorate of Communications keeps advertising and propagating the achievements of Baykar drone company with the latest communique of 04 June 2025 claiming: -

> "*With exports totalling $1.8 billion in 2023, Baykar ranked among the top 10 companies with the highest exports across all sectors in Türkiye. A leading company in global drone exports, Baykar continued its success worldwide in 2024, reaching sales of $1.8 billion, with 90 per*

cent of its revenues generated from exports. Baykar, which accounted for one-third of the sector's exports alone in 2023, achieved one-fourth of the total exports of the defence and aerospace sector in 2024, positioning Türkiye as the leader in the global UCAV export market. ***Baykar, the world's largest UAV company, has signed export agreements with 35 countries for the Bayraktar TB2 UCAV and with 15 countries for the Bayraktar AKINCI UCAV***." [11]

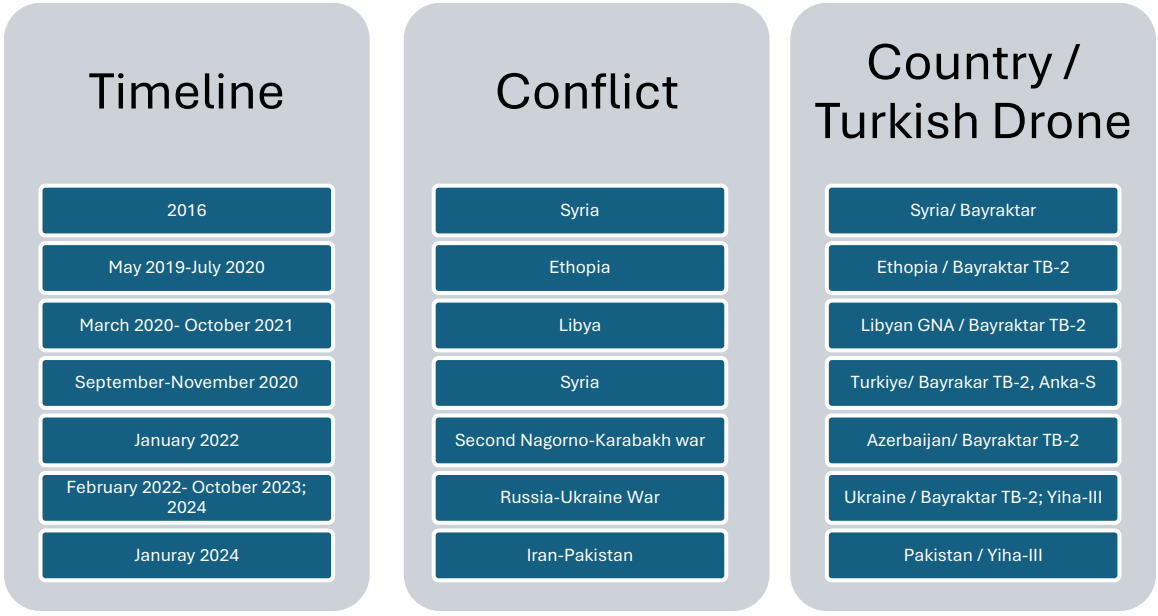

Figure 1: Combat Validations of Turkish Drones

(Source-Author's Research)

PAF-Turkey R&D Project. Pakistan's Prime Minister and Türkiye's Baykar's Board Chairman Mr Selcuk Bayraktar jointly signed a research and development (R&D) cooperation deal on 04 August 2023 at the opening ceremony of PAF's National Aerospace Science and Technology Park (NASTP), in the presence of the all-powerful PA Chief Asim Munir as seen in the photograph below in Figure 2. Baykar Teknoloji, a subsidiary of Baykar, is mandated to conduct R&D activities inside the park as part of the deal. [12] The display of scale models of various Turkish drones and missiles along with Pak-Turkish fighter aircraft KAAN, evidently highlighted the depth of mutual cooperation. With Pakistan already one of the leading importers of Turkish ships, and targeting pods, drones and drone missiles were expected to be the most important area of cooperation[13] as witnessed during Operation SINDOOR.

Pakistan's PM Shahbaaz Sharif, Baykar's Chairman Mr Selcuk Bayraktar, Pakistan Army Chief Syed Asim Munir Ahmad Shah, PAF Commander General Zaheer Ahmed Baber Sidhu and NASTP Commander Lieutenant General Ghulam Abbas Ghumman stand in front of Bayraktar Akıncı UCAV inducted the PAF inventory

Figure 2: Pakistan's NASTP's Launch Ceremony for R&D Facility with Turkish Baykar Subsidiary Baykar Teknoloji

(Source-Baykar Industry)

Baykar's Akinci. Baykar received Pakistan's order in March 2022[14] and exported the first batch of Akinci high altitude long endurance (HALE) class drones to Pakistan in end 2022.[15] PAF revealed the acquisition of Akinci HALE UAVs in one of its videos released in October 2022 as shown in the photograph below in Figure 3. It is a large UCAV with 20 metres wingspan, an endurance of more than 24 hours, can scale an altitude of 12192 metres (40,000 feet), has a maximum take-off weight of 5500 kg and payload of 1350 kg. [16] Its most important drawback is the cost of 20 million USD from Chinese perspective.[17]

Figure 3: Akinci Drone in PAF's Video

(Source-Chinese Website Toutiao.com)

Powered either by Turkish domestic engines (PD-170, PD-222) or Ukrainian AI-450T turboprop engines, it is equipped with six external racks which can carry multitude of payloads – electro-optical/infrared/laser designation pod (EO/IR/LD), AESA radar, SIGINT system, EW systems, Gokgogan and Bozdoğan AAMs, several types of locally made ammunition, standoff missiles (SOM) and air-to-ground missiles as elucidated in picture at Figure 4.[18]

<u>Figure 4: Payload Options Onboard Bayraktar Akinci Drone</u>

<u>(Source-Chinese Website Toutiao.com)</u>

Limitations of Bayraktar Akinci. A Chinese article, quoting Indian media, accepted serious limitations of employment of Akinci against India. The first issue highlighted was that with a large size, length and wingspan comparable to that of any manned fighters but without any stealth, Akinci UCAV will be an easily discoverable aerial target by Indian AD. Secondly, equipped with two AI-450 engines and nominal 750 horsepower, Akinci is a slow-moving aircraft making itself a bulky target liable to easy targeting by LR-SAMs. [19] Despite the cons, PAF had hoped to achieve a paradigm shift in the employment of drones by Pakistan with the induction of Turkish Baykar UCAVs – Akinci and Bayraktar.

Figure 5: PAF's Akinci Syndicate

(Source-Chinese website Toutiao.com)

Bayraktar TB-2. A medium altitude long endurance (MALE) class drone, TB-2 SIHA carries smart munitions like Roketsan MAM-L[20]. While satellite images have picked up the presence of Bayraktar TB-2 SIHA in Pakistan since May 2022, they were first seen in official photographs in January 2024 during an official induction ceremony organised

by PAF and personally attended by the Pakistan Army Chief Syed Asim Munir.[21] Singled out as the most important platform for Azerbaijan's victory over Armenia by its President Ilham Aliyev in 2020, Pakistan had hoped to emulate the same victory against India. Azerbaijan military's swarm-based employment of Bayraktar drones (armed with laser guided smart munition) evaded Armenia's Russian AD systems. The success of drones' swarms' incursions and attacks, to overwhelm and neutralise Armenian combat systems, was then followed by Azerbaijan's conventional military advances.[22] PAF replicated in copybook style the Azerbaijan's swarm tactics by using 300-500 mostly Turkish drones' but Indian AD thwarted their strikes

Figure 6: Baykar's Bayraktar TB2 in Pakistan
(Source-Defenceturk.net)

Drone Missiles KaGeM-V3 and KEMANKES. With the induction of both HALE and MALE class Turkish drones, the next obvious step was the procurement of missiles for drones. KaGeM-V3 drone-missile, with a range of 200 km approximately and most probably an upgraded version of Turkish KEMANKES cruise missile, was displayed at a PAF event in August 2023. With a turbojet engine, this missile could either have been exported or have been a part of a joint Pakistan-Türkiye production. Much lighter than KaGeM V3, KEMANKES is a winged floating ammunition with an endurance of one

hour. With AI-enabled optical guidance and maximum operating altitude of 18,000 feet, KEMANKES is employed as combat payload onboard Akinci THIA, Bayraktar TB2, and Bayraktar TB3 SIHA.[23] Baykar's AI-powered KEMAKES small air-launched cruise missiles were provided to Pakistan most probably in 2023 and have been integrated into Pakistan military's drone fleet. With a weight of 35 kg, warhead of 6 kg, a sub-sonic cruising speed of 0.3 Mach and maximum penetration speed of 0.7 Mach, and a maximum range of 200 km, Chinese netizens appreciated PAF to employ these air-launched cruise missile with drones as a stand-off strike weapon for striking Indian targets in depth. [24]

Figure 7: KEMANKES Drone Subsonic Cruise Missile

(Source-Chinese website Toutiao.com[25])

Figure 8: KaGeM-V3 Drone Missile at PAF Display

(Source- Defense Mirror.com)

Asisguard Songar Drones. With Russia-Ukraine war emphasising the importance of miniaturisation of drones, Pakistan military looked towards Turkish defence firm Asisguard's Songar drones. Designed for armed operations[26], they were first exhibited internationally in 2019[27]. Various Indian media outlets have talked about an operational range of 3-5 km[28] with flying altitude of 3 km above mean sea level and 300 metres above ground level. However, Asisguard official website claims an operational range of 10 km when launched from a land vehicle[29]. Acclaimed as Türkiye's first indigenous armed drone, they were launched in April 2019, and inducted in the Turkish Armed Forces (TAF) in February 2020.[30] The Asisguard company further claims that: -

> "*Thanks to the armed drone system SONGAR, which has been brought to an advanced level by integrating automatic machine guns and bombers, the 4x4 military land vehicle will have the ability to find targets from the air and conduct remote armed operations. Working effectively both day and night in all military and security operations, SONGAR will be on standby 24/7 to respond to asymmetric threats with its autonomous take-off and landing capability…With its ability to perform simultaneous missions with a single or multiple drone system, it can perform many critical tasks such as detecting the target area, neutralizing the threat, post-operation damage detection and real-time image transmission. SONGAR can be used effectively in border and cross-border security operations with the integration of land vehicles, with a high number of shells from the air against ambush or threats, and for offensive purposes when necessary.*" [31]

The multiple assortments of Songar drones with variety of combat payloads include[32]:

- **5.56 x 45 mm Assault Rifle**. This uses the standard NATO cartridge used and has a recoil force-damping mechanism to minimise the recoil impact on the drone. With a range of 5 km, it has endurance time of 35 minutes without payload.

Figure 9: Songar Assault Rifle Drone

(Source- Asisguard[33])

- **Two 40 mm Grenade Launchers**. It has the capability to fire its grenades up to a range of 400-450 metres
- **Six 40 mm Drum Type Grenade Launcher**.This can launch six grenades at a similar range of 400-500 metres.

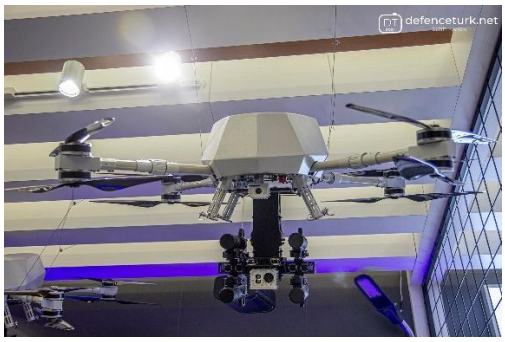

Figure 10: Grenade Launcher Songar

(Source: Defencetrurk.net[34])

Three 81 mm Mortar Gripper. Turkish smart mortar ammunition for TOGAN 81 mm mortar has also been integrated into SONGAR.

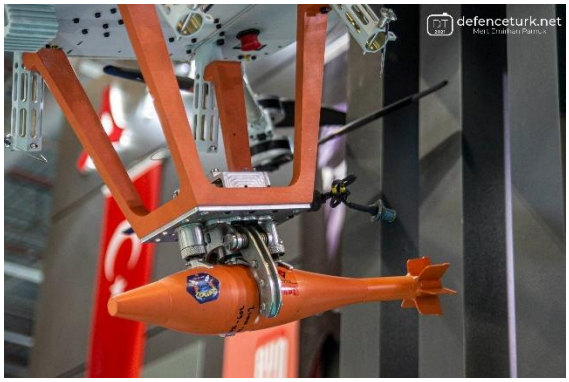

Figure 11: 81 mm Mortar Songar

(Source: Defencetrurk.net[35])

- **Eight Tear/Smoke Grenade Launcher**. With the capability to execute controlled descent through the air, it plans to conduct direct impact attacks on targets.

Yiha-III Loitering Munition. A joint Turkish-Pakistani project between PAF's National Aerospace Science and Technology Park (NASTP) and Turkish Baykar, these kamikaze drones also contain Chinese components. They were first seen in the

Pakistan's NASTP inauguration ceremony in August 2023 attended by the Pakistan Prime Minister, the Army and the PAF Chiefs.

Figure 12: Yiha III Loitering Munitions with KaGeM Drone Missile nearby at NASTP's Launch Ceremony – 04 August 2023

(Source-DanielR on X[36], characteristic serial numbers YX-68, 69, 72)

Sometime later, Turkish AF delegation led by Commander General Ziya Cemal Kadioğlu visited the NASTP and inspected the assembly process of Yiha-III loitering munitions.

Figure 13: Turkish Delegation Visit to Pakistan's NASTP

(Source-DanielR on X[37])

The Yiha-III kamikaze drones were then combat tested in Syria, by Ukraine to attack targets in Russia in 2024, and by Pakistan on 18 January 2024 to strike targets in Iran. The Pakistan's strike on Iran was successful because Iranian AD intentionally refrained from the PAF strike on Baluchistan's fighters on Iranian soil. Recently inducted by Albanian AF in March 2024, they are characterized by a long and thin fuselage based on the missile body. With straight wings and a uniform tail as seen in Figure 14 below, it has a rear-mounted propeller engine for protracted flight

endurance. With a comparatively complex production based on rocket technology, these loitering munitions are claimed as most suitable high-precision strike assets for destroying adversarial AD systems, radar installations, and forward operating bases.[38]

Figure 14: Yiha-III Drone

(Source- Dylan Malyasov, Defence Blog; Serial number YX-122 indicative of Yiha-III drones)

Most importantly, Yiha-III kamikaze drones are optimised for swarm tactics which Pakistan military exploited during the retaliatory strikes on 09 May 2025. With airborne loitering capabilities for several hours before implementing its terminal attack phase with precision-guided targeting, its distinctive design incorporates elements of the Turkish ROKETSAN's OMTAS anti-tank guided missile (ATGM). A long-range precision-guided ATGM, it is claimed that OMTAS can operate 24x7 in all weather conditions because of its infrared imaging seeker.[39]

Figure 15: Induction of Yiha-III Drone with Albanian AF

(Source- Dylan Malyasov, Defence Blog; Serial number YX-121 Yiha-III drones)

Induction Ceremony of Turkish Drones. Various Turkish drones, including Bayraktar AKINCI TİHA, Bayraktar TB2 SİHA and Baykar Yiha-III varieties, were inducted in PAF at a ceremony organised in presence of Pakistan's Army Chief Syed Asim Munir on 02 January 2024 as can be seen in the Figure 16 below. [40]

Figure 16: Induction Ceremony of Turkish Drones including Yiha-III Kamikaze drones at a PAF Base on 02 January 2024[41]

AAMs Technology Sharing Agreement – February 2024. One more Turkish AF delegation, under General Irfan Ozsert, visited Pakistan. The PAF and Turkish AF decided to progress the AAM technology exchange program further ahead. This may have facilitated the provision of advanced GOKDOGAN BVRAAMs for PAF Akinci UCAVs.[42]

STM's UAVs.In November 2024, one more Turkish firm STM Defence Technologies Engineering and Trading Inc. showcased its UAVs at a Karachi Defence Exhibition. STM had exported MILGEM corvettes to Pakistan Navy (PN) and had even upgraded PN's three Agosta 90B class. With hopes of early induction of its mini-UAV models in Pakistan's military, STM exhibited KARGU UCAV along with the variety of anti-personnel and armour-piercing ammunition, TOGAN surveillance UAV and the BOYGA ammunition-dropping UAV.[43]

Yiha-III Loitering Munition in Ukraine. Various OSINT inputs accredit Pakistan, and not Türkiye despite joint production, for the export of Yiha-III loitering munition to Ukraine in 2024. However, the kamikaze drones failed on many occasions. A detailed thread on X by Canadian X-handle DanielR in 2024, elucidated the reasons for various crashes which occurred during Ukraine's employment of Yiha-III drones against Russia. While many Yiha-III loitering munitions crashed in Russia due to an effective Russian C-UAS grid, some of them were even recovered nearly intact due to drones' internal faults[44]. DanielR's analysis, based on photographs and information from Russian telegram channels, reveals that: -

- **Key Components**. The Yiha-III drones found in Ukraine contained C3-6 explosives, Chinese made DLE170 engine, expensive fuselage made of carbon fibre, and few fancy aluminium parts. 23 circuits in small drone like Yiha-3 is a bit intriguing with minimum 6 varieties of electrical connectors.

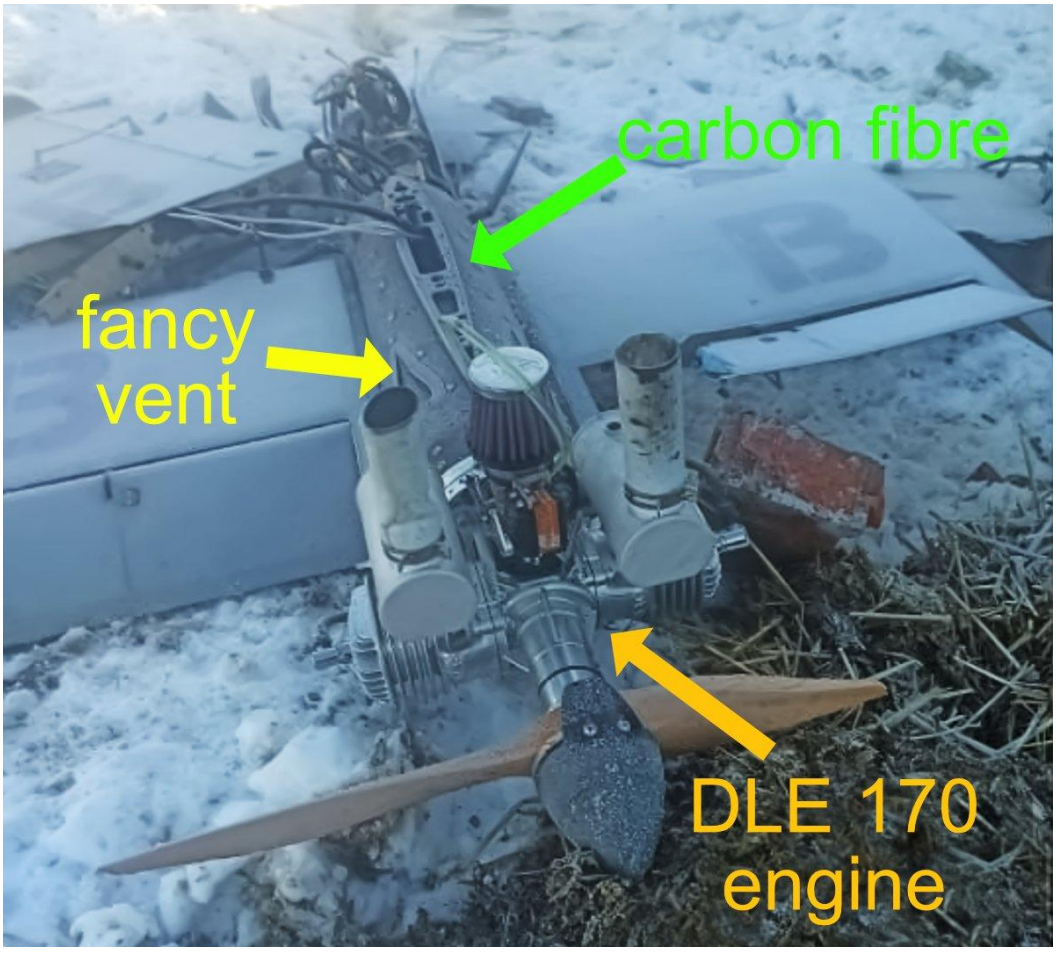

Figure 17: Crashed Yiha-III Drone in Russia

(Source-DanielR on X[45])

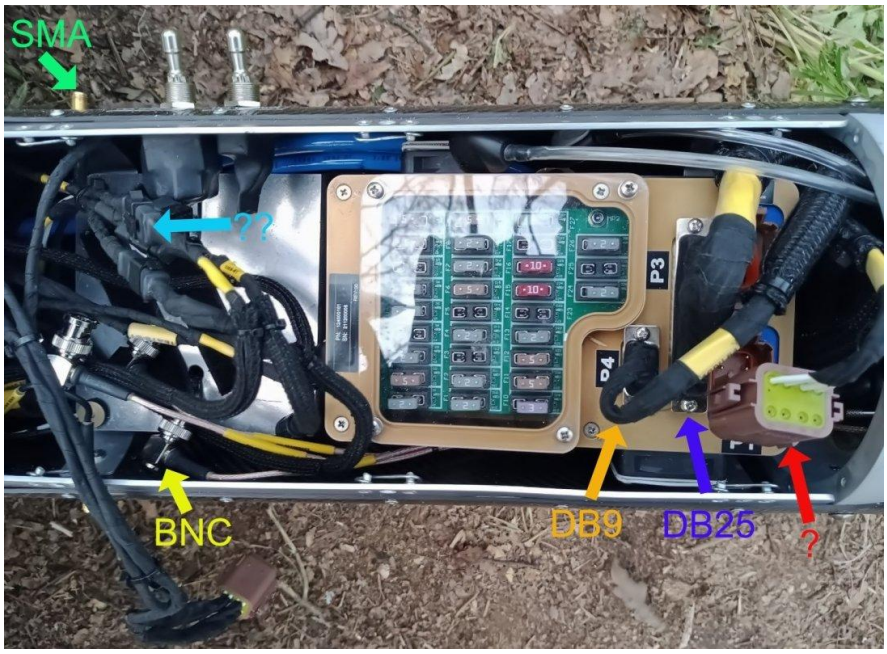

Figure 18: BNC, SMA, DB9, and DB25 Connectors in Yiha-III Drone's Electric Circuit

(Source-DanielR on X[46])

- Chinese DLE170 engine probably has been the cause of failure many times. Whenever the battery supplying the ignition has been low, the engine has misfired and lost power.

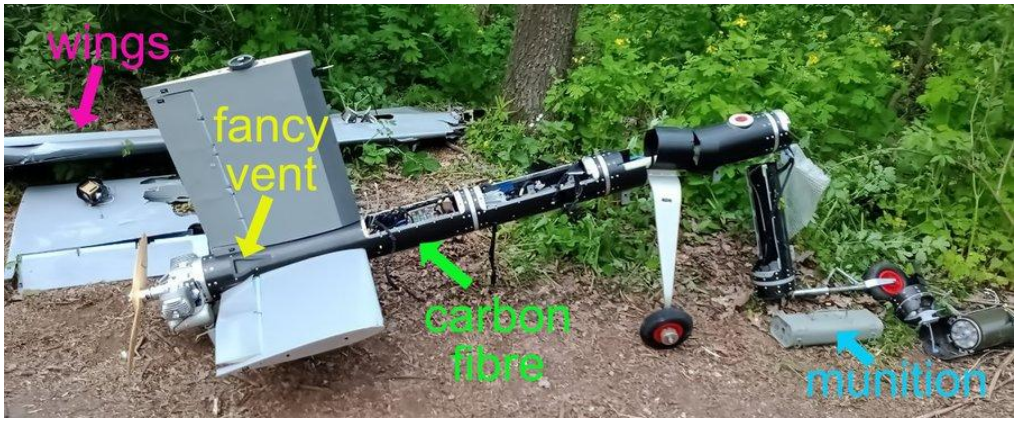

Figure 19: Nearly Intact but Crashed Yiha-III Drone in Russia

(Source-DanielR on X[47])

Aselsan's EW Pod.Turkish firm Aselsan had displayed an EW pod integrated with Baykar's Akinci UAV in July 2024 with multi-target jamming capabilities. While the main pod weighs 40kg, a mini version weighs 11 kg and can be mounted on Bayraktar TB-

2 also. Whether PAF integrated these pods is not known, however, Turkish defence companies may have tried the combat testing against Indian combat platforms. The author's personal interaction with Aselsan's representatives during one of the trials in India in 2015 surely proved the firm's determined and fast-paced improvisations particularly in emergencies. In the emerging situation post 22 April 2025, Aselsan would have surely provided mini-EW pods in sufficient quantity to Pakistan.

Türkiye-Pakistan High-Level Strategic Cooperation Council (HLSCC). HLSCC was established in 2016 to institutionalize the Pakistan-Türkiye cooperation in the main fields of defence, education, energy and culture. On 13 February 2025, Pakistan and Türkiye organised the 7th HLSCC session at Islamabad. The two leaders Turkish President Erdoğan and Pakistani Prime Minister Shehbaz Sharif signed a declaration "Deepening, Diversifying, and Institutionalizing the Strategic Partnership". Although only six agreements were planned initially[48], the two leaders signed 24 bilateral cooperation agreements and set a target of achieving 5 billion USD annual bilateral trade between the two countries. The military agreements signed between the Defence Ministers of the two countries were the Memorandum of Understanding between the Turkish Secretariat of Defence Industries and Pakistan's Ministry of Defence Production; Protocol on the Exchange of Military and Civilian Personnel for Social and Cultural Purposes; the Memorandum of Understanding on AF EW Cooperation; and the Protocol on Training and Cooperation in Military Health. Additionally, Mr Mehmet Demiroğlu, the General Manager of the Turkish Aerospace Industries (TAI) signed a Memorandum of Understanding with Mr Javed Iqbal, General Manager of the Pakistan's Naval Research and Development Institute (NRDI). [49]

Turkish Support from 22 April 2025 Onwards

It is evidently clear that Turkiye provided maximum possible support to Pakistan in 2023 and 2024. Turkish satellites also provided few images of Pahalgam area in 2025 which has been covered in separate monograph by the author already published by CENJOWS. However, as a responsible nation which claims moral high ground for fighting against terrorism, Ankara should have taken a step back on 22 April 2025. Coincidentally on 22 April 2025, Erdoğan and Sharif were having a bilateral meeting in Istanbul, when Pakistan-sponsored terror attack, to disrupt Kashmir's returning

normalcy, killed 26 innocent civilians at Pahalgam. To the contrary, Turkish support to Pakistan significantly surged immediately after the Pahalgam terrorist strike.

The close cooperation between the two countries can be aptly defined by the enhanced frequency of interaction between the two leaders of the respective countries – Turkish President Erdoğan and Pakistani Prime Minister Shehbaz Sharif which are listed below: -

- 22 April 2025 – **Erdoğan and Sharif had a bilateral meeting at Istanbul's Presidential Complex while Pakistan sponsored terrorists killed 26 innocent civilians in Pahalgam on the same day**. Erdoğan stated that [50]"*The cooperation between Türkiye and Pakistan, without doubt, significantly contributes to peace and stability in our regions.* ***We are delighted to see that we act in absolute harmony with Pakistan on almost every issue… We want to further improve our relations with Pakistan in the areas of military and defence industry through joint projects***."
- 07 May 2025 - Erdoğan spoke by phone with Shehbaz Sharif to express Türkiye's solidarity with Pakistan. [51]
- 13 May 2025 – Sharif thanked Erdoğan in a X-post as reproduced below.

Figure 20: Sharif's X-post on 13 May 2025

(Source- X)

- 14 May 2025 – Erdoğan responded with a message of “Brotherhood and Support” already quoted in the starting of this paper.[52]
- 25 May 2025 – Sharif visited Istanbul to meet Erdoğan during which both leaders promised to strengthen cooperation with particular focus on defence. [53] The major highlights of the bilateral meeting were intelligence sharing between the two militaries; strengthening joint defence production and technology transfer; enhanced conduct of joint military exercises; planning for more joint military educational programs; ensuring logistics and energy security through the planned Istanbul–Tehran–Islamabad railway line; streamlining the partnership in MİLGEM corvette and **SIHA UAV projects; and most importantly strategic coordination against regional threats**. Shahbaz Sharif commented that “***Our cooperation with Türkiye in the field of defence is the most important indicator of our mutual trust and strategic partnership***.”[54]

Figure 21: Bilateral Türkiye-Pakistan Meet on 25 May 2025

(Source-SDE.org[55])

- 28 May 2025 – Erdoğan, Sharif (and Munir) and President Ilham Aliyev of Azerbaijan met each other during a Trilateral Türkiye-Azerbaijan-Pakistan Summit in Lachin, Azerbaijan. Erdoğan’s press release had one statement in bold **“*Our hope is that the declared ceasefire between Pakistan and India will evolve into a lasting peace*”.** The balance statement read as below: -[56]“*I hereby would like to express our pleasure over the termination of the Pakistan-India tension through ceasefire. I once again congratulate my brother Sharif and Pakistani authorities on the calm and wise stance they displayed throughout the process. Türkiye is ready to make any contribution it can in this regard…Deepening our cooperation in defence industry, we will preserve our shared determination in combatting terrorism and transnational threats*.”

Figure 22: Trilateral Türkiye-Azerbaijan-Pakistan Summit

(Source: Presidency of the Republic of Türkiye[57])

- 08 June 2025 - Erdoğan wished Eid Mubarak to Sharif over a telephone call and stated that the longstanding Turkish-Pakistan friendship and strong solidarity have been strengthened by the steps taken. [58]

Military Consignment: 27-30 April 2025. OSINT inputs confirmed the arrival of nearly six Turkish C-130 transport aircrafts on 29 April 2025 at Islamabad's military base. On 30 April 2025, Turkish delegation led by Lieutenant General Yaşar Kadıoğlu, visited PAF headquarters in Islamabad to meet the PAF Chief Zaheer Ahmad Babar, as seen in the photograph in Figure 23 below.[59] Chinese netizens, quoting Pakistani media highlighted that the 6-7 Turkish C130 aircraft were loaded with weapons and equipment, including KARAOK portable anti-tank missiles and 3 types of guided bombs for TB-2 drones.[60]

Figure 23: PAF Chief's Meeting with Turkish Delegation on 30 April 2025

(Source-TOI and MEMRI)

Probable Drones' Consignment – 03/04 May 2025. Various Chinese websites and OSINT inputs indicated arrival of possibly Turkish Anadolu drone carrier, 19,000-ton naval supply ship TCG Büyükada and a C-130 aircraft at Karachi on 03/04 May 2025. probably carrying Asisguard Songar. [61] One of the Chinese websites aptly described the inventory of Turkish drones with Pakistan as comprising TAI Anka, Bayraktar Akinci, Bayraktar TB2 and Asisguard Songar. The Military Balance editions have not included TAI Anka UAV series in Pakistan's inventory.

Figure 24: Chinese Description of Turkish Drones in Pakistan's Inventory

(Source-Totiao.com)

Turkish Drones in Operation SINDOOR

While the recovery of Turkish drones' components on both Indian and Pakistani sides confirmed the employment of Turkish drones, there are OSINT inputs indicating killing of two Turkish drones' crew members deployed in Pakistan. Since training of Pakistan military personnel was not completed adequately, Turkish crew were also employed in the flying of these drones particularly the Yiha-III drones. It is appreciated that the dead bodies of killed Turkish crew were flown back to Türkiye around 12 May 2025. [62] The key Pakistani drone incursions on various nights are discussed in succeeding paras.

Night 07 / 08 May 2025. Pakistan military presumably launched anything between 300 to 400 drones and attempted to target Indian military infrastructure as per official Indian military spokespersons. The wreckage photos reveal that these were mostly the DJI MAVIC series of quadcopters.

Night 08 / 09 May 2025. Similar swarm tactics was employed next night too for saturating Indian AD with some estimates of up to 500 Pakistani drones violating Indian airspace during the night from approximately 2000 hours to 2330 / 0001 hours. Mostly quadcopters, including 350 plus Turkish drones like Asisguard Songar[1] drones, they came in multiple waves to exhaust Indian AD at about 36 military and civilian locations across India's western border with Pakistan. These drones didn't show up easily on most Indian radars because of their small size and resultant low Radar cross-section (RCS) except on the calibrated low-level lightweight radars.[63] As per various OSINT inputs, the Indian AD grid employing its L-70 and Zu-23mm twin-barrel guns and other AD weapons could destroy majority of them. The successful engagement of Pakistani drones by Indian L70 guns near Amritsar is extremely praiseworthy and would have surely had a motivating ripple effect on other AAD and IAF AD gunners. Another 20 drones are estimated to have been jammed or spoofed by a variety of devices. Some drones might have managed to fly back to Pakistan. [64]

The reach of Songar drones up to locations like Amritsar and Samba is against the OEM Asisguard's maximum claimed range of 10 km. Furthermore, with strong EW, they should have either got jammed or spoofed. The maintenance of altitude of more than 1000m above the ground level, on most occasions, to evade EW crossed the claimed ceiling of 300m above ground level. It leads to the following assumptions: -

- The engagement of Songar drones by L70 and other AAD guns would have been done by radar guided ammunition. The successful engagement is indicative of excellent AAD training. However, these guns can at best engage at a range of about 3-5 km when deployed near Vulnerable Areas (VAs) and vulnerable points (VPs). The issue of concern is unguarded critical areas where AD / C-UAS protection is not adequately available.

- Pakistan had most probably been provided upgraded Songar Drones around 29 April to 05 May 2025 when Pakistan received Turkish assignments. This

[1] Confirmed by drones' forensics' preliminary reports as told by IA's spokesperson Colonel Sofiya Qureshi.

replicates Chinese emergent provision of upgraded PL-15 AAMs immediately after the Pakistan-sponsored terrorist strike at Pahalgam on 22 April 2025. The upgrades most probably would have included both power and communication upgrades. Provision of Lithium-ion batteries most probably could have provided the range enhancement.

- The communication range enhancement and evasion of EW is a matter of greater concern. Here, the possible upgrade options included Intelligentisation / AI enablement and operation in GNSS-denied environments; provision of Chinese satellite communication, Turkish frequency hopping technology which could probably evade some fixed frequency EW; the possible use of Indian cellular network through the network of Pakistani Intelligence Operatives (PIOs) on Indian soil; provision of advanced AI EW technology by Turkish Baykar or Asisguard firms on the Songar drones.

Night 09 / 10 May 2025. Pakistan incrementally increased the variety of swarms by including the Yiha-III loitering munitions and TB-2 UCAVs on the night of 09 and 10 May 2025 at large number of locations along India-Pakistan border. The recovery of wreckage of these drones on both sides of borders indicated that they were effectively engaged by Indian AD and had production faults which made some of them fall on Pakistani side too.

Figure 25: Wreckage of Yiha III Drone

(Source-Dinakar Peri, The Hindu; the spotting of these wheels is unique to Yiha-III loitering munition as also picked up by Russians in Ukraine War)

The key takeaways of Pakistan's employment of Yiha-III kamikaze drones are limited destruction at few depth locations, reach up to depth of Udhampur / Nal base etc, and recovery of Yiha-III drones on Pakistani soil[65]. This leads to following implications: -

- Incremental employment of drones by gradually improving on their drones' swarms' employment tactics of saturation and exhaustion.
- Possible employment of Turkish crews indicates inadequate training of PAF / PA crews despite joint production since August 2023.
- Component failures noticed during Ukrainian employment were found repeatedly during Pakistan's employment. Chinese engines failed to be effective.

- Employment of Aselsan's mini-EW pod on board TB-2 UCAVs in conjunction with Yiha-III loitering munition to attempt jamming Indian radars at the appropriate moment to enhance the penetration capabilities of Yiha-III drones to evade Indian AD and EW.

- The communication mode till some depth areas, particularly during last stages of attack indicates possibilities of Chinese satellite communication usage or Indian cellular network and AI enablement for automatic target recognition and engagement.

- Pakistani drones' operators have also tried to map the complete Indian infrastructure which may prove as a critical database for next round of AI enabled drones' strikes with Chinese and Turkish assistance. It may have failed to get exact details, due to operational philosophy of Indian Armed forces.

- The firing of more expensive MR-SAMs and recovery of different wreckage indicates that the drone involved would have either been TB-2 or some higher configuration UAV / UCAV as well.

Indian AD Grid. The key Indian AD weapons and platforms which brought down Pakistani drones, including Turkish-origin Baykar TB-2 UCAVs, Yiha-III loitering munition and Asisguard Songar drones[66], to great extent were- L-70 (3.5km) guns [2], Zu-23 AD guns and IAF's Pechora[67]; Israeli Barak-8 and indigenous MR-SAM[68] with a range of 70 km particularly for TB-2 UCAVs; DRDO-produced Akash SR-SAM[69] on few occasions with a range of 25 to 30 km and altitude of 18 to 20 km[70] and 96% indigenous content; Igla-S Man-portable AD system (MANPADS)[71] with a range of 6 km; indigenous integrated drone detection and interdiction systems (1-2 km)[72] and various other Indian C-UAS systems employed. Few Turkish OSINT inputs also talk about India's successful testing of indigenous Bhargavastra and Nagastra-1 anti-UAV systems.[73]

[2] Bharat Electronics Limited (BEL) recently upgraded them with optical sights and hydraulic systems.

Distance / System	IAF (IACCS)	IA (Akashteer)
<6km/ Very SR / MANPADS	Igla-S	Igla-S, Indigenous Drone detection & interdiction system
Point Defence	Osa-AK-m	L-70, Zu-23 AAGs
<25 km/ SR-SAM	Israeli Sypder; 15 Squadrons Akash-1 & 2	4 Akash Regiments
25-70 km / MR-SAM	Barak-8 MR-SAM; Pechora	Indigenous MR-SAM
70-400 km / LR-SAM	S-400	

Figure 26: Indian AD Grid Layers

(Source-Author's Research)

AD Penetration Methods. As Indian AD disrupted Pakistan's well-planned retaliatory responses from 07 May 2025 onwards, Pakistan kept on incrementally graduating the variety of drones and missiles in the desire to penetrate India's integrated air-missile-drones defences and strike major targets. A simple formula describes the Probability (P) of Destruction (Pd) = P (Launch) x P (Survival during flight) x P (Penetrating flight) x P (Kill). While survival during flight was a major concern for Yiha-III drones due to internal failures, Pakistan military wanted to maximise the probability of penetrating flight over Indian air space by evading or destroying Indian AD. A YouTube channel Perun, based on Russo-Ukraine War lessons in its 16 June 2025 video "How Not to Lose Your Air Force (On the Ground) - Hardening, modern threats & air base defences" aptly describes the various methods of penetrating adversary's AD- High Threat Qualitative technology facilitating speed or evasion like hypersonic glide vehicles etc; Saturation through greater quantity of drones and missiles than the maximum interception capacity of adversary's AD; Exhaustion through repeated waves of low-cost platforms which by themselves have low probability of penetration; or strategic surprise based sabotage as witnessed during Ukraine's recent Operation

SPIDERWEB and Israel's Operation RISING SUN. [74] Iran, in its retaliation to Israel's Operation RISING SUN, achieved penetration of its air defences by overcoming the 90% protection threshold of Israeli multi-layered AD. So, for every 100 missiles fired, at least 10 would penetrate world's qualitatively best and most dense AD.

Pakistan Military's Drone Tactics. The Pakistan military's 'incremental waves of swarm' tactics, comprising Chinese quadcopters on first night, additional Songar drones on second night, additional Yiha-III loitering munitions on next night, and TB-2 UCAVs, aimed to exploit the above-mentioned types of drones' tactics for penetrating Indian AD. Saturation of Indian AD was attempted by launching 300-500 drones in swarms comprising dozens of low-cost quadcopters and drones. Multi-layered exhaustion was attempted by launching waves of MALE UCAVs, loitering munitions and low-cost drones as illustrated in Figure 27 below. The aim could have been the precise acquisition of Indian AD and EW locations, their saturation and exhaustion before a much larger barrage of air-missiles-drones including Akinci heavy UCAVs attempted to strike India's critical military and civil infrastructure after 0430 hours on 10 May 2025. Chinese PLA's tactics, at Combined Arms Battalion itself, involves training their UAV crews, in conjunction with snipers, to lure enemy AD to open up during the advance phase of their offensive operations. Similarly, from the night of 6/7 May to 9/10 May, Pakistani drones attempted to lure Indian AD and EW detachments to give away their positions before they attempted a massive strike. The admission of Pakistan's PM Sharif that Indian BrahMos missiles thwarted this massive PAF retaliatory strike evidently proves some of these assumptions. Since larger aircrafts and UCAVs could not take off, Pakistan launched another wave of Baykar Yiha III loitering munitions and targeted Amritsar and other areas at about 0500 hours on 10 May 2025.[75]

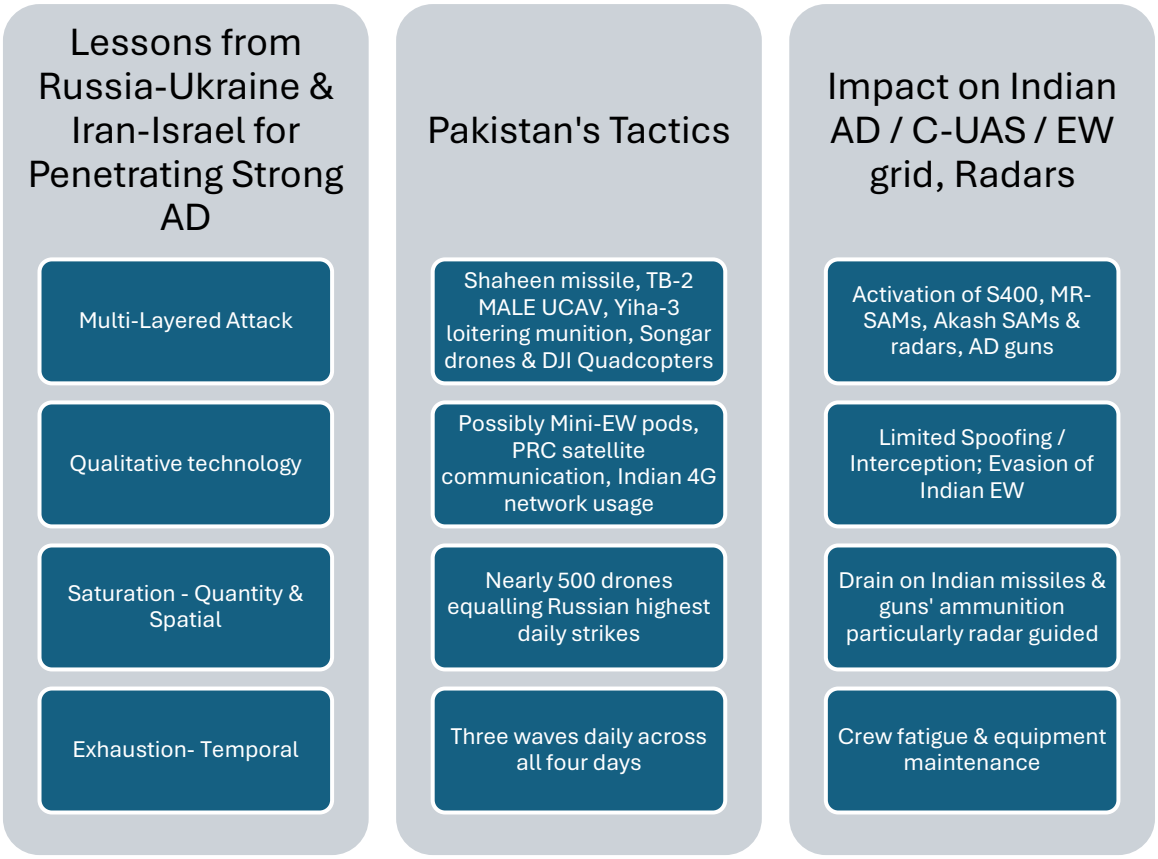

Figure 27: Appreciation of Pakistan Military's Drones' Strikes Tactics

(Source- Author's Research)

Reasons for Failure of Turkish Drones. While Turkish drones infiltrated to some depth in few areas, they could not cause any consequential damage on Indian side except few civilian targets. The probable reasons for failure, apart from strong Indian AD response, are listed below: -

- **Technological Dependency**: While Bayraktar TB2 was initially dependent on imported Western components like American semiconductors, Canadian optical systems and Austrian motors etc, embargos on these suppliers particularly for exported equipment to Pakistan adversely impacted the production. Baykar's swift transition to domestic production most likely failed to achieve the required quality. [76]
- **Strong AD**: Turkish UAVs have been mostly successful against weak enemies. The ideal example is the reduced effectiveness and consequentially limited employment of Bayraktar TB2s by Ukraine as a result of Russia's advanced EW and AD systems. [77]

- **Exaggerated Propaganda**: Erdoğan and his office have tried to propagate strategic superiority of Baykar drones through regular sharing of impressive drone attack videos on social media. The failure in Ukraine got noticed later. [78]
- **Lack of Ecosystem Depth**: Many experts feel that Baykar's drones' program lacks a vibrant technological ecosystem. [79]

Employment of Drones in Future Indo-Pak Conflicts

Pakistan has been resorting to drones based trans-frontier narcotics smuggling and even terrorist attacks since long. However, the Russia-Ukraine War, followed by four days of Operation SINDOOR and Ukrainian Operation Spiderweb on 31 May 2025 have triggered a paradigm shift in the employment of small-drones for trans-frontier strikes with minimal chances of uncontrollable escalation. As part of Israel's Operation RISING SUN in June 2025, the production and assembly of small drones on Iranian soil and later optimal exploitation by Israel for SEAD and targeting SSMs simultaneously ensured air dominance by Israeli AF and delayed Iranian retaliatory strike. Pakistan has neither adopted the "sabotage through strategic / operational / tactical surprise" method of penetrating adversarial C-UAS and AD till now nor launched FPV / OFC UAVs till now. However, with growing rumours of large-scale orders of Chinese drones' components on Amazon in India and Pakistan's extensive PIO network on Indian soil, such a drones' sabotage operation should be a major concern for Indian security establishment and even critical private / civil firms.

Smit Shah, from the Drone Federation India representing over 550 Indian drones companies, estimates that Indian government plans to spend nearly $470 million on drones over the next two years, nearly tripling the amount spent before Operation SINDOOR. While Indian push is towards indigenisation to overcome its dependence on Chinese components, Pakistan is aiming to intensify collaboration with its permanent friends China and Turkey to procure their drones and simultaneously improve domestic drone research and production capabilities. Being cash-strapped and also to avoid risking its high-end aircraft, PAF aims to strengthen NASTP and Baykar's collaboration to acquire more UAVs. [80]

Turkish Drone Advancements. Turkish drone companies are continuing deeper R&D on numerous drones' technologies which will find their way into Pakistan military sooner or later: -

- **AI Powered Take-off and Landing**. The Turkish President's Directorate of Communications claims that Baykar's Bayraktar TB3 (maritime version of TB2), achieved AI enabled fully autonomous take-off and landing from a Turkish ship TCG Anadolu with a short runway. TB3 also tested firing of supersonic missile UAV-122 in March 2025. [81]
- **Autonomous UAVs/UCAVs**. As part of Türkiye's 2021-2025 National AI Strategy, its primary goal is to build a new ecosystem by increasing R&D investments particularly in drones, strengthening the data infrastructure, and significantly developing national AI capacity. Thus, autonomous UAVs/SIHAs, are the focus areas by the government to enhance Türkiye's competitive advantage by incorporating advanced machine learning tools in Bayraktar TB2, KIZILELMA and ANKA through better sensor fusion and advanced AI algorithms. Bayraktar TB2T-AI, is supposedly capable of autonomous flight, thereby performing complex combat tasks without human intervention.[82] Baykar is working on advanced AI tools like Visual Posture Detection, Basic Object Detection, Gimbal Object Detection, Landmark Recognition and Operation Beyond the Line of View.[83]

Role of Drones in Conflict Escalation. A study of Kahn's 44 steps escalation matrix in a nuclear scenario and PLA's escalation ladder was undertaken in conjunction with Pakistan Army's 'Notion of Victory' to understand the role of drones in Sino-Indo-Pak conflict escalation dynamics. While India has not officially spelt out any "Escalation Control" policy, India's actions during Operation SINDOOR validated its new normal of "Zero Tolerance to Terrorism" wherein calibrated punitive strikes will be an expectation rather than an exception. The Chinese military's strategic escalation ladder has been defined in their Science of Military Strategy 2013 and 2020 editions. Drones have emerged as the low-cost risk-averse and safest means for China, India and Pakistan for strategic signalling without unintended conflict escalation while satisfying national populace aspirations of political resolve. In the overall geo-political framework of Indian

subcontinent, drones will thus play a key role in the complex hybrid Pakistan-India-China context as elucidated below.

State of Conflict	China-Pakistan-India Aim	Role of Drones / C-UAS	Recent Examples
Confidence Building Measures (CBMs) / Peace	To plan a crisis, particularly in Kashmir, disrupt Indian progress & then exploit every available opportunity	- Narcotics Smuggling - Weather modification -Persistent Surveillance	- Pakistan's drones drops in Punjab - Chinese cloud seeding tests & AI-enabled weather modification UAVs -PLA's UAVs' regular surveillance missions
Crisis – Continuous Grey Zone as prevalent currently to exploit every available opportunity	To cause turbulence in Jammu & Kashmir or disrupt Indian forces along India-Tibet border & deter India from infrastructure development	- Small drone strikes - Spoofing of Indian recce UAVs - Aerial incursions -USV / UUV incursions -Propaganda drones exercises to display PLA's preparedness	- Jammu airbase attack June 2021 - By PLA in Arunachal Pradesh in 2017 - Regularly by both Pakistan & PLA - Chinese UVs in IOR -Regular PLA videos on FPV drones, C-UAS grid
Coerce	To coerce adversary to follow China's directives	Limited and Indirect strikes in Nomad's Land / Sea	Chinese 8th step (medium density sub-step) in SMS 2020; executed against Taiwan on 04 August 2022
Compel – Deterrence by Punishment	To compel the adversary to stop a particular activity like forcing Pakistan to stop State sponsored terrorism	- Limited and Direct strikes - Calibrated & controlled punitive precision strikes with no collateral damage	- Chinese 8th step in SMS 2020 (high-density sub step) - Iran Against Israel- 13 April & 01 Oct 2024 - Operation SINDOOR – Attack on nine terrorist strikes without SEAD
Calibrate Confront / Retaliate	To calibrate the escalation or scale up in other domains	- Retaliatory punitive strikes on other targets expanding the conflict scope & expanse	-Pakistani strikes on Indian military & civilian targets from 07 to 10 May 2025 -Iranian retaliatory strikes on Israel- June 2025
Control Escalation	Devastating strike within same domain to	- Punitive precision strikes to deny adversary the capability to escalate further	- Israel on Iran – 19 Apr & 25 Oct 2025

	end conflict at least temporarily		- Indian strikes on PAF airbases & Pak AD on 10 May 2025
Curb / Curtail Nuclear capabilities	To deny the adversary the chance to build nuclear weapons	- SEAD and destruction of SSMs to facilitate missile strikes and air dominance - Protect own assets against all varieties of adversarial drones	Israel on Iran – June 2025 – Operation RISING LION
Combat – Hot war / Failure of Deterrence	To cause maximum damage to the enemy across all domains	- Tactical to strategic Raids / Ambushes - Manned-Unmanned Teaming based assaults - Swarms / stacks of drones, FPV drones -Integrated Information Firepower Strikes	-Ukraine's Operation Spiderweb – 31 May 206 - Russian & Ukrainian tactics during the ongoing war from 2022 to 2025 - PLA's plan from tactical to strategic levels during hot war

Table 2: Conflict Escalation Ladder – Role of Drones

(Source- Author's Research)

Indian AAD Upgradation. The plan for upgradation of Indian AAD, based on Ukraine War lessons, as available in open source, is listed below. The omnipresent drones' threat both during peace and war, as validated in Operations SINDOOR, Spiderweb, and RISING LION would have further expedited this plan with new proposals. [84]

- Upgradation of high-end AD systems.
- Emergency procurement of very short-range AD (V-SHORAD) missiles.
- Procurement of air burst rounds for IA's mechanised battalions having 30mm cannons on their infantry combat vehicles (ICVs) and 40mm/23mm ammunition for vintage L70 and Zu-23 AAGs is under progress.
- A Request for Proposal (RFP) for 220 new indigenous AAGs to replace the vintage L70 and Zu-23 along with smart ammunition has already been floated. With trials expected to commence in July 2025, Indian Army is hopeful of contract finalisation by May-June 2026.
- Procurement of laser and microwave weapons.
- With the aim of increasing kill probability and reducing logistics constraints, procurement of smart ammunition is being undertaken. With the capability to

program each round, one round of smart ammunition is assessed to be equalling 17 rounds of High Explosive in kill probability.

- Final trials of a new-generation of Akash SR-SAM, with a probable interception range of 30-km.

Lessons for Indian C-UAS Grid

"*In Gaza and Eastern Ukraine, FPV drones have showcased high-speed, low-altitude tactics that overwhelm traditional radar signatures through minimal RCS and chaotic manoeuvring, Israel struck inside Iran with drone either smuggled or assembled in the targeted country. This isn't merely a tactical problem—it's a structural one. Most of the Counter-UAS systems fielded remain mismatched to these evolving aerial threats*."

-Mr Pawan Kakkar, Jugapro[85]

The targeting of Indian civilians and even religious sites by Pakistan both during the sponsored Pahalgam terrorist strike and during Operation SINDOOR clearly indicate that C-UAS grid is no longer a military mission alone. Russians, with comprehensive Chinese assistance, have transformed the range of FPV drones from just 10-15 km across frontline to nearly 40 km using OFC. Although not used by Pakistan this time maybe because of inadequate skillsets, it would soon find entry in the Pakistan Army and their terrorist networks. **The biggest lesson is thus that local government officials, religious organisations, border forces and even border residents need to be taught to detect and block drones**. The Indian Prime Minister Mr Modi has indicated even to US President Trump that **Operation SINDOOR is still "on"**. Thus, time is precious and cannot be wasted. **Team BHARAT must strengthen C-UAS protection now**.

Countering Drones' Penetration. The same video by Perun "How Not to Lose Your Air Force (On the Ground) - Hardening, modern threats & air base defences" describes essential methods to counter the widening array of drones' and missiles threats –

- "**No Drone is Too Small to be Ignored"**. As very rightly pointed out by Mr Pawan Kakkar and Jugapro in their LinkedIn post[86], the smallest drone needs to be detected by all possible means. Wherever one detection mode fails, there must be another detection mode available. A multi-layered drones' detection

architecture, as indicated in the graphics at Figure 28 below, is the starting point of any resilient C-UAS architecture.

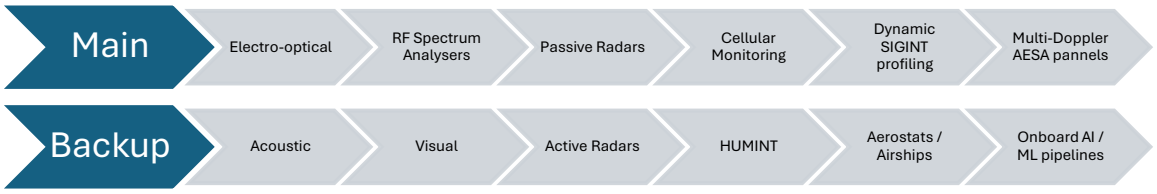

Figure 28: Layered Detection System

(Source- Author's Research)

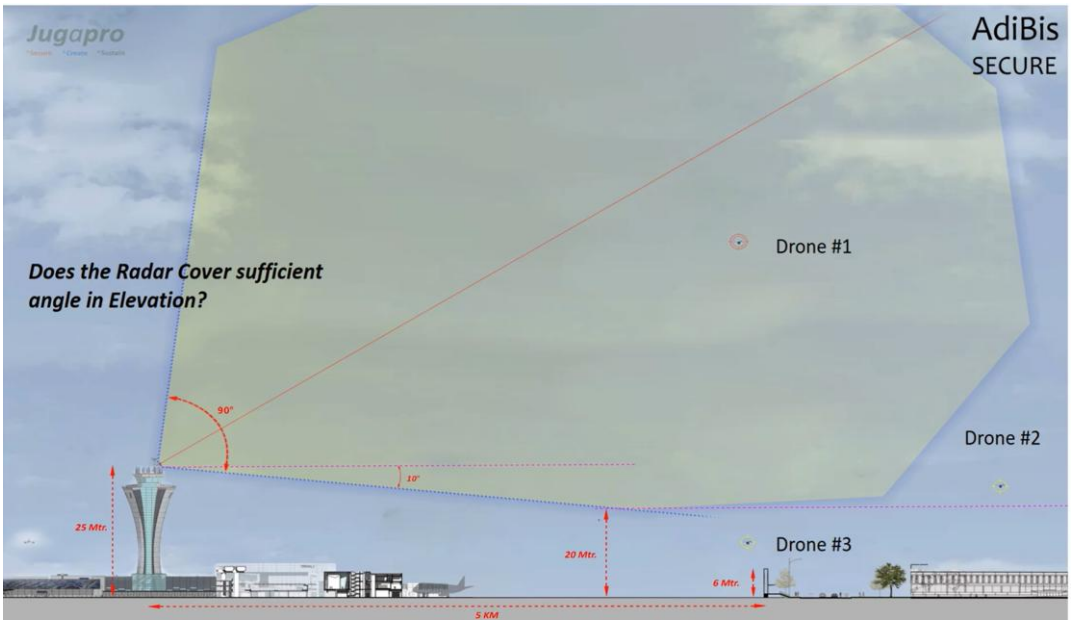

Figure 29: Possible Blind Spots in Radar Based Detection of Small Drones

(Source- Jugapro)

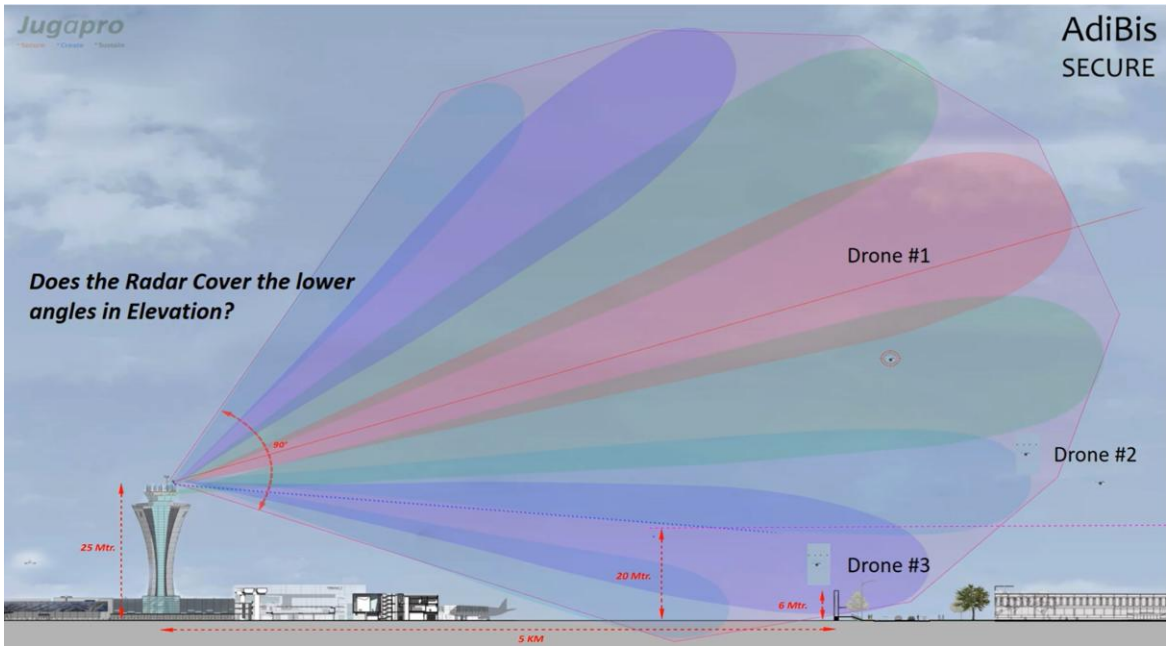

Figure 30: Minimising Blind Spots in Radar Based Detection of Small Drones

(Source- Jugapro[87])

- **Passive Defence by Enhancing Survivability**. The era of aircrafts lying in the open along airport runways or conventional SSMs deploying in unprotected hides is essentially over. With increased persistence of Chinese satellites, any low-cost drone either delivered by mother-UAV or through sabotage or assembled by PIOs on Indian soil can strike such aircrafts or SSMs. Due to shortage of hardened aircraft shelters at times, some aircrafts keep lying in the open and are visible from satellite images. Thus, Indian defence forces need to urgently work on decoys, concealment and survivability of critical assets. The least possible low-cost option is exploitation of existing tunnels and such dual-purpose options.

Figure 31: Satellite Image of Indian Rafale on Pakistan Defence Forum

(Image Source-Ghazi 52 on Pakistan Defence Forum[88])

- **Overcoming Low-cost Saturation / Preventing Exhaustion**. While variety of C-UAS options and technologies like lasers, directed energy weapons, shotguns, nets etc are now available, most of them need to be fully indigenous to provide 100 percent assured protection. The most effective low-cost response is aerial interception by low-cost drones which are also largely import dependent. Thus, the most effective way is to integrate all possible indigenised assets in the most optimal manner as possible. It requires a multi-layered response across our borders to ensure our AD protection umbrella neither gets exhausted nor saturated. The most suitable concept should be to handle each and every layer of adversarial drones / swarms strikes in detail through at least one indigenous / assured option in Indian C-UAS toolkit. When everything fails to block the incoming threat, survivability options need to be strengthened positively.

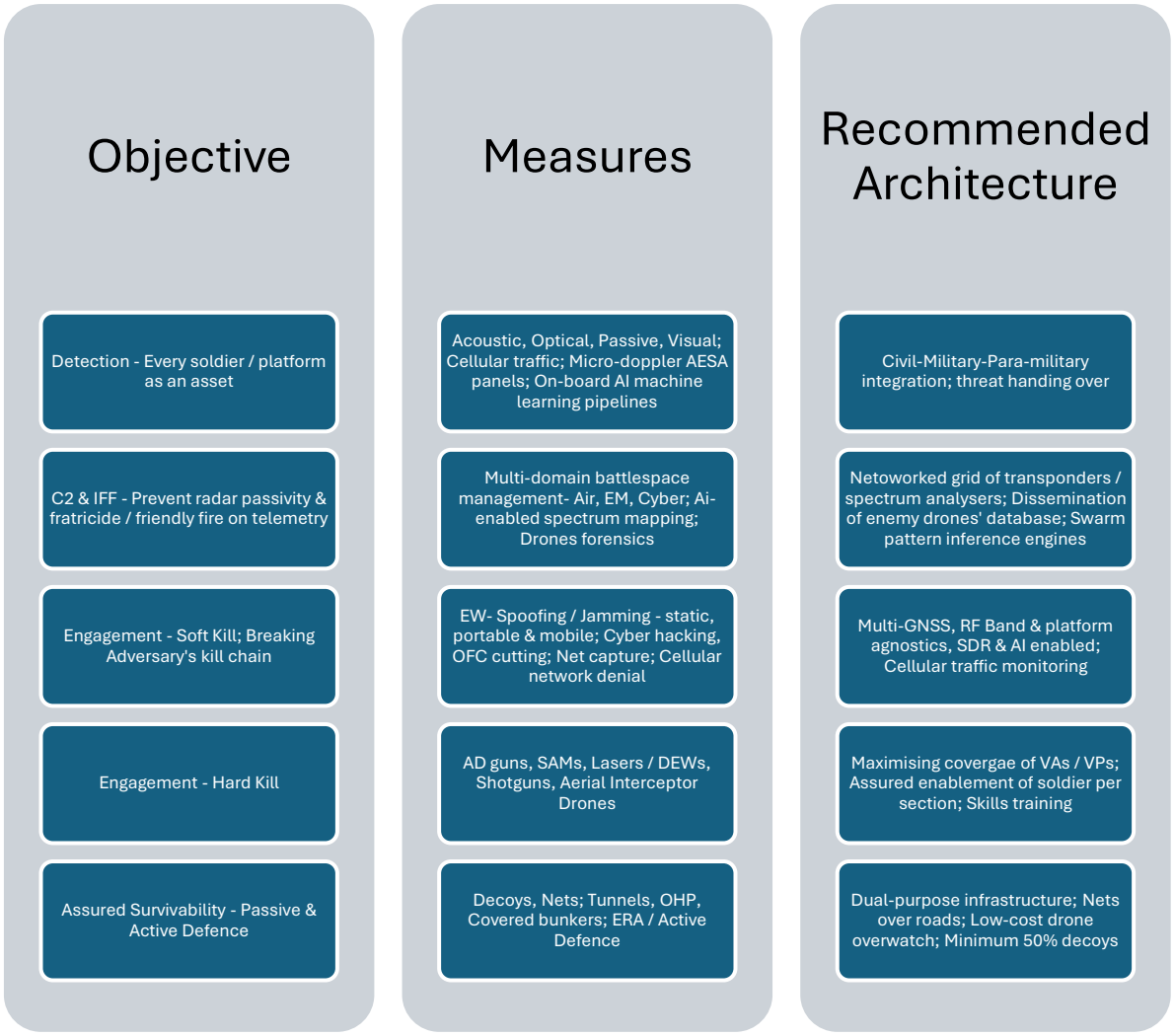

Figure 32: C-UAS Toolkit Against Saturation Cum Exhaustion Tactics

(Source-Author's Research)

- **Breaking the Enemy Kill Chain**. While static assets can still be saved by tunnels and C-UAS grid, protection of mobile assets requires mobile C-UAS platforms. In such a case, the most effective option is also to disrupt the adversarial kill chain process by targeting the weakest link.
- **Denying Easy Accessibility**. Unlike restrictions on procurement of rifles, guns or even improvised explosive devices, there are hardly any restrictions on procurement of drones' components especially with the enhanced ease of production with 3D printers. Thus, rules and regulations need to be implemented to minimise the illegal assembly of drones particularly provision of explosive components. Iranian government, having learnt the lessons hard way, is now undertaking propaganda campaigns to guide their population to be

aware of suspicious activities relating to adversaries' drones' factories inside normal residential area. Indian central and state governments need to undertake similar population awareness campaigns.

- **Adversarial Drones' Forensics**. Whenever wreckage of enemy drone or fully intact drone is recovered, comprehensive database after its forensics investigations must be circulated amongst all military, paramilitary and indigenous C-UAS companies to ensure faster response.

Fusion of Ideas and Technologies. No single company or organisation can find the best battlespace solutions today particularly with the rapid pace of technology development. Hence, there is a need to transform from a single L1 contractor process to a fused collaborative order, merging defence firms with local sponsoring military units, to amalgamate and fuse best technological solutions together as **TEAM BHARAT** and also ensure faster surge capacities or scalability whenever the product is urgently required. Complementarity is the way forward.

Turkish / Chinese Long-Range Strikes. While Pakistan does not have the requisite depth to save its critical assets from Indian standoff strikes, it is not beyond imagination that Turkey, like Iran or Israel, may at some time resort to long-range strikes on India in support of Pakistan. While the possibility of such an eventuality is absolutely minimal particularly at a distance of 4000 km plus between Delhi and Ankara, it still cannot be ruled out as fiction in the currently volatile geopolitical scenario. Azerbaijan, in a war-like situation with Armenia often, complements the eternal Islamic trio and reduces that distance to 3000 km. In any case, Chinese proximity, all-weather friendship with Pakistan and volatility of Sino-Indian relations make Chinese strikes more likely. However, Indian retaliatory strikes must have adequate reach to go even beyond Tibet and Xinjiang. Thus, in the current case like Operation RISING LION, India must have conventional strike assets of 1000 km plus strike range minimum in adequate quantum of 100 plus daily strikes. The conventional missiles-drones strike capabilities need to ideally reach 3000-4000 km if capital needs are to be matched to a capital mirroring response.

Wargaming / Red Teaming for Audit. Comprehensive audit of our critical infrastructure through wargaming by independent red-teams is essential from both

angles- success of our C-UAS grid against enemy's strikes and penetrability of our drones-missiles strikes of enemy's C-RAAMD grid. It's very important to test our drones against enemy style EW / C-UAS assets and not own assets. Similarly, our C-UAS platforms and architecture must be tested against most advanced drones' technologies available with our adversaries.

Indian Readiness. Indian readiness for SINDOOR 2.0 requires multiple lines of efforts through a multi-disciplinary whole-of-nation collaborative execution as per a timed vision.

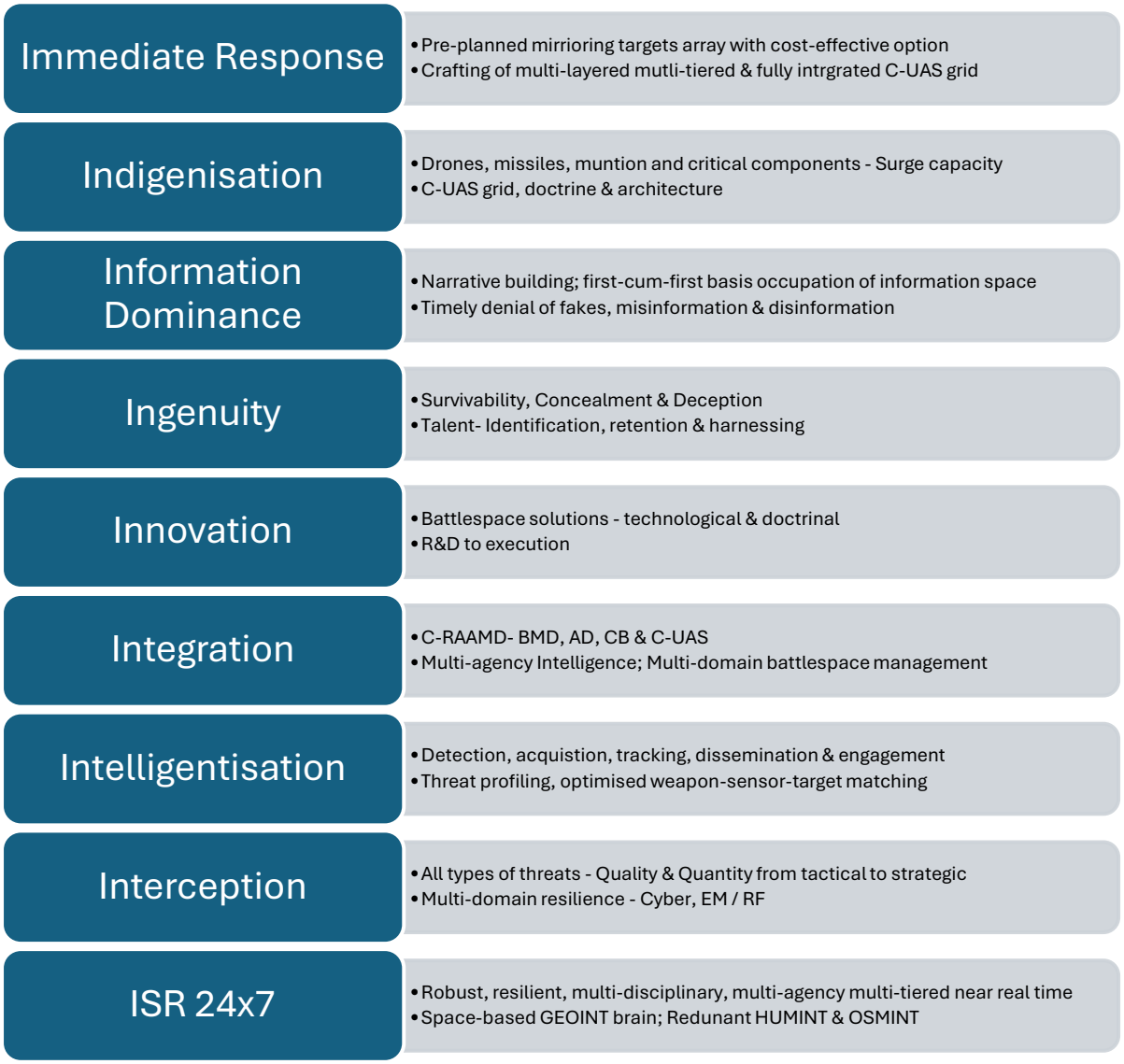

Figure 33: Contours of Proposed Indian Response

Conclusion

'*Unless India stands up to the world, no one will respect us. In this world, fear has no place, only strength respects strength'*

- Former President and Missile Man of India Late Dr APJ Abdul Kalam[89]

The failure of Turkish Baykar firm's variety of drones to cause any significant damage on Indian soil not only questions the much-acclaimed efficiency of Turkish drones but also is a personal setback to Turkish President Erdoğan who has utilised the power of his office to promote the sales of his son-in-law's firm. With repeated failures of Chinese drones during numerous trials particularly in high altitude areas, Pakistan relied on Turkish drones during the four days war. However, with Indian AD denying any significant success to Turkish drones in combat, Pakistan must be looking for suitable alternatives. Pakistan may even approach Ukraine for drones' technology in return for their support through Yiha-III drones initially. The recent Trump-Munir lunch bonhomie indicates possibilities of American technological assistance as a bargain for more intelligence or Pakistan's geographical rental support against Iran. Atmanirbhar India must thus closely monitor Pakistan's moves by its own assets. The other big advantage with Pakistan is that China has near sole monopoly in production of drones' components**. Indian military, industry, and the government need to urgently resolve this Achilles heel by 100% indigenisation on priority even at the cost of some delays**.

The quantum jump in range and strategic depth of missiles-drones strikes, whether through sabotage or direct strikes, makes it evidently clear that vulnerabilities cannot be neglected. Amidst Trump-Munir chemistry, the growing proximity of Türkiye-Pakistan-China trio with Bangladesh and volatile situation in both Myanmar and Nepal only aggravates these vulnerabilities. It's not a scary scenario building but a harsh reality which dawns on the country. Defences against adversary's air, missile, rockets, artillery and drones' capabilities cannot be handled in compartments and silos of services, arms, forces, and departments anymore. **100% Indigenisation of our drones and C-UAS grid, integration and collaboration cutting across all turfs and bureaucratic norms is the immediate essential and cannot remain on the drawing boards and academic papers**.

Mr Pawan Kakkar's punch line in his recent article[90] aptly sums up the gist of C-UAS requirements today

> "Countering the Drone threats is no more a sidekick, this doctrine must be viewed as a continuous ISR compression problem not just a trigger-happy interdiction game. The real mission is not to shoot the drone. It is to *know* what to shoot, when, and with what authority**, …constantly striving to Detect earlier, Interpret faster and Strike with confidence. The drone threat is not static. Neither can be our response**!"

About the Author

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