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A Qualitative and Quantitative Assessment of the Drone Threat to India from Our Potential Adversaries & Anti-Drone Capability Required to Counter the Same in a Multi-Front Tri-Service War

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A Qualitative and Quantitative Assessment of the Drone Threat to India from Our Potential Adversaries and Anti-Drone Capability Required to Counter the Same in a Multi-Front Tri-Service War

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Abstract

The rapid proliferation of unmanned aerial systems (UAS), swarm drones, loitering munitions, and autonomous strike technologies is reshaping the character of modern warfare. This paper examines the qualitative and quantitative drone threat to India from its potential adversaries in the context of a future multi-front tri-Service war and analyses the anti-drone capabilities required to counter such threats. The study assesses the expanding drone arsenals and operational doctrines of China and Pakistan across the spectrum of ISTAR platforms, UCAVs, swarm drones, FPV systems, and loitering munitions, including the possibility of collusive employment.

It further evaluates the likely operational pattern of future drone warfare, characterized by persistent grey-zone activity followed by large-scale swarm and drone attacks intended to overwhelm India's air defence and command-and-control networks. Based on open-source assessments, the paper estimates that India could face coordinated drone attacks of 1500–2000 or more platforms per day during a high-intensity conflict. The study argues for an integrated Counter-UAS framework comprising advanced detection systems, kinetic and non-kinetic kill mechanisms, and dedicated Battle Management Command and Control (BMC2) architecture, supported by accelerated indigenization and capacity building.

Keywords: Drone Warfare; Counter-UAS (C-UAS); Swarm Drones; Multi-Front Warfare; Air Defence; Autonomous Systems

The Contours of the Drone Threat.

The term drone threat is all-encompassing. In its constituents, it will include the following types of threats (Saxena, V.K. 2021) [1]

The ISTAR Threat

ISTAR or Intelligence, Surveillance, Target Acquisition and Reconnaissance relates to battle functions. The threat of this is limited to the loss of information, locational/positional secrecy or loss of battle-critical information.

The UCAV Threat

UCAV or the Unmanned Combat Aerial Vehicles, (metamorphosed from ISTAR machines) with limited weapons on board such as guided rockets, bombs, air-to-surface missiles (ASMs) etc., pose a threat to targets in the Tactical Battle Space (TBS) such as combat vehicles, mechanized elements, field fortifications etc.

Dedicated Unmanned Aerial Systems (UAS) Threat

This threat is from dedicated and standalone UAS machines complete with their niche communication, surveillance and navigation suite and a slew of weaponry to include precision guided munitions (PGMs), ASMs, guided bombs and rockets, smart / loiter munitions etc.

This threat will present itself in two altitude/endurance domains viz. HALE and MALE. HALE standing for High Altitude Long Endurance (altitude >30,000 ft, endurance > 48 h) and MALE for Medium Altitude Long Endurance (altitude 10,000-30,000ft, endurance 24-48 h).

The Manned and Unmanned Teaming (MUMT) Threat

These are the threats in HALE/MALE domains posed by joint manned and unmanned platforms. The threat is substantial as it combines human intellect of the combat pilot with AI driven 'look-see' and strike capability of UAS. The multiplication factor is huge, say 1: 30.

The Small Drone Threat

These include small drones with all configurations (conventional wings, delta wings or quad/hexa/octa rotors etc.). Featuring Radar Cross Section (RCS) from 0.001-0.5 M, these threat vehicles defy detection by conventional radars and possess capability of a precise hit at a point of choosing with a variety of warhead including the PGMs. Small drones have come to pose a big threat as of date. The Russo-Ukraine war and the ongoingUS-Iran war has actually transformed the contours of asymmetric warfare shaped by drones. In GPS denied environments, First Person View (FPV) drones, driven by the camera feed from drones are capable of being steered for precision strikes by their operators.

Drone Swarms Threat (Saxena, V.K. 2020)[2]

Drone swarms, as a manifestation of small drone threat, will feature a body of small drones (10-100s and more) which are gridded together to behave as one integrated body (swarm – standing for Smart War Fighting Array of Reconfigurable Modules). The swarm inspired by the amazing intelligence of a locust swarm displays 'collective intelligence' and amazing 'survivability instincts.

Programmed by the tools of AI, drone swarms are capable of taking decisions, show tolerance for ambiguity to take default actions where no orders exist as also possess the capability to conduct 'intelligent autonomous warfare'. They can quickly adapt to unexpected changes and have the capability of 'group thinks to shoot down multiple threats simultaneously. With their sheer numbers, they can simply overwhelm the finite capability of conventional air defences to respond through kinetic countermeasures.

Assessment of Drone Threat from Our Potential Adversaries

We face a comprehensive drone threat from our potential adversaries. This may be standalone or collusive among the potential adversaries or may draw from external powers that choose to support them in a war with India.

As is known, there are two components to the threat—the capability and intent. An attempt has been made to state the capability and infer the intent when the opportunity will present itself.

Drone Threats from China

China is a strong UAS power, having machines in each of the threat verticals described above. Salient points: -

- ISTAR machines, though available across genre, are not detailed here as aerial combat 'threat' vehicles per se. Suffice to say that with such a threat at play, the security of our equipment-related information, as well as critical information on the instant progress of operations will be at stake, and would require to be guarded.

- In the UCAV and dedicated UAS category, China has both the MALE UAS (BZK 005, GJ 1 and GJ 2; service ceiling 9000 m and endurance up to 24 h), as well as, HALE UAS (EA 03 and WZ 7 service ceiling 18000m and endurance up to 24 h) {Saxena, V.K. 2020}.[3]

- One UAS that deserves a special mention is the Wing Loong- I UAS (improved version is Wing Loog II- range 4000 Km, endurance of 20 hrs, service ceiling 5000 meters, maximum speed of 370 km/h.) This UAS is actually in the same class as MQ 9 Reaper, or MQ1-C Gray Eagle etc. (both US UCAVs are top of the line, though have taken some beating in the ongoing US-Iran war) {**Liu Xuanzun**, L. and Wei, F. 2023}.[4]

- MUMT capable, Wing Loong can carry a payload 480 Kg which could include precision munitions, guided bombs, ASMs, guided rockets, anti-radiation missiles etc. (one possible configuration of a Wing Loong payload may be – Bombs FT 7- 130 kg, FT 9 - 50 kg , FT 10 - 25 kg, or ARM -BRM 1, guided rockets and AKD 10 and GB10- a flare seeker bomb). For sea-based threats, Wing Loong can carry an anti-ship missile - YJ9E (**Liu Xuanzun**, L. and Wei, F. 2023).[5]

- Besides the above mainframe UAS, there is a whole range of technology-driven UASs held by China. These include platforms that are capable of Vertical Take Off and Landing. There are also morphing-enabled UAS. Morphing is the capability to adapt to changing flying conditions by modifying vehicle/wing configuration. There are also rotary wing platforms and such other UAS which are nearly independent of Ground Control Station (GCS). Later generation UAS have a reckonable stealth capability (**Liu Xuanzun**, L. and Wei, F. 2023).[6]

- Some other UAS worthy of mention are the MUMT enabled Tianying/Skyhawk drone (speed 200 km/h, endurance 6-12 h), Gongji 11 (combat radius 1000 km) and WZ8 supersonic ISTAR platforms.

- As regards swarm drones, both the fixed wing, as well as, the rotary wing machines called helicopter swarms are reported to be developed to mission-ready status (Lin, J. and Singer,

P.W. 2021)[7]. Chinese swarm drones (like Atlas drone swarm system capable of simultaneous deployment of 96 drones, 200 drone AI swarm, CETC 119-drone fixed wing swarm etc.) are major force multipliers capable of overwhelming conventional air defences (Ditter, T. 2025). [8]

- Swarm drones from China have the capability to conduct multiple operations in India— saturate, overwhelm and exhaust the air defences before executing the mainframe air threat, conduct threshold surveillance, conduct dedicated electronic warfare missions or mass kamikaze strikes (The Diplomatic Envoy, 2025). [9]

- Drone threat from China has a substantial stealth muscle. UAS like the Wing Loong II and CH 7 are low observables with a capability to for deep strikes with precision.

- Kamikaze drones (Jiu Tian, ASN 301, Sunflower 200, KZ 2 and more), FPV drones (Little falcon, Xinge, CH 817 etc.) along with loitering munitions (FH 901, Feilong 300-D, WS 43 etc.) are the major strength of the Chinese drone arsenal.

- Chinese drone development continues at a fast pace signaling a steady escalation in the threat ladder.

Drone Threat from Pakistan

Pakistan's UAS journey started around 1997-1998, a time when we were going in for Searcher Mk 1 UAS from Israel and the DRDO was a few years into making indigenous machines (Worldpress)[10].

The programme initially was driven by public sector. Lead players were Air Weapon Complex (AWC) and Pakistan Aeronautical Complex (PAC). As years rolled, several private sector players came in— Integrated Dynamics, SATUMA (Surveillance and Target Unmanned Aircrafts), Associated Consulting Engineers (ACES), GIDS (Global Industrial & Defence Solutions), NESCOM (National Engineering and Scientific Commission) and more.

Over the years, GIDS in particular came out with a large number of drones. Importantly, the Shahpar series (Shahpar I, II and III) reconnaissance (recce) and strike drones. Others included short range recce drones, Sarfarosh canister launched kamikaze drone (range (r)-1000km, endurance(e)-2h) and the Turah stealth loitering munitions (.[11]PAC made a beginning with Ababeel lightweight military drone (r- 5 km) and later a target drone named Bazz (r- up to 200 Km). In 2007-08 PAC and ACES developed the Uqaab tactical drone (r-300-350 km, e- 5-6 h)[12]. The AWC around this time produced the Bravo (and Bravo +) UAS. This machine with a range of 80 km was capable of ISTAR missions[13].

SATUMA developed Jasoos series of ISTAR UAS (range: 100km, e->5h) [14] and Mukhbar (range-50 km, e -1.5 h) and Flamingo (range-200+km e -6-8 h) short range reconnaissance UAS.[15] Another mini UAS developed was the Stingray, basically for 'around the corner' and 'over the hill' surveillance (range-45 km e-1 hr)[16].

Vector ISTAR UAS (range-200km, e 4-5 h)[17], Vision Mk I and II surveillance drones (range-100 and 150 km, e-5 hrs+), Shadow Mk II surveillance drones[18], Tornado and Nishan target drones, Border Eagle surveillance drone, Hornet surveillance drone and HUMA 1 etc. were other machines developed around this time[19].

The Foreign Hand

A large portion of the Pakistani UAS arsenal was built up through direct import. Prominent among these were the Chinese machines ASN 105A (r- 155 km, e- 2h) and ASN 206 (r-200k, e-6-8h). Germany provided Luna (r-100 km, e-5 hrs). From UK, Pakistan imported Snipe Mk II (r-8km, e-35 min) and Streak (r-not known, endurance 20 min). From Italy, Pakistan imported Falco UAS (range 200 Km endurance 8-12 hrs) while from South Africa there was Seeker (r -200 km, e- 9 h).

Towards Combat UAS

Pakistani quest for a combat UAS (UCAV) dedicated platforms capable of carrying variety of warheads for precision strike, started as early as 2001 when it made a bid to acquire the Predator MQ9 from US on the plea to guard the Durand Line during the Global war on Terror.

When this did not succeed, its indigenous Programme to develop the UCAV was awarded to NESCOM in 2009. The product that came out in March2015 was called Burraq UCAV. This UCAV had a range of 1000 km is capable of carrying two air-to-surface laser guided missiles (Barq)[20]. It can also carry anti-tank missiles (r-10km) and guided bombs (Chinese -YC 200). [21,22].

Figure 1: NESCOM's Burraq

Source: https://english.alarabiya.net/News/asia/2015/09/07/Pakistan-armed-drone-kills-three-in-first-attack

UCAVs from China

As early as 2018, there were reports of likely sell of 48 Wing Loong II Chinese UCAVs to Pakistan.[23]

While the current status of 48 UCAV is not reported in open source, there was a report of 4 Wing Loong II being given to Pakistan for the protection of Gwadar Port[24]. Then there is the recent report of Pakistan purchasing 30 Wing Loong II drones.[25]

The Turkish Drone Connect

Besides all the countries from where Pakistan has imported drones, Turkish support stands significant. Turkish drones showed up in a big way in the Indian skies during Op Sindoor. Some details: -

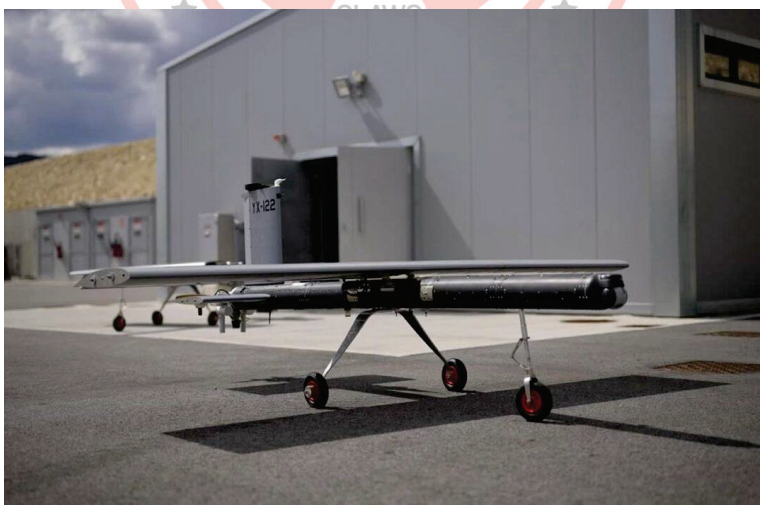
- Pakistan holds the Turkish TAI Anka drones. Anka has a fairly long combat range of 250 km and endurance of 30 h. It can carry laser-guided rockets, long range anti-tank missiles, and other PGMs. Going by the claimed figures it is a formidable platform.[26]

- Bayraktar TB2 is another very effective Turkish drone held by Pakistan. It has a combat range of 300 km and endurance of 27 h; this drone is an effective platform that can deliver a variety of warheads laser-guided rockets, 81mm mortar, long range anti-tank missiles and laser-guided smart bombs.

- Pakistan also holds a small inventory of Bayraktar Akinci drones (r-500km+, e- 25h). These are the high altitude (HALE) version of the Bayraktar family. Akinici is gold class capable of delivering a diverse payload of rockets, bombs and missiles. Another Turkish drone used in large numbers is the Assiguard Songar drones (r -10 km , e -35 min).

Large number of Turkish kamikaze drone viz. YIHA-III are being locally produced in Pakistan by GIDS. [27] These also showed up in large numbers during Op Sindoor.

Figure 2: Kamikaze Drone



Source https://defence-blog.com/albania-fields-turkish-made-yiha-iii-kamikaze-drones/

How the Drone War is Likely to Unfold?

In order to assess what counter against the entire package of drone-based threat from our potential adversaries needs to be built by India in quality and quantum, the key question is – How the drone war from our potential adversaries is likely to unfold?
An attempt has been made to crystal gaze the same.

At the onset some assumptions are made: -

- Irrespective of the fact whether the war has started with any one adversary, the other(s) will join in collusive effort covertly and/or overtly.

- The drone-based threat play featuring drones, swarm drones and loitering munitions will be used in overwhelming numbers throughout the currency of the war.

- Op Sindoor is no reference to go by as it was not even a 'trailer' of the 'next war'. At the most, it may serve as a stark reminder that a much fiercer and much more overwhelming and destructive rounds are lined up for the future.

- While this research work is focused on the drone/anti-drone domain, the spread of the war will be 'all encompassing'. The typically cited hybrid war besides the mainframe weapon systems, viz, aircrafts, missile guns, autonomous systems and more will also feature cyber, Electronic Warfare (EW), cognitive, narrative and disinformation warfare

Based on the above assumptions the drone war is likely to unfold across following stages:-

Pre-war Grey Zone Conflict

This phase will be a near continuous one round-the-year. It will involve all kinds of ISTAR machines which will continuously probe the border areas to cumulatively shore up and continuously update situational awareness data on the Indian defences.

Figuring ORBATS to mapping constant re-deployments, identifying gaps in defences, deciphering minefield patterns and gaps therein, keeping a tab on vehicular movements and possible spikes therein, reporting on induction, deployment and re-deployment of major platforms and more, will be the typical task sheet of the ISTAR machines dedicated to intelligence gathering mode.

Sporadic but steady dropping of arms, ammunition, cash, narcotics, smuggled goods etc. will be a constant feature in this phase. The threat will be loss of strategic information, as well as, battlefield intelligence besides potential danger from drops. Drones and swarm drones on such mission will be the targets for our counter UAS (C-UAS) means much like 'the cat and mouse game' – an eternal duel.

The Opening Round

In the drone domain, the action that will signal the transition from the pre-war to active hostility stage is likely to be a huge swarm drone strike.

There are reports of collaborative efforts by Pakistan and China to commence the war with an AI-enabled, high altitude drone swarm that will have the capability to overwhelm and exhaust the Indian Ground Based Air Defences (GBAD), mainly the S- 400, MRSAM and Akash weapon system. These swarms are likely to operate at altitudes (10000 ft and above) so as to bypass the terminal GBAD terminal deployments of guns (L -70, ZU 23) and VSHORADs (Schilka gun-missile system and Igla MANPADs) which have proved to be 'bulk-killers' of swarms.[28]

Preparations for such a collaborative effort are well underway. As stated earlier, China is helping Pakistan in the area of UAVs in general and high-altitude swarm drones in particular. There have been technology transfers enabling co-development and co-production between China and Pakistan (GIDS and NESCOM).[29] Military exercises (recent Warrior IX done in December 2025) focused on joint operation of swarm drones and suicide drones embedding Chinese technology in Pakistan's tactical operational plans. [30]

Keeping the Momentum Alive

In the days that will follow the initial pre-emptive strike by the onslaught of a continuum of drones (ISTAR+UCAVs+ UAS machines), the momentum will be kept alive by more and more swarms and more and more small drone attacks. These attacks will continue to lure own GBAD sensors to open up thus giving out their locations which will be 'prime targets' by strike aircrafts, attack helicopters and missiles coming in at the heel of drone swarms.

Besides air defence assets, critical infrastructures, bridges, ammunition dumps, logistic convoys, stores holding war-waging potential, population centres, oil and gas infrastructures, command, control and communication nodes and more, will increasingly come under attack by swarms, small drones, fully-loaded UAS, FPV machines and more.

Besides overwhelming the GBAD systems, the aim of the drone onslaught will be to choke the Air Defence Control and Reporting System (ADCRS). ADCRS controls the prosecution of the air defence battle at the national level. It is based on a nation-wide chain of Air Defence Control Centres threaded together by the Air Force's Integrated Air Command and Control system (IACCS) which interconnects with the Army's ADCRS, i.e. Akashteer system and Navy's ADCRS, viz. Trigun system thus completing a nation-wide grid for the control of execution of the air defence battle. Once this grid is choked, the country's capability to counter the mainframe threat (aircrafts, attack helicopters, Cruise missiles, ARMs, SSMs, and more) will stand degraded. [31]

A Perception of The Quantitative Threat.

What is the quantum of drones and swarm drones that is likely to be pitched against India by our potential adversaries in a collusive manner in an event of multi-front tri-Service war?

This is a difficult question to answer in definitive terms. Here are some inputs that will assist in putting together a response to this poser:-

Open source indicates that Pakistan alone has the capability of amassing drone swarms of 300-500 drones per strike.[32]
While Op Sindoor is no guide, it is on record that on a single night of attack (07/08 May) Pakistan launched some 300-400 drones[33] . Some other accounts suggest that Pakistan launched a total of 500 drones in three waves.

According to reports, China is aiming to deploy more than one million (10,00,000) AI enabled drones along the Indian border by 2026. [34]

China has demonstrated the capability of deploying 96 to 200 drones instantly using a single command vehicle. Also its truck mounted Atlas Swarm drone System can deploy 48 drones /vehicle. This capability can be cumulated instantly.[35]

A typical Chinese swarm drone configured to overwhelm Indian GBAD could be 500-1000 strong.[36]

Keeping in mind the above figures, following is stated: -

- In a multi-front war involving the three Services, the quantum of drones pitched against India by our adversaries acting in a collusive manner could be 1500-2000+ on each day of the strike.

- This number is likely to be shared randomly between various elements of the drone-package, viz. ISTAR machines, UCAVs, UAS, drone swarms and loitering munitions.

- It is also likely to include the sea-drones which go by the name of Un-crewed Surface Vehicles (USVs) and Un-crewed Underwater Vehicles (UUVs)

How Drone-Based Threat Needs To Be Negated?

Since drone-based threats has multiple dimensions as detailed in this paper, the counter to the said threat must also to be multi-dimensional.

It is understood that both drones and anti-drone as two sub-set verticals will form components of the Superset called the Sudarshana Chakra as announced by the Hon'ble PM on the Independence day in the year 2025.[37]

Back to the anti-drone or C-UAS systems, it is stated that the package will embrace three important verticals viz. Detection systems; Kill Systems; and Battle Management Command and Control (BMC2) Systems.

Detection Systems

The biggest challenge in this field is the detection of small drone and swarm drones which, due to their extremely low RCS, defy detection by conventional radars. The solutions lie along these lines:-

- Detection using Electro-Optical (EO) surveillance devices. A typical Electro- Optical Fire Control System (EOFCS) would have five main components —Day camera, Night camera, Laser Range Finder, Fire Control Computing Device and a Video Display Unit.

- Radio Frequency (RF) based surveillance devices basing detection on the RF signatures of the drone-package.

- Normally the above dual mode surveillance pack (EO+RF) is associated with a radar-based surveillance for precise location of drones. Radars optimized for low-RCS drone detection are the Active Electronically Scanned Array (AESA) Radars and some other precise radars working in the frequency bands of 6-15 GHZ (C, X Ku and Ka bands). Frequency Modulated Continuous Wave (FMCW) radars, as well as, Passive Coherent Radars also show promise in small-drone detection.

- Acoustic sensors optimised to listen on to the very peculiar and very distinct buzz of the quad/hexacopters are getting integrated in the detection envelop.

Kill Systems

That low-cost drone-based threat needs to be countered with comparable cost kill means is basic. Here is a brief glimpse of what is required: -

- RF kill means based on jamming /disrupting the GPS/INS signal used by the drone for its navigation or crippling the connectivity between the drone and the GCS.

- Directed energy kills using lasers or high-power microwave (HPMs) systems that simply 'fry-up' the sensitive electronics and electromagnetic components of the drones thus making them impotent. It also includes the EMP (electromagnetic pulse) where the kill means releases an EMP to decapitate/ burn out the drone swarm.

- EW based kills – hacking spoofing and more.

- Erecting an 'electronic fence' (500-700m) and subjecting the intruding drones to jamming attacks thus crippling them and forcing them to initiate a default 'return to base's command.

Kinetic kill using multiple means: -

- High rate of fire air defence guns and autonomous weapons, small arms and more.

- A swarm of micro-drones aiming for a catastrophic kamikaze collision or proximity kill.

- Net-based drone capture.

- Bulk kill means for drone swarms.

BMC2 Systems

Dedicated Battle Management Command and Control or BMC2 architecture (ADCRS, in air defence parlance) is required to handle a huge volume of drone and anti-drone operations in the Tactical Battle Space (TBS). This is inescapable to ensure multiple outcomes: -

- The primary air defence ADCRS chain, which is basically dedicated to dealing with the mainframe threat, is not choked by voluminous drone traffic that is actually pressed in to achieve that aim.

- The response to drone-based threat is immediate (instant) and not routed for authorization on the higher ADCRS artery (IACCS-Akashteer).

- Drone and anti-drone operations in the TBS embrace all the players (except the GBAD, rest like Infantry, mechanized forces, artillery, signals and others are not connected on IACCS-Akashteer grid)

What Specific Actions Are Required?

Here are the specific action points that emerge from the foregoing.

Detection Capabilities

There is an urgent need to enhance our drone detection capabilities. These capabilities configured on the verticals stated above are currently resident in two modes—Standalone; and As a part of completed C-UAS systems.

Standalone detection systems

For the standalone vertical reasons are made: -

The current drone detection radars include the Low-Level Light Weight Radar (LLWR) (Improved version)[38], the 3D FMCW Drone Detection Radar (DDR)[39] both made by Bharat Electronics Limited (BEL). Drone detection capabilities are also resident in the Air Defence Fire Control Radar – Atulya made by BEL on DRDO design and the Mountain Fire Control Radar unveiled by BEL in 2026.[40]

These capabilities are far too less and worse; these are primarily single companies based too in the public sector. There is a need to diversify the base. Private players must pitch in to provide more variants and more quantum of drone detection radars.

- Key Industry players like the Zen Technologies Limited, Grene Robotics, Solar Defence and Aerospace Limited that are in the forefront of providing completed C-UAS systems covering both detection and kill could also consider making standalone drone detection radars. Our requirement of drone detection radars (package), especially in high altitude areas, keeping in mind the multi-front scenario is likely to be 1000+ radars. A single source will be unable to address this operational requirement.

Completed C-UAS systems

We have a robust industrial base (about 550 players) active in the field of drones and C-UAS systems. Still a lot of drone-chain components are imported— flight controller software, AI inference chips and controlling software, stealth capability, and hardware for advanced computing and data transmission capability etc. The first task for the Industry will be to try and indigenise the entire drone chain under the IDDM banner.

While C-UAS systems from leading industry players like BEL, Zen Technologies Limited, Adani Defence and Aerospsce, NewSpace Research & Technologies and more are in Service with the defence forces, their population is far less.

Even in Op Sindoor, we faced an onslaught of 800-1000 drones in two nights. In a multi-front tri-Service war, this number will be huge. Something like 2000+/day. The quantum of C-UAS systems required are far in excess of what we hold (actual holdings – classified).

The Technology Roadmap of the Army, released on 06 April 2026, mentions three verticals in the anti-drone domain. Drone-on-drone systems; Drones for anti-swarm roles; and Aircraft/helicopter emulator systems (UALS), these are quite different from the dedicated CUAS systems like the following - Integrated Drone detection and Interdiction System (IDD&S) – BEL

- Zen Anti- Drone System (CUAS)
- Zen anti-Drone system Hard kill (Zen ADS-HK)
- C UAS system by Adani Defence and Aerospace with DRDO
- D4 System by DRDO (Drone detect, deter, destroy)
- Family of man portable counter drone systems (eg. MPCDS by Axiscades Aerospsce and Technologies Private Limited).

Anti UAS High Power Microwave Mk II (AUHPM MK II) system by DRDO.

Towards implementation of TPCR 2025 and Technology Roadmap for UAS, the SHQs must assess their requirement of standalone C-UAS systems for a future multi-front war and set a time bound plan to build on the numbers required.

Swarm Drone killers

A dedicated effort will be required to build the capabilities in building counters to swarm drone threats. Some systems are already under development and a few are completed. Some of these include the Air Launched Flexible Asset—Swarm (ALFA-S) or the CATS swarm drone capability programme of HAL and NewSpace Research and Technologies, the Autonomous Surveillance and Armed Drone Swarm (A –SADS) or the Bhargavastra Micro Missile System by Solar Defence and Aerospace Limited.

The requirement will be of many more systems. This paper has assessed that in a tri-Service multi-front war, the drone-package attack throughput is likely to touch 1500-2000+ each day. The major constituent of this threat is likely to be swarm drones. Our swarm counter drone capability should also be built for a 1000-1500+ turn around each day.

Not talking alone, the government is also trying to walk the talk on building anti-drone and anti-swarm drone capabilities. Defence Acquisition Council (DAC) on 29 December 2025 cleared proposal worth 79000 cr. A large portion of this was towards building capabilities in loitering munitions, radars, drone and anti-drone system.[41] Even the latest clearance of proposals worth 2.38 lakh cr by DAC on 27 March 2026 includes a large component of drone and anti-drone capabilities.[42]

Loitering Munitions

While the government's ongoing efforts for building capabilities in the field of Loitering munitions are correctly headed, much more diversification and building of numbers will be required.
Loitering munitions projects like the Nagastra IR by Solar Defence and Aerospace, ALS 50 by Tata Advance Systems Limited, the Sheshnag 150 by New Space Research Technologies or the Ultra-light Precision Guided Munitions (ULPGM) by Adani and DRDO are promising projects. While these need to be given a boost. Many more industry players need to join in building the numbers and volumes.

On Technology Roadmap for UAS and Loitering Munitions[43]

As stated, the subject document was released by the Indian Army on 06 April 2026. In furtherance to TPCR 2015, it further details the Army's vision for the development of drone and anti-drone capability.

In essence, Army plans to deploy 30 types of UAS and loitering munitions, configured across five categories, namely, surveillance (ISTAR), strike, air defence support, special roles and logistics applications. The drone types in the above categories are further expected to generate nearly 80 variants depending on terrain and operational needs.

The surveillance category will include the ISTAR machines and tethered drones for short medium and long-range surveillance. Loitering munitions will also cover the short medium and long range. The FPV and swarm are required both for surveillance and strike. As stated, the air defence or the

counter UAS capability lays out the requirement of Drone-on-Drone systems, Drones for anti-swarm role and aircraft/helicopter emulator systems.

A large variety of special role drones have been envisaged, viz, MUMT system paired with combat aircraft and with helicopter and armored fighting vehicles; hunter-killer machines, weapon mounted UAS for immediate deployments; UAS for multiple roles such as survey, mine dispensing, data relay, swarm drones as smart mines, deployable at will; UAS based jammers; UAS capable of delivering PGMs and nano drones.

The roadmap also includes Logistic drones covering various range and payload requirements. As stated in the document, the same is intended to strengthen collaboration with domestic Industry players while accelerating the development of next generation UAS for future wars.
While this is only the Army's roadmap, a similar document is expected from the other two Services as well, especially from the Navy with their peculiar requirement of USVs and UUVs.

Salient Points of Research Work

The essence of the research work is stated at succeeding paras.

- The work started with the research question - What is the qualitative and quantitative drone threat to India from our potential adversaries and what anti-drone capability is required to counter the same in a multi-front tri-Service war?

- Since building capabilities to counter are driven directly by the threats we face, the research started by defining this threat in qualitative and quantitative terms.

- To begin with, the contours of the drone threat were defined. This enumeration enabled positioning of the threat package from the potential adversaries along different verticals each to be countered with a family of C-UAS, optimally suited for the same.

- It emerged that we face a very live and comprehensive drone threat from our potential adversaries.

- This threat not only spans all the contours detailed above, it becomes more pronounced and more lethal when executed in a collusive manner and with the help of external players inimical to our interests.

- The research then attempted to decipher a possible unfolding of drone war in the event of a conflict.

- It emerged that the threat is likely to unfold starting with a seamless pre-war grey zone conflict which is likely to swell and reach the kinetic phase with a heavy onslaught of AI-enabled high altitude swarm drone attacks meant to exhaust and overwhelm our air defenses.

- It also emerged that preparations for executing such a debilitating onslaught are already underway at a feverish pace.

- The momentum, post the initial crippling, swarm attacks is likely to be kept up by follow up swarms and drone strikes and in the fog of these drone attacks, the mainframe threat anchored on strike aircraft, attack helicopters, cruise missiles, ARMs, PGMs, hypersonic weapons and more will be unleashed.

- During the execution of the main air threat, it will be the hope of the adversary that our air defence control and reporting system stands already choked and overwhelmed by the preceding drone onslaught.

- A perception of the quantum of attack has been derived by examining open-source data from several diverse sources and making a logical assessment therefrom.

- This research work establishes that, in the event of a multi-front war, the quantum of drones pitched against India could be 1500-2000+ each day of the strike.

- This number is likely to be shared randomly between various elements of the drone-package, viz ISTAR machines, UCAVs, UAS, drone swarms and loitering munitions.

- It is also likely to include the sea-drones, namely the Un-crewed surface vehicles (USVs) and Un-crewed Underwater vehicles (UUVs).

Hereafter the research work proceeded to assess how the drone threat package so defined needs to be negated.

- The analysis revealed that we need to build our capabilities along the three verticals viz. detection systems, the kill means and the BMC2 systems.

- Flowing from the above, the work analyzed what capabilities need to be built in each of the above verticals, especially the counter swarm drone threat.

- In quantum terms, it was stated that, if we are to face an onslaught of 1500-2000+ drone threat throughout a day then we need to ready for a 1000-1500+ counter threat vehicles turnaround on a daily basis. The industry has to measure up to this requirement.

- The research work ends with providing a brief glimpse of the Technology Roadmap for UAS and loitering munitions as promulgated by the Army on 06 April 2026

- Regarding Roadmaps, it is stated that, other two Services also need to put out their vision and requirement and the Industry body upon accumulation of the same, needs embark on a time- bound programme for realizing the same, bound-by-bound.

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