DEFENSE AND AEROSPACE INDUSTRY PROGRAM

JUN 2026

Building Drone Power

India's Path from Innovation to Endurance

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Recommended Citation:

Tiwari, Shashank (2026). Building Drone Power: India's Path from Innovation to Endurance. New Delhi: Council for Strategic and Defense Research.

ABOUT THIS REPORT

This report examines whether India can sustain drone warfare, not merely whether it can acquire drones. Moving beyond the platform-centric terms that have shaped India's debate, it reframes drone capability as a question of endurance: the capacity to absorb losses, replenish inventories, adapt under fire, and keep producing through a prolonged conflict. To structure the assessment, it develops a five-tier framework: access, scale, integration, adaptation, and resilience, and applies it to India's ecosystem using open-source evidence and comparative lessons from Ukraine, the Red Sea, and Operation Sindoor. The analysis identifies scale, the rate at which India can regenerate combat losses, as the binding constraint, and traces how dependencies on foreign components and supply chains tie that rate down. Intended for policymakers, defense planners, and industry, the report offers a horizon-based set of recommendations aimed at moving India from possessing drones to sustaining drone warfare.

COUNCIL FOR STRATEGIC AND DEFENSE RESEARCH

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DEFENSE AND AEROSPACE INDUSTRY PROGRAM

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EXECUTIVE SUMMARY

For the past decade, India's debate over military drones has centered on acquisition: which platforms to import, which indigenous programs to sustain, and how far a growing private sector can reduce foreign dependence. This report argues that acquisition is the wrong frame. The decisive question is not whether India can field drones but whether it can sustain drone operations through the attrition that now defines modern conflict. Drawing on the experience of Ukraine, the Red Sea, and Operation Sindoor, the analysis assesses India's readiness across five sequential tiers: access, scale, integration, adaptation, and resilience.

The central finding is that India possesses meaningful capability at the lower tiers but faces compounding constraints as the demands rise. Access to drones has broadened through imports, an expanding startup base, and indigenous development, yet much of that access remains conditional on foreign suppliers and on Chinese-dominated component and rare-earth supply chains. The binding constraint lies at the level of scale. India's procurement architecture is optimized to acquire small numbers of high-value platforms rather than to mass-produce the inexpensive, attritable systems that sustained-rate warfare consumes. The challenge is therefore institutional as much as industrial, and it remains unaddressed.

These limits propagate upward. India has demonstrated an effective defensive sensor-to-shooter network in Akashteer, but offensive employment is constrained by centralized strike authority and by indigenous systems that underperformed in contested electromagnetic conditions. Its adaptation ecosystem generates prototypes and contracts but lacks the continuous feedback and fielding cycles that allow Ukraine and Israel to revise systems within weeks. Resilience remains the least testable tier: a thin and degraded space layer, dependence on foreign commercial imagery, and concentrated, unhardened production leave India's capacity for a prolonged campaign unproven, a conclusion the four-day Operation Sindoor cannot resolve.

Viewed comparatively, India's principal long-term challenge is China, both as a producer it cannot match in volume and cost, and as the patron sustaining Pakistan's drone capability. The report's recommendations are organized by horizon rather than by tier: in the near term, joint doctrine, delegated strike authority, and counter-UAS formations; over the medium term, manufacturing-readiness gates in procurement and a dedicated attritable-systems production line; and over the longer term, secure rare-earth supply and resilient navigation. The objective throughout is to move India from acquiring drones to sustaining drone warfare.

INTRODUCTION

Over the past decade, discussions of military drones in India have largely revolved around platforms. The debate has focused on whether India should procure the MQ-9B, whether indigenous programs such as TAPAS (Tactical Airborne Platform for Aerial Surveillance) should be revived, whether imported systems offer better value than domestic alternatives, and whether India's growing drone startup ecosystem can reduce dependence on foreign suppliers.[1] While these questions are important, they are secondary.

Recent developments regarding drone warfare have exposed the limits of this platform-centric approach. The experience of Operation Sindoor, subsequent concerns over electronic warfare vulnerabilities, and the failure of indigenous systems to perform reliably in GPS-denied environments have revealed a more fundamental problem. Possessing drones is not the same as being able to fight with them. Producing prototypes is not the same as sustaining combat operations. Funding innovation is not the same as converting innovation into military capability at scale.

The character of drone warfare is changing. Across Ukraine, Gaza, the Red Sea, and the exchanges between Iran and Israel, drones have ceased to be niche enablers and have become consumable instruments of warfare. Rather than technological sophistication, the defining challenge in these conflicts has been the ability to absorb losses, replenish inventories, adapt designs, and sustain operations over extended periods. The central competition has increasingly become one of rates rather than platforms: production rates against attrition rates, adaptation rates against countermeasures, and replacement rates against battlefield losses. Recent scholarship has described this phenomenon as the emergence of "affordable mass" or "precise mass"— the ability to generate large quantities of sufficiently capable systems at a cost and scale that can be sustained throughout a conflict.[2] Rather than a few exquisite platforms, modern drone warfare increasingly rewards the side that can field many good-enough systems continuously.

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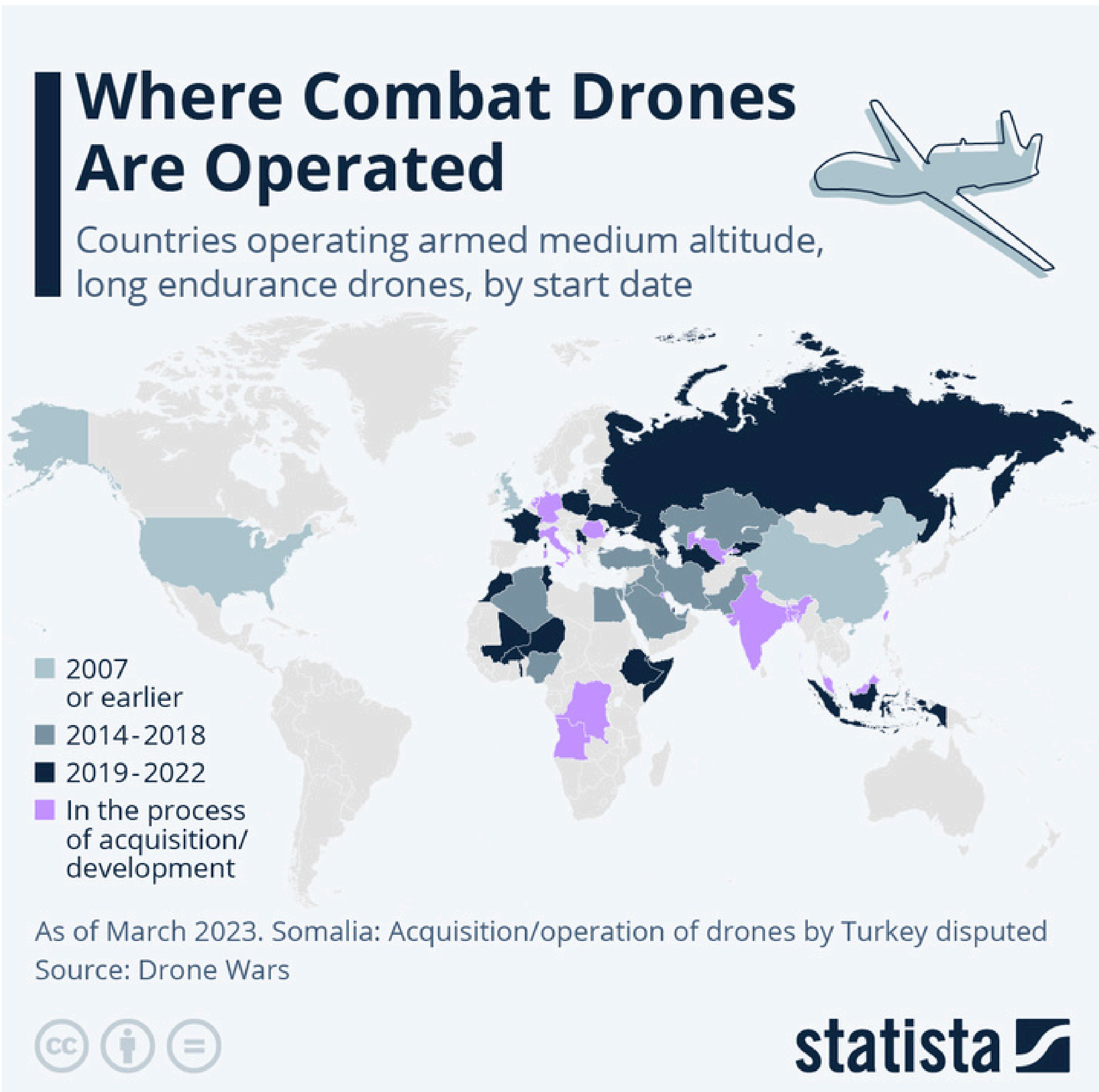
This shift has profound implications for how military capability should be assessed. Traditional measures such as platform performance, technological sophistication, or inventory size capture only a portion of the problem. A force may possess advanced drones and still fail if losses cannot be replaced. It may field capable systems and still lose effectiveness if electronic warfare disrupts operations faster than adaptations can be introduced. It may have a vibrant startup ecosystem and still struggle in wartime if production cannot be scaled under combat conditions. As recent analyses of drone warfare have argued, the decisive question is increasingly not who fields the most drones at the start of a conflict, but who can continue producing, modifying, and employing them after months of sustained attrition.[3]



This report, therefore, approaches India's drone ecosystem from a different perspective. Instead of asking whether India possesses drones, it asks whether India can sustain drone warfare, treating drone capability as a question of warfare readiness. At its core lies a simple proposition: a military possesses affordable mass when its ability to replace and regenerate capability equals or exceeds the rate at which that capability is consumed in combat.
To evaluate that proposition, the report develops a five-tier framework of drone warfare readiness.

The first tier examines Access: whether India can obtain and retain the drones, components, and supply chains on which its capability depends.

The second examines Scale: whether losses can be replaced at wartime consumption rates.
The third examines Integration: whether drones are embedded within operational kill chains and combined-arms formations.

The fourth examines Adaptation: whether the system can evolve faster than an adversary's countermeasures.

The fifth examines Resilience: whether drone operations can continue when production networks, navigation systems, communications links, and trained operators themselves come under attack.

The logic connecting these tiers is hierarchical rather than additive. Success at a higher tier depends on success at the tiers below it. A force that cannot generate scale cannot fully exploit integration. A force that cannot adapt rapidly will struggle to remain effective even if it initially possesses mass. A force lacking resilience may see its early advantages eroded over the course of a prolonged conflict. Drone warfare is therefore best understood as an interconnected system whose overall performance is constrained by its weakest component.

The report's central finding is that India possesses meaningful capability at the lower end of the ladder but faces significant constraints as it moves up the ladder. Access has improved considerably over the past decade, supported by imports, indigenous development programs, and a growing private sector ecosystem. Yet the ability to generate affordable mass at scale remains limited, creating a bottleneck that constrains progress across the higher tiers. As a result, much of India's discussion on drones remains focused on the visible question of platforms, while the more consequential questions of production, adaptation, sustainment, and resilience remain insufficiently addressed.

> The challenge confronting India is therefore whether it can build a system capable of enduring the demands of modern drone warfare.

AFFORDABLE MASS AND THE LOGIC OF MODERN DRONE WARFARE

Affordable mass is not a measure of cheapness, nor simply of numbers; it is a rate condition. A force possesses affordable mass when the rate at which it can replace and regenerate capability equals or exceeds the rate at which combat consumes it. This conception departs from the traditional platform-centric approach that dominates much of military analysis. As Marcel Plichta and Ash Rossiter argue in their formulation of "affordable mass precision," strategic studies have tended to focus on sophisticated, costly systems that are necessarily limited in number, while underestimating the military significance of cheap, producible, and expendable systems available in large quantities.[4] Capability debates, therefore, often measure stock (how many systems a force possesses at a given moment), whereas warfare ultimately measures flow – whether destroyed capability can be regenerated at a sufficient rate. A large stock without a corresponding flow is a temporary advantage that attrition steadily erodes.

Recent conflicts involving drones suggest that modern warfare is becoming a competition of rates rather than platforms. Russia's expanding campaign of Shahed-type one-way attack drones demonstrates this shift.[5] As launch volumes increased dramatically through 2024 and 2025, the challenge confronting Ukraine was not the sophistication of individual airframes but the tempo at which they could be produced, launched, and replaced.[6] This is precisely the dynamic that Plichta later described as "precise mass"— the ability to generate sufficient quantities of precision effects at sustainable cost over time. It is also consistent with T.X. Hammes' long-standing argument that military competition is shifting from forces built around a small number of exquisite platforms toward systems that are small, smart, numerous, and readily replaceable.[7]

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Affordable mass rests on three interrelated dynamics:

- **Expendability**: systems designed to be lost without imposing unacceptable operational or financial costs.
- **Replenishment**: the ability of production systems to keep pace with battlefield consumption.
- **Reconstitution**: the regeneration not merely of platforms but of operators, tactics, software, and organizational knowledge following sustained attrition.

Together, these dynamics transform affordable mass from a procurement question into a system-level characteristic of military power.

The distinction that follows is between technology readiness and production readiness. Defense establishments traditionally place considerable emphasis on technology readiness. Technology Readiness Levels (TRLs), originally developed by NASA and subsequently adopted by the US Department of Defense, assess whether a technology functions as intended. Manufacturing Readiness Levels (MRLs), introduced by the Department of Defense to complement TRLs, assess whether that technology can be produced at scale, at acceptable cost, and with manageable industrial risk. A force may therefore possess highly mature technology without possessing meaningful wartime capacity. This distinction has become increasingly important in contemporary warfare.

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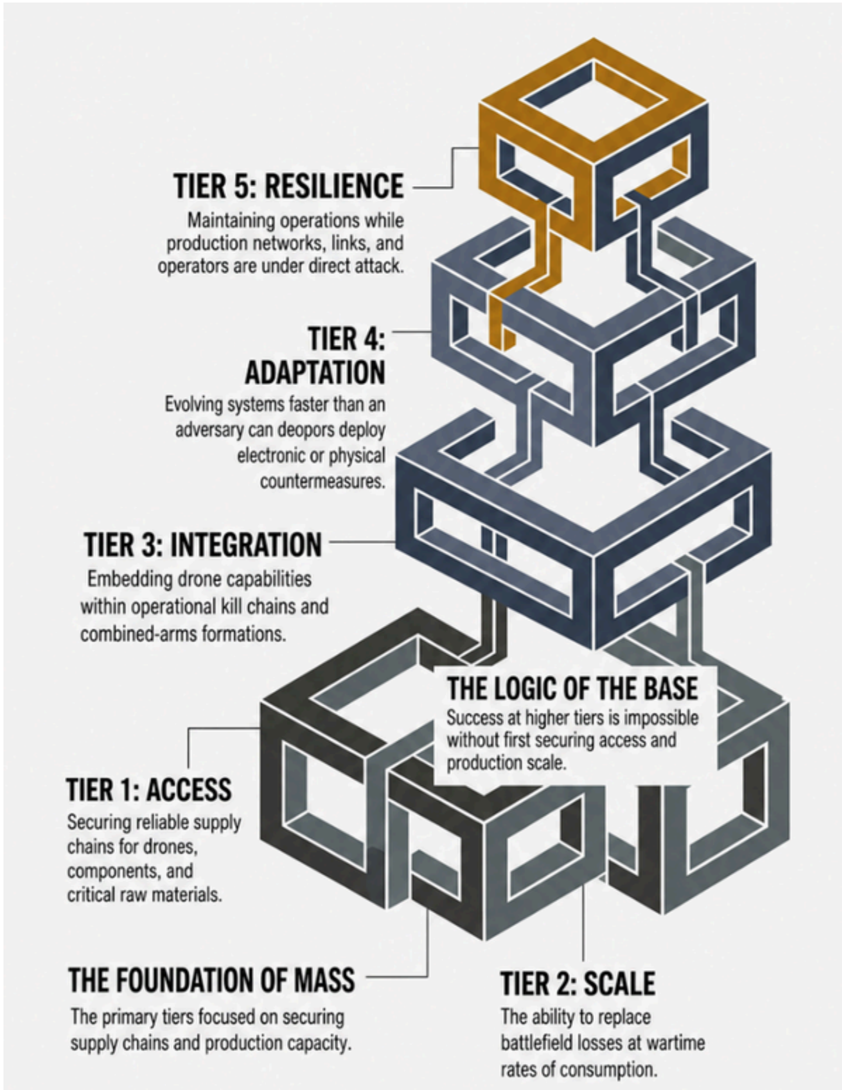
As Michael Kofman and Franz-Stefan Gady observe, modern warfare remains fundamentally attritional even when enabled by advanced technology; military effectiveness ultimately depends on the ability to replace losses and sustain combat power over time.[8]

Affordable mass, therefore, can be assessed across the following five tiers:



TIER I — ACCESS

Supply Sovereignty and the Sovereignty Test

The first requirement of affordable mass is access. Before a force can scale production, integrate drones into military operations, adapt to battlefield countermeasures, or sustain prolonged combat, it must first secure access to the systems and inputs on which drone warfare depends. Access, therefore, extends far beyond the question of inventory. The relevant question is one of supply sovereignty: When supply chains break down, what keeps working?

A useful benchmark is Iran, often portrayed as a model of drone self-sufficiency. The reality is more nuanced. Iran's Shahed ecosystem was built using roughly 80% American-origin components acquired through shell companies, Chinese re-export hubs, and dual-use commercial supply chains.[9] Nearly every major component of the Shahed-136 – the aluminum airframe, electronics, and commercial microchips – was derived from widely available civilian technologies, with the engine representing one of the few genuinely specialized subsystems that Iran successfully indigenized. Iran's resilience, therefore, emerged from designing around commodity inputs and building substitution networks that could withstand sanctions. One assessment noted that manufacturing a Shahed-136 was roughly comparable in resource and labor intensity to producing a basic agricultural tractor.[10] Even after the 2025 conflict, Iran reportedly retained approximately 40% of its pre-war strike-drone inventory.[11]

India's position can be understood through three layers of access: imported systems, domestic platforms, and component supply chains.

The first layer consists of imported systems. India's drone inventory continues to rely heavily on foreign-origin platforms. The most prominent example is the acquisition of 31 MQ-9B remotely piloted aircraft at an estimated cost of USD 3-3.9 billion, with deliveries expected from 2028 onwards.[12] These systems provide significant capability but also create long-term dependence on American original equipment manufacturers for software updates, mission systems, spares, and lifecycle support. Reports indicate that integrating Indian-origin weapons onto the platform was ultimately deemed prohibitively expensive, reinforcing dependence on the parent ecosystem.[13] Similar patterns exist with Israeli-origin systems. Following Operation Sindoor, India reportedly pursued emergency procurement of Heron Mk-II drones while simultaneously exploring local manufacturing arrangements involving HAL and Israel's Elcom under a 60% indigenous-content mandate.[14] Yet local assembly does not eliminate reliance on foreign intellectual property, proprietary software, or overseas supply chains.

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INDIA'S IMPORTED MILITARY DRONES

Major ISR and strike UAVs by supplier of origin. Small commercial, FPV and loitering "mass" are not captured.

KEY FACT
India was the largest single recipient of Israeli arms exports, taking roughly 34% of Israel's total arms exports in 2020–2024 (SIPRI). The United States is the major new entrant, through the 31-aircraft MQ-9B deal.

ISRAEL — Dominant supplier

IAI Heron Mk-I / Mk-II
Medium-altitude, long-endurance ISR
~50+ in service; ~90 being upgraded (Project Cheetah)

IAI Searcher Mk-II
Tactical, short-range ISR
In service across multiple units

IAI Harpy / Harop
Loitering munition (anti-radiation / strike)
In service; used in Operation Sindoor

Elbit Hermes 900
MALE ISR / strike
Emergency orders; assembled in India (Adani-Elbit, Hyderabad)

UNITED STATES — Emerging supplier

GA-ASI MQ-9B Sea Guardian
High-altitude, long-endurance ISR
2 leased since 2020 (Indian Navy)

GA-ASI MQ-9B Sea / Sky Guardian
HALE ISR / strike (tri-service)
31 on order: 15 Sea + 16 Sky Guardian
~USD 3.9 bn; deliveries from ~2028

THE DEPENDENCY THE NUMBERS HIDE
Even "Made in India" imports keep foreign roots: local assembly of the Hermes 900 and MQ-9B still relies on foreign software, mission systems, spares and supply chains. Import tallies also omit the cheap FPV and loitering systems that actually decide a war of attrition.

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Sources: SIPRI Arms Transfers Database; ThePrint; manufacturer and Ministry of Defence statements; open-source reporting.
Figures are approximate open-source estimates; tactical-fleet quantities are not officially published. Compiled June 2026.

The second layer consists of domestic platforms. India today possesses one of the world's largest drone startup ecosystems, with more than 200 firms operating across military and civilian segments.[15] Indigenous programs such as TAPAS, Archer-NG, and a growing number of private-sector systems suggest ways to improve self-reliance. Yet Operation Sindoor exposed the gap between domestic availability and combat effectiveness. Defense Secretary Rajesh Kumar Singh subsequently described the conflict as a "reality check", highlighting shortcomings in electronic warfare resilience, counter-UAS capabilities, and the manufacturing ecosystem needed to produce military-grade drones capable of surviving contested environments.[16] During GPS-denied trials near Dehradun in September 2025, all 46 participating indigenous manufacturers reportedly failed to maintain operational performance.[17] A more demanding follow-up trial conducted in October produced only a handful of successful performers, including Raphe mPhibr, NewSpace Research & Technologies, SMPP, and Munitions India Limited. Several systems with impressive, published specifications failed to function under battlefield conditions. The broader conclusion is difficult to dispute: domestic production does not automatically translate into combat survivability.

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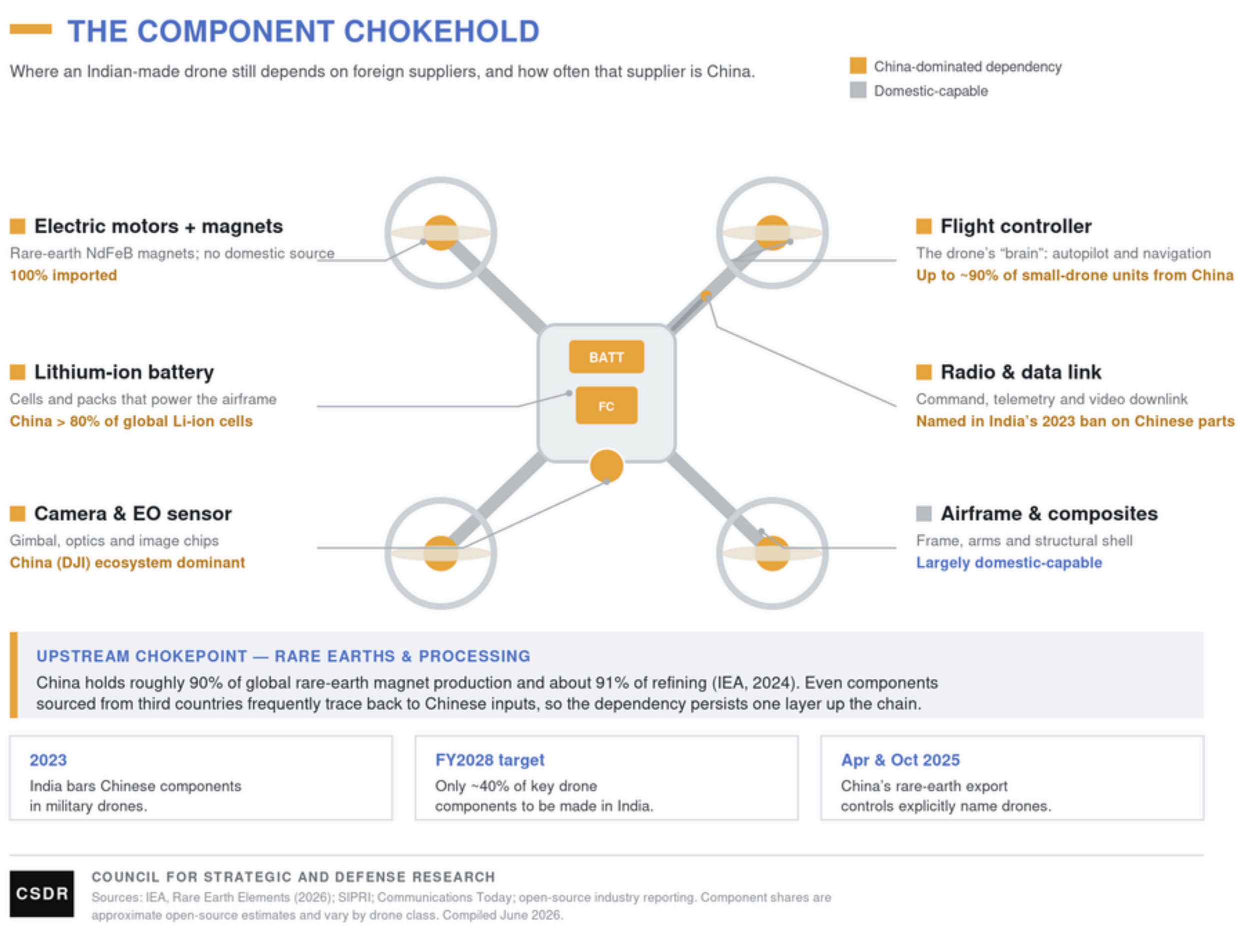
The third and most consequential layer is component dependency. Recognizing these risks, New Delhi prohibited the use of Chinese-origin components in military drones in 2023, citing concerns related to communications equipment, cameras, radio transmission systems, and software.[18] Following Operation Sindoor, New Delhi announced incentives worth approximately ₹2,000 crore (≈ USD 230 million) to strengthen domestic drone manufacturing.[19] Yet the program's stated objective is to achieve domestic production of only 40% of key drone components by FY2028. Implicitly, the target acknowledges that a majority of critical components will continue to depend on external supply chains for the foreseeable future. The challenge is compounded by upstream dependency. China controls 60% of mined magnet-rare-earth output, 91% of refining, and 94% of finished-magnet production.[20] These materials underpin motors, sensors, navigation systems, and power-management equipment across modern drone ecosystems. As a result, even components sourced from third countries frequently depend on Chinese-origin inputs further up the supply chain.

If Chinese exports stopped tomorrow, what proportion of India's drone ecosystem could continue operating and producing at current rates?



This is no longer a hypothetical exercise; a live version of the sovereignty test took place in 2025. In April 2025, China imposed restrictions on seven rare-earth elements and associated magnets. In October 2025, Beijing expanded those restrictions, explicitly identifying drones among affected defense-related products and extending controls to components assembled abroad using Chinese-origin materials. Fourteen entities, including firms associated with counter-drone technologies, were simultaneously added to China's Unreliable Entity List. In India, concerns over magnet shortages prompted intervention requests from the Society of Indian Automobile Manufacturers (SIAM) and the Automotive Component Manufacturers Association (ACMA) amid fears of production disruptions.[21] Similar restrictions disrupted deliveries of drones and drone components to Ukraine.

India, therefore, meets Tier I in peacetime but may fail to meet it in wartime. The country possesses multiple sources of access, a growing domestic industrial base, and an increasingly capable start-up ecosystem. Yet much of this access remains conditional. Imported platforms depend on foreign suppliers, domestic systems continue to struggle under contested conditions, and critical components remain tied to supply chains vulnerable to external pressure. In conclusion, India possesses access, but not yet sovereign access.

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TIER II — SCALE

Can India Replace What It Loses?

Modern drone warfare has transformed military competition into a contest of regeneration. Rather than starting quantities, the true measure of capability is whether drone manufacturing can keep pace with ongoing battlefield losses.

A methodological challenge immediately arises. Reliable public data exists for drone and interceptor costs, allowing certain aspects of scale to be measured directly. Comparable data does not exist for India's military drone inventories, production rates, or wartime attrition rates. Instead of estimating how many drones India currently produces, it asks how many drones India would need to produce under plausible wartime conditions to sustain affordable mass. Those requirements are then tested against the publicly visible industrial capacity.

Ukraine standard

The contemporary benchmark for scale is Ukraine. By early 2025, Ukraine was producing approximately 200,000 FPV drones per month, up from roughly 20,000 per month a year earlier.[22] President Volodymyr Zelensky stated that Ukraine had an annual production capacity of nearly 4 million drones, while some estimates put total FPV production in 2024 at over 2 million units.[23] Crucially, Ukrainian drones are treated as ammunition rather than aircraft. Frontline FPV drones often survive only a handful of sorties, while combat losses are measured in thousands per month. Production is therefore organized around replacement rather than accumulation. The lesson is that modern drone warfare consumes systems at rates far beyond traditional defense-industrial assumptions.

Industrial Reality

India has started well with 200+ drone startups, but the critical variables remain unknown. No publicly available data establishes India's monthly military drone production rate, nor is there reliable public data on the inventory levels available to Indian forces or the attrition rates they might experience in a high-intensity conflict (apart from occasional CAG audits on War Wastage Reserves). But even if there were something similar, scale cannot be assessed through inventory counts alone. It must be assessed through the relationship between production and consumption.

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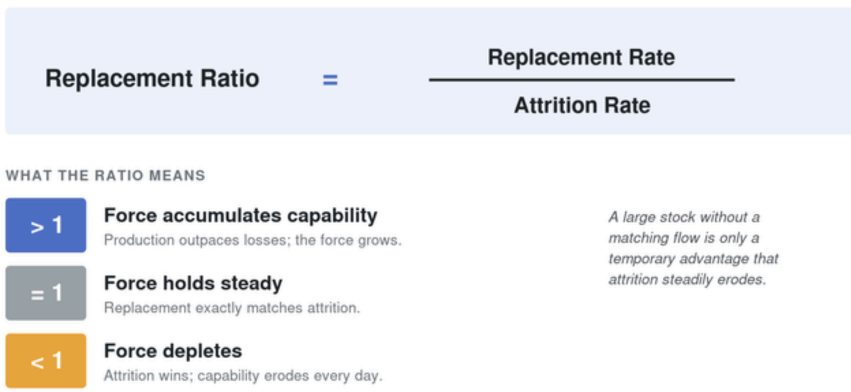
Model 1: Production versus Attrition

The simplest measure of affordable mass is the replacement ratio:



A force accumulates capability when the ratio exceeds one, maintains capability when the ratio equals one, and depletes capability when the ratio falls below one.

Because India's actual production and attrition figures are unavailable, the model must be inverted. Rather than estimate production, the question becomes: what production rate would India require to sustain a plausible wartime loss rate?

Operation Sindoor offers a limited but useful reference point. Reports indicate that more than 500 drones were employed during a four-day operation.[24] Even if this tempo represented only a fraction of what might occur during a prolonged conflict, it demonstrates that drone consumption can occur far more rapidly than peacetime procurement cycles assume. If a future conflict generated losses measured in thousands of drones per month – as has become routine in Ukraine – India would require equivalent replacement capacity merely to maintain force levels. Anything less would result in a steady erosion of capability.

The precise threshold remains unknowable from open sources. The implication, however, is clear.

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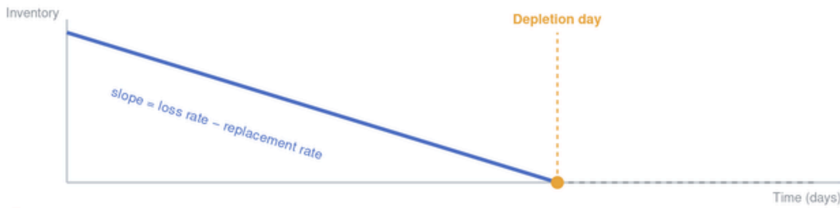
Model 2: Days to Depletion

The second model translates replacement shortfalls into operational endurance.

$$\text{Days to Depletion} = \frac{\text{Inventory}}{\text{Loss Rate} - \text{Replacement Rate}}$$

WHY A BIG STOCKPILE STILL RUNS OUT



Once losses outrun replacement, depletion becomes a mathematical certainty, no matter how large the stockpile.

Again, the objective is not to estimate India's inventory but to illustrate the underlying relationship. Large inventories can create an illusion of preparedness while concealing a regeneration deficit. Once losses exceed replacement, depletion becomes a mathematical certainty.

Ukraine demonstrates the point. During the war, drone losses have been measured in the tens of thousands per month. Yet Ukrainian capability has not collapsed because production has expanded to replace those losses. If we remove replacement from the equation, the same inventories will rapidly disappear regardless of their initial size.

For India, the significance lies in its strategic sense. With finite inventories, a force can be designed for a small campaign but will struggle to sustain a full-scale war.

Model 3: Interceptor Exchange Ratios

Scale is also shaped by the cost of destroying drones. The Red Sea campaign provides the clearest illustration. Between October 2023 and early 2025, the US Navy expended hundreds of SM-series interceptors against Houthi drones and missiles.[25] Replacement costs exceeded hundreds of millions of dollars, while many of the attacking drones cost only a few thousand dollars to manufacture.[26] The resulting cost asymmetry generated widespread concern regarding the sustainability of traditional air-defense approaches.

A similar dynamic exists in South Asia. During Operation Sindoor, Indian air-defense systems reportedly relied on assets such as the S-400, Barak-8, Akash, and Spyder. Open-source estimates place the cost of an Akash interceptor at approximately USD 250,000-500,000, while advanced S-400 interceptors exceed USD 1 million.[27] By contrast, many battlefield drones can be produced at a fraction of those costs.

The raw cost-exchange ratio, however, can be misleading. Expending a million-dollar interceptor to protect an airbase, command center, or strategic asset may be entirely rational. The true constraint is replenishment. The challenge emerges when defensive magazines and production lines are consumed faster than they can be replenished.

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DRONES VS. THE MAGAZINE

Air defense against Iranian one-way attack drones in the 2026 Iran war, and the cost of stopping them.

6,000+ **Iranian one-way attack drones intercepted**
by the US-led regional coalition, across US forces, Israel and Arab partners.
Plus 1,500+ ballistic missiles · Source: CENTCOM, Senate testimony, 14 May 2026.

UNITED ARAB EMIRATES	JORDAN	ISRAEL	UNITED STATES
2,256	**79 / 119**	**~92%**	**> 50%**
drones intercepted (as of 9 Apr 2026)	projectiles stopped (60 missiles, 59 drones)	claimed interception (missiles + drones)	of pre-war THAAD stock used (SM-3: ~30–60%)
THAAD · Patriot	**Fighters · ground-based AD**	**Arrow · David's Sling · Iron Dome**	**THAAD · Patriot · SM-3**
Official UAE claim	*5 drones leaked through*	*Israeli MoD claim*	*CSIS estimate*

THE ASYMMETRY THAT MATTERS

Iran's one-way attack drones cost a few thousand dollars each. Stopping them drew on interceptors costing hundreds of thousands to millions, and the United States expended more than half its THAAD stockpile, which can take roughly 1.5 years to replace. The defense held, but magazine depth, not technology, was the binding limit, exactly the rate problem this report describes.

Figures are preliminary and contested; several are official national claims rather than independently verified counts, and drone and missile tallies are sometimes reported together.

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Sources: CENTCOM (Adm. Brad Cooper) Senate Armed Services testimony, 14 May 2026; CSIS; JINSA; Jerusalem Post; FDD; open-source reporting.
Compiled June 2026. The 2026 Iran war was ongoing at the time of writing.

Model 4: Saturation Threshold

The final model examines the point at which quantity itself becomes a weapon. Historically, military effectiveness was associated with platform quality. Drone warfare suggests that effectiveness may emerge from sufficient quantity. Once incoming drone volumes exceed the engagement capacity of defensive systems, additional drones generate disproportionate operational effects regardless of their individual sophistication.

A case in point is Russia's Shahed campaign. As launch rates expanded dramatically, Ukraine increasingly shifted from interceptor-based defense toward electronic warfare and other lower-cost solutions; the reason was arithmetic.[28] Interceptor inventories, production rates, and engagement capacities could not indefinitely keep pace with the growing volume of attacks. Hence, Saturation became the governing variable.

For India, the implications are immediate as Chinese and Pakistani drone doctrines increasingly emphasize swarms, coordinated attacks, and massed unmanned systems.[29] A sufficiently large barrage need not defeat every defensive layer; it need only consume defensive resources faster than they can be replaced.

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> India's own response acknowledges the problem. Systems such as the Bhargavastra micro-missile counter-drone system seek to create a cheaper, more scalable method for defeating drone swarms than traditional missile-based interception.

India's own response acknowledges the problem. Systems such as the Bhargavastra micro-missile counter-drone system seek to create a cheaper, more scalable method for defeating drone swarms than traditional missile-based interception.[30] Yet even this solution ultimately depends on the same variable that created the problem in the first place: the ability to manufacture affordable mass at scale.

Why Scale Remains India's Binding Constraint

The evidence across all four models points toward a common conclusion. India's principal challenge is neither technological innovation nor a shortage of drone companies. The constraint lies in the transition from technology readiness to production readiness. India's procurement architecture remains optimized for scarce, high-value, highly certified platforms. Modern drone warfare rewards rapid production, rapid replacement, and continuous regeneration. In effect, India is attempting to acquire attritable mass through institutions designed to procure enduring platforms. This is not primarily an industrial problem; it is an institutional one.

India has demonstrated access to drones and possesses a growing industrial base. What remains unproven is whether that base can regenerate losses at the rates modern drone warfare demands. The available evidence suggests that contemporary conflicts consume drones at rates measured in the thousands or tens of thousands per month, and that success depends on the ability to sustain production under those conditions. India has not yet demonstrated such capacity. A skeptic could counter that India has long sustained conventional wars through proven mobilization and its War Wastage Reserves, but those reserves were sized for the slow attrition of manned platforms, not the daily, thousands-per-month consumption of drones, and they cannot be topped up at civil-industrial speed.

> India's principal challenge is neither technological innovation nor a shortage of drone companies. The constraint lies in the transition from technology readiness to production readiness.

TIER III — INTEGRATION

By 2026, India will have created drone-centric formations. Under the Army's Decade of Transformation (2023–2032), the service has begun fielding Rudra all-arms brigades, Bhairav light commando battalions, Shaktibaan artillery regiments, Divyastra surveillance-and-loitering-munition batteries, and drone platoons embedded within infantry battalions.[31] The structural foundations of a drone-enabled force are being built at a remarkable speed.

Tier III, therefore, evaluates whether India can convert drone-generated information into battlefield effects through a rapid, resilient, and decentralized engagement loop. A useful distinction separates this chapter from Tier IV. Tier III examines the engagement loop: how quickly a force can find and strike a target. Tier IV examines the learning loop: how quickly it adapts after doing so.

Pillar I: Kill Chain Architecture

Modern conflicts show that individual platforms matter far less than the kill chains supporting them.[32] A drone only provides real military utility if it is integrated into a network that can detect, track, and strike targets faster than the enemy can react. Consequently, fleet size is a secondary metric; the true test of capability is the latency and reliability of the data-to-decision loop.

India's primary breakthrough on this front is in air defense. During Operation Sindoor, the Army's indigenous Akashteer system successfully integrated radar, electronic warfare, and sensor data.[33] Using those inputs, it created a unified operational picture and automated threat assignment to the optimal weapon systems. Official accounts credit Akashteer with neutralizing all incoming aerial threats it engaged during the conflict, a claim that awaits independent confirmation, marking a major shift toward automated air defense. By linking Akashteer with the Air Force's IACCS and the Navy's Trigun network, India has built a highly integrated defensive network.[34]

> While Akashteer excels at tracking and destroying incoming threats, India has struggled to replicate this efficiency in offensive drone operations (Tier III), where drones must act as the primary shooters within the targeting cycle. India has mastered the defensive side of the ledger, but not the offensive ecosystem.

The significance of this system goes beyond raw interception numbers. Operation Sindoor proved India could field a functional sensor-to-shooter loop that handles everything from detection to engagement seamlessly. Efforts to push this architecture to the tactical edge are already underway, notably through the CADET program, which mounts Akashteer on tracked platforms to support mobile mechanized formations.[35]

However, this defensive maturity highlights a stark asymmetry in India's broader drone strategy. While Akashteer excels at tracking and destroying incoming threats, India has struggled to replicate this efficiency in offensive drone operations (Tier III), where drones must act as the primary shooters within the targeting cycle. Operation Sindoor exposed this exact vulnerability: while defensive networks performed flawlessly, indigenous offensive drones floundered in heavily contested electromagnetic environments. Ultimately, India has mastered the defensive side of the ledger, but the offensive ecosystem critical to modern drone warfare remains largely unproven.

Pillar II: Decentralized Authority

Modern drone warfare requires immediate tactical speed. If drone-generated targeting data must pass through multiple command layers for validation, the target will likely move before a strike can be executed. High-performing military forces solve this by compressing the decision loop and pushing engagement authority down to the lowest possible level.

However, distributing hardware is not the same as delegating authority. While Akashteer proves India is comfortable outsourcing defensive engagements to machine-assisted loops, offensive operations remain tightly bound. In Ukraine, junior officers and frontline operators retain the independence needed to task and execute drone strikes rapidly, making a platoon or company responsible for strike missions.[36] Conversely, the Indian military has yet to formalize these rules of engagement; offensive drone command authority across the services remains largely nascent or ill-defined. Consequently, while drone hardware is clearly making its way to the front lines, the authority to pull the trigger has not followed.

Pillar III: Organic Electronic Warfare

The final component of integration is electronic warfare. It is a contest between sensors and counter-sensors, communications and jamming, navigation and spoofing. Drones that cannot survive in contested electromagnetic environments contribute little to the kill chain regardless of their technical specifications.

This is currently India’s most vulnerable point. In the wake of Operation Sindoor, Defense Secretary Rajesh Kumar Singh explicitly called the experience a "reality check," highlighting electronic warfare (EW) resilience as a critical capability gap.[37] Platforms that performed well under peacetime conditions frequently failed once navigation and communications were degraded. These findings suggest that electronic warfare remains insufficiently embedded within tactical formations and drone operations. Offensive drone employment continues to depend heavily on conditions that may not exist during conflict.

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Curiously, India's response to this vulnerability has skewed almost entirely toward defensive counter-drone technology. Heavy investments in laser-based interceptors, battalion-level counter-UAS kits, and systems such as Bhargavastra indicate a concerted effort to ground enemy assets. However, this creates a stark imbalance: India is deploying EW assets to destroy adversary drones much faster than it is hardening its own drone fleet to survive. As with its kill chain architecture, India's defensive EW capabilities are rapidly maturing, while its offensive ecosystem lags far behind.

Recent reforms are substantial, but military reorganization does not automatically translate into operational effectiveness. India's experience with Integrated Battle Groups offers a useful reminder. IBGs were announced, discussed, and periodically advanced, yet implementation remained uneven and prolonged.[38] The existence of a new organizational concept, therefore, should not be confused with demonstrated battlefield capability. The same caution applies to reported figures regarding trained drone operators and future force structures.

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TIER IV — ADAPTATION

While Tier III focuses on the immediate sensor-to-shooter timeline, Tier IV evaluates a force's capacity to learn under fire and re-engineer its capabilities. This shifts the metric of success from tactical speed – how many minutes it takes to execute a strike – to institutional agility: how many weeks it takes to upgrade a fleet based on front-line feedback.

Drones are dynamic platforms – they are constantly shifting packages of software, frequencies, and countermeasures. This means any technical edge is fleeting, lasting only until the enemy adjusts. Ultimately, having the best drone today matters far less than having the agility to upgrade it by tomorrow.

Recent conflicts demonstrate how quickly adaptation now occurs. In Ukraine, innovation cycles that once took years have compressed into months and, in some sectors, weeks. When electronic warfare rendered radio-controlled FPV drones increasingly vulnerable, both Russia and Ukraine rapidly shifted towards fiber-optic drones that are effectively immune to jamming.[39] Russian battlefield adaptation was replicated by Ukrainian manufacturers within months, leading to dozens of approved domestic fiber-optic designs by mid-2025. The lesson here is speed of response. Battlefield feedback generated modifications, production adaptations, and new systems that returned to the front in a continuous cycle.

Israel provides a different benchmark. Its defense innovation ecosystem increasingly embeds start-ups and developers within operational experimentation structures, creating direct feedback channels between battlefield users and designers.[40] In one documented example, engineers modified a drone-detection system within a week after receiving frontline feedback regarding false identifications.[41] The significance lies less in the specific technology than in the institutional mechanism in which operational experience rapidly informs technical modifications. Yet adaptation also contains a tension of quality standards. Ukraine's experience demonstrated that rapid iteration often comes at the expense of formal certification and quality assurance. Conversely, efforts to impose stricter standards can slow the delivery of urgently needed systems. Adaptation speed and quality control frequently pull in opposite directions.

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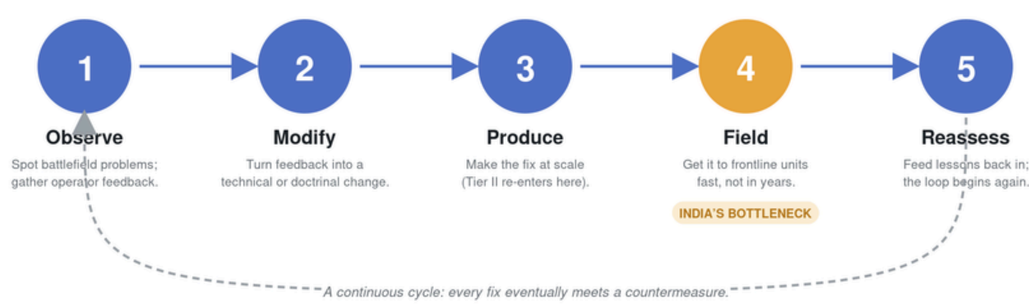
The Adaptation Cycle

Adaptation can be understood as a five-stage cycle:



The effectiveness of a military adaptation system depends on the speed and continuity of the entire loop. If a failure occurs at any stage, it will slow adaptation, regardless of performance elsewhere.

Observe

The first stage is observation: identifying battlefield problems and generating operational feedback. The strongest adaptation systems maintain continuous feedback channels between frontline operators, commanders, engineers, and manufacturers. Ukraine's wartime ecosystem demonstrates this principle. Drone operators, military units, software developers, and manufacturers interact continuously, creating a constant stream of battlefield data that informs subsequent design changes.

India's feedback mechanisms remain more episodic. The post-Sindoor GPS-denied trials represented a genuine attempt to evaluate battlefield survivability under contested conditions and generated valuable insights regarding electronic warfare vulnerabilities. However, such exercises remain periodic events rather than continuous institutional processes.

Modify

The second stage is modification: converting observations into technical or doctrinal changes. India faces two distinct constraints at this stage. The first concerns imported systems. Modification rights do not necessarily accompany ownership. As discussed in Tier I, platforms such as the MQ-9B remain dependent on proprietary software architectures and foreign-controlled algorithms. Operational users may identify a problem without possessing the authority or technical access required to change the system itself.

The second constraint affects indigenous platforms. Here, modification rights exist, but effective modification depends upon receiving timely operational feedback. Weaknesses in the Observe stage, therefore, propagate directly into the Modify stage. The result is an adaptation ecosystem constrained by both intellectual property barriers to imported systems and feedback limitations on domestic ones.

Produce

The third stage is production. This is where Tier II re-enters the analysis as it discusses scale. Adaptation is more of a production problem than a design problem. Once a new countermeasure, software update, drone architecture, or electronic warfare solution is

> India's growing startup ecosystem has demonstrated considerable capacity for innovation. However, multiple assessments have identified the transition from prototype production to mass manufacturing as a persistent weakness.

identified, it must be generated in sufficient numbers to influence the battlefield.
India's growing startup ecosystem has demonstrated considerable capacity for innovation. However, multiple assessments have identified the transition from prototype production to mass manufacturing as a persistent weakness (also known as the valley of death). The constraint is familiar because it is identical to the one identified in Tier II: production readiness. Scale, therefore, acts as a ceiling on adaptation.

Field

The fourth stage is fielding: moving modified systems from development into operational use. This is arguably India's most significant adaptation bottleneck. India's innovation ecosystem is not inactive. Since 2018, programs such as iDEX and ADITI have generated hundreds of problem statements, contracts, and development projects.[42] Post-Sindoor, urgency has further accelerated procurement through additional drone orders, DAC approvals, and emergency acquisition programs. The system clearly produces ideas, prototypes, and funding. The challenge lies in the speed with which successful concepts reach frontline formations.
The contrast with Ukraine is instructive as their adaptation cycles frequently operate on timelines measured in weeks or months. In India, transitions from successful demonstration to widespread operational adoption often take much longer. The problem is therefore not innovation itself but cycle time.

Reassess

The final stage closes the loop. Adaptation succeeds only when lessons generated after fielding are systematically reintegrated into future observation and modification cycles. Modern drone warfare is characterized by continuous adaptation rather than permanent solutions. Every successful innovation eventually generates a countermeasure, requiring further adaptation. Here, India faces a coordination challenge. Responsibility for drone development and employment remains distributed across service headquarters, DRDO laboratories, public-sector enterprises, start-ups, and private industry. While this ecosystem generates considerable innovation, coordination mechanisms remain uneven. Lessons do not always flow efficiently across institutional boundaries. As a result, adaptation cycles risk restarting rather than continuously building upon previous iterations. The issue is not a lack of activity. It is a lack of institutional memory operating at battlefield speed.

Overall, India possesses the ingredients required for rapid adaptation but has not yet demonstrated the institutional speed necessary to exploit them consistently under combat conditions.

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TIER V — RESILIENCE

Strategic Endurance Under Sustained Attack

The preceding tiers assessed India's drone ecosystem as a snapshot — whether it can obtain inputs, generate mass, integrate systems, and adapt. Resilience adds the dimension of time. In the previous tiers, it has been concluded that India possesses the technology to fight. Resilience asks a harder question: can it survive and fight through a prolonged war? Can it pass if its supply chains, navigation, networks, production, and trained personnel are degraded faster than they can be reconstituted?

This tier is therefore necessarily more conditional than those before it, and the distinction must be drawn carefully. India's resilience in conventional war is not in question. Across multiple conflicts, it has demonstrated the capacity to mobilize, sustain operations across extended fronts, and absorb pressure over time; conventional endurance is, for India, a tested quantity. What is untested is resilience in drone warfare, specifically. India's only relevant combat experience, Operation Sindoor, was a four-day exchange – too brief to serve as a measure of endurance against the months-long attritional drone campaigns seen in Ukraine. The analysis that follows, therefore, assesses vulnerabilities and scenarios rather than predicting outcomes, and treats the absence of drone-specific endurance data as itself a finding. The threats below are real and can be laid out with precision; what cannot yet be claimed is how India performs against them over a sustained campaign.

Three of the five threats have been examined in earlier tiers and need only be situated here in their temporal aspect. Component denial, analyzed in Tier I, becomes a question of stockpile depth: India's dependence on Chinese rare-earth magnets and lithium-ion cells is survivable for a short conflict drawing on existing inventory, but in a prolonged war, the binding constraint is how many months of critical components India holds before a domestic base it does not yet possess must take over. India's strategic reserves are not public; the vulnerability is the gap between burn rate and the limited replacement capacity Tier II identified. Production targeting extends Tier II's scale problem into the physical domain, and the reciprocal strikes of the Russia–Ukraine war are instructive. Ukraine has repeatedly struck Russia's Alabuga complex, which produces up to 300 drones a day, in attacks more than 1,000 kilometers deep, and has gone after the sub-component plants making the anti-jamming navigation modules found in downed Shaheds.[43] India's high-cost drone production is concentrated in a handful of firms and sites that are neither dispersed nor hardened, and Sindoor already demonstrated cross-border strike reach into Indian territory, making that concentration a vulnerability. GPS denial, raised in Tier III, is addressed below as part of a larger pattern.

> Operation Sindoor, was a four-day exchange – too brief to serve as a measure of endurance against the months-long attritional drone campaigns seen in Ukraine.

Space layer

India's space layer is thin across all three of its military functions — navigation, imagery, and communications — and each rests on assets that are degraded, sparse, or outsourced. NavIC, India's indigenous positioning system, was conceived as a resilience asset: it was funded after the 1999 Kargil War, when the United States denied India access to precise GPS.[44] Yet the constellation is now closer to liability than asset. Of eleven satellites launched, only three were broadcasting navigation signals by early 2026 — below the four-satellite minimum for basic function and well short of the seven needed for full service.[45] Six first-generation satellites suffered failures of their imported atomic clocks, a new satellite was stranded in the wrong orbit after its 2025 launch, and the surviving constellation has no redundancy and substantially degraded precision, with replacement launches running years behind schedule.[46] Whatever navigation resilience NavIC was meant to provide cannot be relied upon in its present state — and most Indian drones still navigate by GPS anyway.

More revealing was India's dependence on foreign commercial imagery, a distinct function that Sindoor exposed far more sharply than navigation. India's own reconnaissance satellites are few and slow to revisit targets: Cartosat-3 was built for 30-centimeter imagery but delivers closer to 50-centimeter imagery, and its single-satellite operation limits how often it can re-image the same point.[47] Lacking persistent overhead coverage, India was forced to procure imagery from the American commercial provider Maxar for planning and battle-damage assessment, using data available roughly once a day.[48] That is a strategic exposure in itself, because Maxar sells the same imagery to Pakistan through a local reseller, meaning India's ISR provider served both belligerents.[49]

> India's space layer is thin across all three of its military functions — navigation, imagery, and communications — and each rests on assets that are degraded, sparse, or outsourced. NavIC, India's indigenous positioning system, was conceived as a resilience asset. Yet the constellation is now closer to liability than asset.

Pakistan reportedly received near-real-time imagery from Chinese military satellites, and at subsequent DGMO talks cited specific vectors of Indian troop movement believed to have been gathered that way.[50] India outsourced its eyes to a vendor that also served the adversary, while the adversary was handed a dedicated military feed.

India's communications layer is similarly sparse, resting on a small fleet of dedicated military satellites — the Navy's Rukmini, the Air Force's Angry Bird, and the Army's first dedicated satellite, contracted only in 2023.[51] These are high-value targets: China fields operational anti-satellite missiles and could extend that capability to Pakistan, while India's launch-on-demand reconstitution remains under development. Across navigation, imagery, and communications, India's space layer therefore reduces to a single strategic vulnerability. India's post-Sindoor response, the accelerated 52-satellite Space-Based Surveillance program, cleared at ₹26,968 crore (≈ USD 3.1 billion) with private players building 31 of the satellites, is an acknowledgment of exactly this gap.[52] But none of it is yet in orbit, and a satellite lost in the third week of a war is not replaced by the twelfth.

The principal finding of Tier V is therefore not vulnerability alone but uncertainty. India's drone ecosystem has not yet faced the kind of sustained pressure that resilience is meant to measure.

THE ECONOMICS OF DRONE WARFARE FOR INDIA

The preceding tiers assessed India's drone ecosystem on its own terms. They asked whether India can obtain systems, produce them at scale, integrate them into combat, adapt them under pressure, and sustain them through a long war. Those are questions of capability. A war, though, is fought against an opponent solving the same problems, and the side that prevails is often the one whose solutions are cheaper to repeat. This chapter takes the battle math developed in Tier II and turns it outward, applying the same logic to Pakistan and China. The question moves from what India can do to what India can afford against the actors it may have to fight.

Affordability in drone warfare is a question of conversion. The size of a defense budget matters less than how efficiently a given amount of money translates into a sustained flow of usable systems at the front. By that measure, the three actors sit in very different places, and the comparison reveals more about the likely shape of a future conflict than any inventory count.

India's position was established in Tier II and does not need to be rebuilt here. India has the largest economy of the three, and its FY26 defense budget, at ₹6.81 lakh crore (≈ USD 78 billion at the 2025 average of about ₹87 per US dollar), is its highest ever.[53] The constraint lies downstream of the money. India's procurement system prioritizes a small number of capable platforms over a large number of expendable ones, and its production base cannot yet replace combat losses at the rates a war would demand. India can buy drone capability. Whether it can regenerate that capability month after month under attrition is the question the earlier tiers left open.

Pakistan

Pakistan approaches the same problem from a position of weakness and has made a virtue of it. Its fleet is large for its means, exceeding a thousand systems drawn from Chinese, Turkish, and domestic sources: the Chinese CH-4B and Wing Loong II, the Turkish Bayraktar TB2 and Akinci, and the indigenous Burraq and Shahpar series. Its own manufacturing capacity is thin, and its more ambitious indigenous projects cost more than it can comfortably sustain; development of the Shahpar-III alone has been estimated at between one and two hundred million dollars.[54] Islamabad has chosen to lean on its partners rather than compete with them. Its collaboration with Turkey's Baykar allows local assembly of YIHA-III drones in as little as two to three days, and most of its capable platforms arrive from Beijing and Ankara as finished or near-finished systems. What follows from this is a strategy of cost imposition. Pakistan has no need to match Indian production. It needs only to send enough cheap drones and loitering munitions against Indian air defenses to force the firing of far more expensive interceptors. A drone worth a few thousand dollars that draws an Akash round costing roughly ₹2.5 crore (≈ USD 287,000) in reply has done its economic work, whether or not it reaches the target, and Tier II's exchange ratios describe exactly this trade running against India.

	INDIA — Caught in the middle	PAKISTAN — Weakness as strategy	CHINA — In a different league
ECONOMY & BUDGET	Largest economy of the three. FY26 budget 6.81 lakh crore (~USD 78 bn).	Smallest budget; turns its weakness into a deliberate strategy.	Tens of billions in state subsidy; a cost structure no rival can match.
FLEET & SOURCES	Imports from Israel and the US, plus 200+ domestic startups.	1,000+ systems, mostly Chinese (CH-4B, Wing Loong II) and Turkish (TB2, Akinci).	Makes ~70% of the world's commercial drones; tens of millions of units a year.
MANUFACTURING & SCALE	Can buy capability, but cannot yet regenerate losses at wartime rates.	Thin home production; leans on partners (YIHA-III assembled in 2–3 days).	DJI sources 90% of parts near one city. CH-4 ~$1–2m vs $4m US Predator.
ECONOMIC ROLE	**Ambition outruns output.**	**Cheap drones to drain costly defenses.**	**Out-produces everyone, and supplies them.**

THE BOTTOM LINE

In a war with **China, India is out-produced**. In a war with **Pakistan, India is out-lasted, with China's help**.
Either way, the economic adversary India must reckon with is China. Cost imposition in one line:
a **~$3,000 drone** can force a ~ **2.5 crore (USD 290,000) Akash interceptor** in reply.

Two qualifications: China's commercial dominance is not the same as proven high-intensity military readiness, and an India-China clash would compete with Taiwan for Beijing's focus.

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Sources: report analysis; PIB (FY26 budget); SIPRI; IEA; manufacturer and open-source reporting. Figures approximate. Compiled June 2026.

China

China sits in a different order of magnitude. It manufactures close to 70% of the global commercial drone market and about 90% of the world's consumer drone segment. It supplies a commanding share of the components (airframes, batteries, motors, cameras, and radios) used in small drones worldwide.[55] It is the world's largest drone exporter, shipping tens of millions of units a year, supported by tens of billions of dollars in state subsidies, and its leading firm sources 90% of its components within 100 miles of a single city. The result is a cost structure no competitor can approach. A Chinese CH-4 sells for one to two million dollars, against four million for an American Predator of comparable class. For this report, the implication is plain. China can produce drones in quantities and at prices India cannot, and it does so from a supply chain on which India itself partly depends.

> China supplies a commanding share of the components (airframes, batteries, motors, cameras, and radios) used in small drones worldwide. However, while its industrial advantage is established, its proven ability to wage a sustained, high-intensity drone war is less so.

Two qualifications stop this from becoming an exercise in inflating Chinese power. Commercial dominance and military readiness are separate things. Analysts of the PLA's drone program have pointed to its reliance on civilian manufacturers whose products lack military-grade standards and secure supply chains, alongside fragmented suppliers and limited operational testing. China's industrial advantage is established; its proven ability to wage a sustained, high-intensity drone war is less so. The second qualification is that India would seldom be China's main concern. A Chinese contingency against India would compete for attention and resources with the Taiwan theater that dominates Beijing's planning, and that competition for focus is one of the few structural factors working in India's favor.

ASSESSMENT

With the three profiles in view, the comparison resolves into a few clear judgments. China can scale faster than either South Asian power by a wide margin; India occupies an uncomfortable middle where ambition outruns output; Pakistan trails in domestic production while making up the gap through imports. On cost imposition, both of India's potential adversaries hold the advantage, throwing inexpensive systems at the costly defenses India has invested in, while India has yet to field drones cheap enough to respond in kind.

The fourth question, which side runs out first, has no single answer, and the reason it has none is the most important point in this chapter. The outcome depends entirely on who India is fighting. Against Pakistan, the contest is not simply India versus Pakistan. India possesses the larger economy and industrial base, but Pakistan offsets this disadvantage through access to Chinese and Turkish platforms, components, and production networks. Against China directly, the question scarcely arises. India would be pulled into a rate competition with the largest drone producer on earth, while relying on a supply chain that the producer controls, and it would come up short.

> In a war with China, India would be outproduced. In a war with Pakistan, India is outlasted with China's help. Whether the trigger is pulled in Rawalpindi or Beijing, the economic adversary India has to reckon with is China, as the direct producer it cannot match, and as the patron whose supply keeps Pakistan in the fight.

In a war with China, India would be outproduced. In a war with Pakistan, India is outlasted with China's help. Whether the trigger is pulled in Rawalpindi or Beijing, the economic adversary India has to reckon with is China, as the direct producer it cannot match, and as the patron whose supply keeps Pakistan in the fight. The conclusion is sobering and clarifying, because it shows India where its real difficulty lies and, by extension, where any durable answer would have to be directed.

ASSESSMENT: WHO RUNS OUT FIRST?

The answer depends entirely on who India is fighting, and both roads lead back to China.

SCALE LEADER	THE AWKWARD MIDDLE	IMPORT-RELIANT	COST-IMPOSITION EDGE
China, by a wide margin	**India: ambition > output**	Pakistan, via partners	**Both adversaries lead**

INDIA vs PAKISTAN

INDIA'S EDGE
The larger economy and the deeper industrial base.

PAKISTAN'S OFFSET
Access to Chinese and Turkish platforms, components and production networks that cancel out India's size advantage.

India is out-lasted, with China's help.

INDIA vs CHINA

THE CONTEST
A rate competition against the largest drone producer on earth.

THE CATCH
Fought while drawing on a supply chain that same producer controls. There is no offset India can reach for.

India is out-produced, and runs out first.

Whether the trigger is pulled in Rawalpindi or Beijing, the economic **adversary India must reckon with is China.**

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Source: report analysis (Economics of Drone Warfare chapter). Compiled June 2026.

RECOMMENDATIONS

Indian defense planning operates in budget cycles and plan periods rather than analytical tiers, and most of the weaknesses identified in this report have answers that span different timeframes. The recommendations below are grouped by the horizon over which they can realistically be achieved: an immediate horizon of up to 2 years, a medium horizon of 3 to 5 years, and a longer horizon of 5 to 10 years.

Immediate (0–2 years)

- **Promulgate a Joint Doctrine for Unmanned Systems.**

Headquarters Integrated Defense Staff, under the Department of Military Affairs, should issue a tri-service doctrine that classifies attritable drones as consumable munitions rather than capital platforms, and that sets expected loss rates, replenishment norms, and employment principles accordingly. India has raised Rudra brigades, Bhairav battalions, and battalion drone platoons ahead of the doctrine that tells them how to fight as drone-centric formations; the doctrine is the precondition for the rest of this chapter and requires no manufacturing.

- **Delegate offensive drone-strike authority to the tactical edge.**

The Service Headquarters should revise the rules of engagement so that engagement authority for offensive drone strikes rests at the company and battalion level, with the Bhairav units and drone platoons as the natural holders. Tier III found that India has distributed drone hardware faster than the authority to use it; closing that gap is a matter of command policy, and intent can change faster than industry.

- **Raise dedicated Drone Defense Units and operationalize a national counter-UAS authority.**

The services should institutionalize counter-UAS sub-units within forward formations, and the Ministry of Defense and Ministry of Home Affairs should convert the announced national anti-drone unit into a standing, resourced organization with clear inter-agency command. Tier III showed counter-drone capability maturing faster than offensive capability, and this recommendation consolidates that strength rather than leaving it ad hoc.

- **Adopt Joint Engagement Zones and begin a tri-service Cooperative Engagement Capability.**

Building on the Akashteer, IACCS, and Trigun networks that performed during Sindoor, the Indian Air Force should lead the adoption of Joint Engagement Zones, in which layered air-defense systems and manned interceptors are cleared to engage within a defined volume on a common air picture, and the early integration of those three networks into a Cooperative Engagement Capability that allows any shooter to engage on another service's sensor track. This directly addresses the saturation threshold identified in Tier II: against a swarm, the binding limit is aggregate engagement rate, and pooling sensors and shooters across the services raises it without buying a single new interceptor. The full Cooperative Engagement

Capability matures over the medium term; the doctrinal decision and initial netting can begin now.

- **Stand up Operational Experimentation Units in each service.**

The services, working with the Defense Innovation Organization, should establish permanent units that embed developers alongside frontline formations to generate continuous operational feedback, on the Israeli model. This repairs the Observe stage that Tier IV identified as the first break in India's adaptation cycle, replacing the episodic post-Sindoor trials with a standing channel.

- **Expand the operator training pipeline.**

The services and the central armed police forces should scale operator throughput well beyond the BSF Drone Warfare School's current batch sizes, since trained operators are the one input a sustained campaign consumes that cannot be procured at short notice.

Medium-Term (3–5 years)

- **Make Manufacturing Readiness a procurement gate and create an attritable-systems acquisition category.**

The Defense Acquisition Council and the Department of Defense Production should amend the Defense Acquisition Procedure to assess Manufacturing Readiness Levels alongside the Technology Readiness Levels already applied, and should create a distinct acquisition category for attritable systems with relaxed certification thresholds and framework contracts that provide long-term demand signals. Tier II located India's binding constraint in an acquisition architecture built for exquisite platforms; this is the reform that attacks it directly.

- **Compress the fielding cycle.**

The Defense Innovation Organization and the Ministry of Defense should reform iDEX, ADITI, and the Fast-Track Procedure so that a demonstrated system reaches formations in months rather than years. Tier IV found that India's innovation base already generates prototypes and contracts in quantity, and that cycle time at the fielding stage is the bottleneck.

- **Establish a disposable mass production line for low-cost attritable drones.**

The Department of Defense Production, contracting with the private sector under assured orders, should stand up dedicated, high-volume manufacturing of cheap, good-enough FPV and loitering systems. The object is to reverse the cost-imposition ratio Tier II described, in which a drone worth a few thousand dollars draws an interceptor worth crores, by making India's own systems cheap enough to flip that exchange against Pakistan.

- **Constitute a National Mission for Unmanned Systems with an inter-service Unmanned Systems Command.**

As CSDR's earlier work has argued, a single empowered body should synchronize procurement, R&D, and industrial policy across the services, DRDO, and industry, and be paired with an inter-service command to overcome the coordination failure that Tier IV identified at the Reassess stage. This is the institutional anchor on which the other medium-term reforms depend.

- **Pre-negotiate co-production and wartime-resupply arrangements with partners.**

The Ministry of Defense should conclude standing co-production and surge-supply agreements with capable partners now, since the scale India cannot build at home can be borrowed only if the arrangements exist before a conflict rather than being improvised during one. As production grows, the Department of Defense Production should disperse and harden it across sites, addressing the production-targeting vulnerability flagged in Tier V.

Long-Term (5–10 years)

- **Dedicate a defense tranche of the critical minerals program to drone components.**

The Ministry of Mines and the Ministry of Defence should ring-fence a defense-grade share of the existing instruments, the National Critical Minerals Mission approved in January 2025, the ₹7,280 crore (≈ USD 835 million) Rare Earth Permanent Magnet scheme approved in November 2025 and targeting 6,000 tonnes a year of integrated capacity, and the dedicated rare-earth corridors announced for Odisha, Kerala, Andhra Pradesh, and Tamil Nadu in the 2026–27 Budget, for the magnets, motors, batteries, and sensors on which drones depend. This is the only measure that removes, rather than manages, the single lever Tiers I and V showed China holds over India's drone economy, and it builds on programs the government has already created rather than proposing new ones.

- **Restore NavIC and launch a national non-GNSS navigation program.**

The Department of Space and ISRO, with DRDO, should rebuild NavIC to a full and redundant constellation and, in parallel, develop and mandate non-satellite navigation, inertial, terrain-referenced, and visual, so that Indian drones can operate when satellite signals are denied or the constellation is degraded. Tier V showed navigation reduced to a near-defunct fleet of three operational satellites; this addresses the root cause of the gap.

- **Close the space layer through SBS-3 and resilient communications.**

The Defense Space Agency and ISRO should accelerate the Space-Based Surveillance program to end reliance on commercial imagery exposed by Sindoor, and field a resilient military communications fleet with a credible launch-on-demand reconstitution capability. Tier V showed navigation, imagery, and communications converging on a single fragile dependency; this recommendation, together with the one above, separates them.

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