CENTRE FOR AEROSPACE POWER AND STRATEGIC STUDIES (CAPSS)

Forum for National Secuirty Studies (FNSS)

AEROSPACE NEWSLETTER

On 15 May 2026, CAPSS and IMR organised a Joint Seminar and Exhibition on 'Unmanned Aerial Systems & Counter-UAS' at the Air Force Auditorium, Subroto Park, where Air Chief Marshal AP Singh, PVSM, AVSM, Chief of the Air Staff, in his Inaugural Address, emphasised that drones, UAS and C-UAS systems are an extension of air power, and they are succeeding because they possess all intrinsic qualities of air power.

VOL VI NO 06 **01 June 2026**

Centre for Aerospace Power and Strategic Studies | @CAPSS_India

Centre for Aerospace Power and Strategic Studies | Centre for Aerospace Power and Strategic Studies

Disclaimer:

Information and data included in this newsletter is **for educational & non-commercial purposes only** and has been carefully adapted, excerpted or edited from sources deemed reliable and accurate at the time of preparation. The Centre does not accept any liability for error therein. All copyrighted material belongs to respective owners and is provided only for purposes of wider dissemination.

"Atmanirbharta is a strategic necessity for developing resilient indigenous defence capabilities to proliferate the nation's indigenisation drive and strengthen the aerospace ecosystem."

- Air Chief Marshal AP Singh PVSM AVSM
Chief of the Air Staff

Source: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2264765&reg=3&lang=1

Contents

Opinions and Analysis

Air Power

Space

Aerospace Industry

11. ISRO Clears Gaganyaan G-1 Mission for Launch in Next Four Months
12. Defence Ministry Issues Proposals for Anti-Jamming System from Indigenous Firms for IAF's Entire Sukhoi-30MKI Fleet
13. May 2026 may have Changed India's Space Future Forever and No One Paid Attention

Opinions and Analysis

Needed: Robot Warriors for Three Domains

Air Vice Marshal Anil Golani (Retd),

DG, CAPSS | 13 May 2026

Source: News Indian Express | https://www.newindianexpress.com/opinion/2026/May/13/needed-robot-warriors-for-three-domains

A Ukrainian soldier launching a drone at the front line in the Kharkiv region. In the wake of recent military operation being dominated by aerial systems, India needs a whole lot of unmanned combat systems for all three domains(Photo | Associated Press)

The proliferation of drones in recent conflicts and their unmitigated use in all spheres of life has unwittingly projected them as a panacea for all ills. Maybe this would be a good time to not only discuss concepts and structures considered essential to develop unmanned forces in the country, but also to bust myths regarding their use.

At the outset, drones, at a conceptual level, are robots in the air. Robots are usually expected to proliferate in jobs that are dull, dirty and dangerous for humans. Since the battlefield is dangerous, it can be expected that unmanned systems will slowly replace humans in several dull tasks on the battlefield on land, and in sea and air. In Ukraine, logistics is almost entirely handled by unmanned ground systems. The bulk of offensive operations of the Ukrainian navy, too, are carried out by unmanned systems. This is a natural progression in the field of robotics. However, this needs further context on cost and effectiveness.

Every new weapon system enjoys a period of 'countermeasure holiday' when it is introduced, during which the existing counters are either ineffective or costly. The visible success of drones has been largely due to this.

But that phase is over. Sting, a $2,100 interceptor drone, has been in operation for over a year in Ukraine. President Volodymyr Zelenskyy offered it to the Gulf States recently. Similar systems are in production in several other countries, including India. Further, $1-per-shot lasers, high-power microwaves and other electronic warfare measures have been effective as well.

This doesn't mean drones are going to be extinct. Like surface ships continue to exist after the arrival of submarines and aircraft, both drones and their countermeasures would co-exist. However, their recent performance cannot be linearly extrapolated.

While Operation Sindoor was the first time that saw the employment of one-way attack drones in India, it was actually inducted by the Indian Air Force way back in 1999. The IAF inducted the IAI Harpy, an unmanned anti-radiation hard-kill drone operationalised in the early 2000s. The much-talked-about Shahed-136 is designed and modelled on the Harpy. At the time, the existence of this system was not even known to the majority of IAF personnel. The IAF is the first among the forces to induct unmanned systems. It issued a vision for them in 2013, followed by the creation of a specialised branch of officers for them in 2022. The Unmanned Systems School has been operational for some time. The IAF has more than 27 years of institutional knowledge in operating unmanned systems in the air.

While the move to unmanned systems in all domains is a natural progression, in India, for reasons unknown, this path has been restricted to air. There is no operational unmanned tank, vehicle, ship or submarine yet. Instead of developing ground and sea systems, the army and the navy have invested a bulk of their effort and budget in unmanned aerial systems. This is sub-optimal, since the air force is adept in that domain, the way the army and the navy are in land and sea. This is well-recognised in the existing structures. All pilots of fixed-wing craft of the armed forces train at the Air Force Academy. Likewise, the diving training of all forces is conducted by the navy.

The economic idea of 'comparative advantage' provides a useful light here. It argues that one can benefit more by focusing on the things they are best at, while buying the goods or services they are not as good at. This theory is based on the idea of opportunity costs, which is a potential benefit given up to select a particular option over another. It is down to how well one chooses to use the time and resources at hand. For example, Apple is good at design while Foxconn is good at manufacturing. Apple hasn't manufactured a single iPhone since 2007, which has been done by Foxconn and other similar contractors. With this choice, Apple profited immensely.

While several recent operations—Sindoor, Rising Lion and Epic Fury included—were predominantly aerial operations, the tendency to believe all future operations will be fought from the air is flawed. Land and sea operations are here to stay. Hence, India needs a whole lot of unmanned combat systems for all three domains, and not just jointly-operated aerial systems.

With the implementation of theatre commands on the cards, apprehensions about the non-availability of air power to support land and sea operations can be laid to rest. Despite all this, the focus is largely on unmanned aerial systems. This comes at the opportunity cost of not developing unmanned combat systems for land and sea.

The IAF's existing institutional capacity on unmanned systems can be easily expanded to handle the booming demand. The organisational lessons can be shared with the army and the navy to develop unmanned capabilities in their own domains. Not doing so will potentially increase the gap with adversaries in fielding unmanned land and sea capabilities. More than the equipment, the doctrines, training and experience of operating these systems matter—which is one of the reasons the IAF drones succeeded in Op Sindoor while Pakistan's were intercepted..

***

Defining Roles and Missions in the Indian Military Towards True Optimisation and Jointness

Wg Cdr Dhruv Shukla | 22 May 2026

Source: CAPSS | https://capssindia.org/defining-roles-and-missions-in-the-indian-military-towards-true-optimisation-and-jointness/

Created by the Author using AI

"A dollar spent on duplicative capability comes at the expense of essential capacity or capability elsewhere. Confused organizational structures lead to sub-optimal employment of forces already stretched too thin. Outdated service roles and missions yield costly, inefficient acquisition programs."

David A. Deptula, Lt Gen, USAF

Recent media reports indicate that the Indian military's proposed roadmap for theaterisation has finally been submitted to the Ministry of Defence (MoD) after years of debate. Much of the commentary around theatre commands has focused, understandably, on the promise of greater jointness, faster decision-making and increased operational efficiency. Yet theaterisation may not, by itself, resolve several deeper questions of jointness. One

of the most important questions is also the most basic: what roles should each service perform, and what should define the limits of service-specific capability development? This question has received limited attention in Indian strategic discourse compared to associated concerns such as duplication of capabilities, inter-service overlap and inefficient defence spending. Just as India's theaterisation debate has drawn from global models, this fundamental question may also require a comparative study on similar lines. But more importantly, it will require a thorough introspection as far as our higher defence organisation is concerned.

In the United States (US), this issue is discussed through the vocabulary of 'Roles and Missions.' The US Department of Defense (DoD) defines 'Roles' as 'the broad and enduring purposes for which the services were established by law', while 'Missions' refer to the 'the task, together with the purpose, that clearly indicates the action to be taken and the reason therefore'. Amongst the long list of inter-service issues in the US military that continue to persist after the Goldwater-Nichols Act, the 'Role and Mission' debate is perhaps the oldest, and the most intensely fought. A veteran United States Air Force (USAF) officer, Lieutenant General David Deptula, said in his speech to the US Senate Committee in 2015 that the Goldwater-Nichols Act and subsequent Joint Doctrines were about interoperability but did nothing to resolve the 'Role and Mission' issue affecting the US military since 1947. Like the US DoD Directive that lays down the service Roles and Missions, India has no direct equivalent framework. The closest equivalent, Allocation of Business (AOB) Rules 1961, is not a granular document like the US DoD Directive, and it essentially lays down the area of responsibility of various ministries and government departments. While reforms have been undertaken lately, leading to the creation of the Department of Military Affairs (DMA) in 2019, the issue of delineating the Roles and Missions of the services has not been resolved.

Air Forces across the world are especially exposed to this issue for two reasons. First, a substantial portion of the Air Force is employed towards executing missions in support of land and maritime operations. Secondly, other services commonly maintain organic air arms, whereas Air Forces do not maintain any such auxiliary forces for land or maritime operations. That said, duplication does occur in other domains like Space, where all other services may attempt to develop independent capabilities rather than sharing the products. Given enough money, perhaps this debate would exist only as a 'coordination' issue, but the real world works on a limited budget, and even nations with deep pockets are mindful of where they put their taxpayers' money.

Why is it required – Patchwork vs True Optimisation

At first glance, the question may appear redundant; the three military services by design have distinct domains and associated missions. If so, this entire debate becomes redundant, but history says otherwise. Most militaries, especially larger ones, have repeatedly struggled with inter-service issues such as operational misalignment, procurement competition, and budgetary overlap. In fact, the concept of independent air forces was born out of one of the worst-known cases of inter-service rivalry in Britain, with the Americans following closely.

Till the advent of Air Power, the overlap between services was hardly worthy of mentioning – Armies didn't want to fight on the seas, and Navies had no intention of fighting on land, even as both did coordinate for amphibious operations at times. Air Power brought along with it the concept of 'overlapping functions and duplications of effort', as noted by Brigadier General H.J.F. Miller of the US Army in the 1920s. Even as independent Air Forces came out from the shadow of being auxiliaries of the Army and Navy, the desire to have one's own little 'Air Force' never left the other services. This is not merely about the procurement of platforms, but also about creating an entire ecosystem to field them, which is substantial when it comes to aviation. The total cost (acquisition plus additional costs) of fielding such capabilities should be justified by their output vis-à-vis what it would cost when operated by the primary user service. However, there is no adjudication process which can sense the true financial implications of such duplicative capability development. Once approved, an ecosystem begins to develop and slowly becomes a justified institutional baseline, often at the cost of core domain expertise.

Left unchecked, two services may eventually possess comparable numbers of platforms for a similar mission, but possession of a platform is not the same as the ability to generate comparable operational effect. Domain expertise is not built overnight, and there is no need to do it when it exists with the primary service. The major concern is that as of today, there is no benchmark on how much overlap is acceptable and who draws the line? At this point, it is also essential to understand that a certain amount of duplication is not only acceptable but operationally required. The key is to ascertain where and how much.

Lastly, duplication of capability and mission overlap also deters 'jointness'. Consider a 'Theatre Command' where all three service components are operating a particular platform, say a High-Altitude Long Endurance (HALE) Unmanned Aerial System (UAS). It would not be long before the Theatre Commander realises that optimum utilisation of these platforms spread across services would require centralised planning, common maintenance schedules and

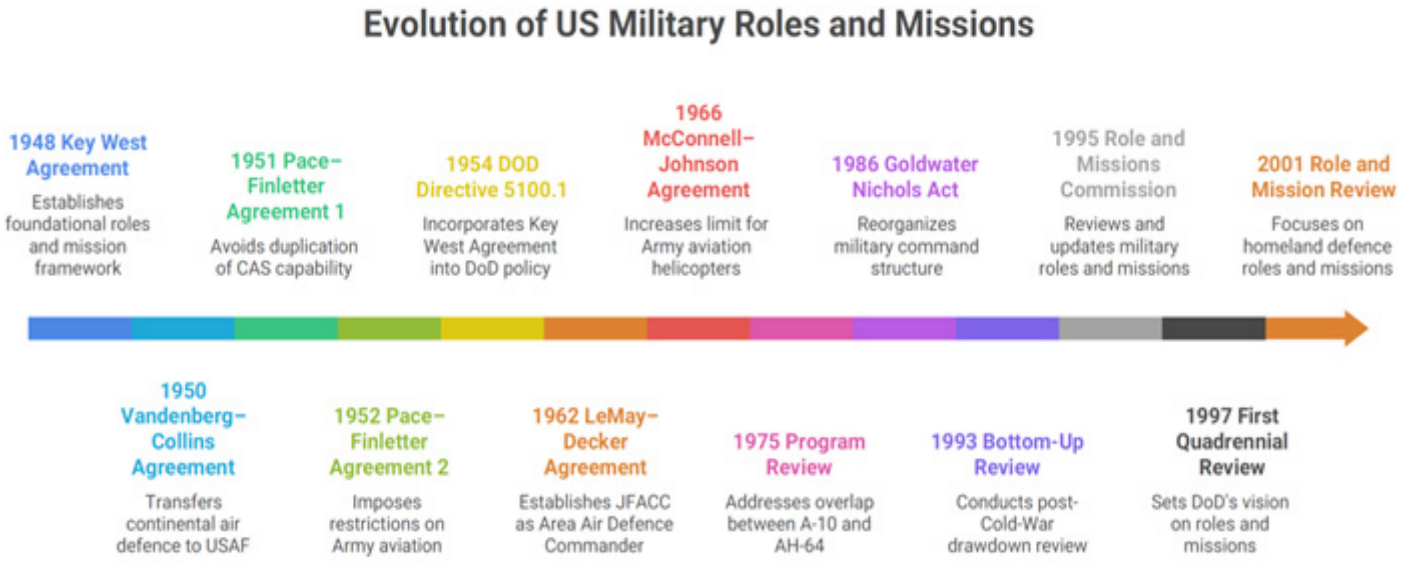
common Tactics, Training and Procedures (TTPs). Eventually, the commander would consolidate these assets under a single component for operations while distributing the products across all components. In due course of time, training of operators and maintenance too would need to be centralised to ensure optimisation, which may or may not fall under his purview depending on the command structure. In effect, the Theatre Commander would have to build a patchwork mechanism to correct the ill effects of fragmentation. These issues would not have existed in the first place had the services focused on the products of the platform rather than ownership.

The American Warning

The history of Roles and Missions debate in the US military is comprehensively recorded and easily accessible for any researcher to use. The debate began with the National Security Act of 1947, which laid down the basic functions of each service. In 1948, Secretary of Defense James Forrestal signed the Key West agreement, often known as the Key West Compromise, since it gave each service a bit of whatever they wanted without clarity. Secretary Forrestal divided the missions into 'primary' and 'collateral', which left room for duplication by default. A report by Stimson Center aptly summarises the agreement – 'The results were ambiguities in service roles, and redundancy in service functions, which built higher costs into the very heart of the US defense establishment.'

The Key West agreement found its legal framework in 1954 with DOD Directive 5100.1. The Department of Defense Reorganization Act of 1958, enacted during the Eisenhower administration, strengthened the authority of the Secretary of Defense and the Unified Commanders at the expense of the individual military departments. This was done to empower the Secretary of Defence and enable him to adjudicate over service requirements, resolve overlaps and assign specific programs to each service. The core debate of Roles and Missions was, however, not entirely resolved, leading to multiple government agreements, before finally solidifying into the Quadrennial Review (QDR). This review, undertaken every four years, is used to debate modernisation plans, national defence strategy, budget priorities and other issues that directly impact military capability. A chronological evolution of the US military Roles and Missions review is depicted below, and beyond 2001, the issue has been handled by periodic reviews like the QDR.

.



Source – Basic Documents on Roles and Missions, Office of Air Force History, US Department of Defense.

In 1986, a service-level prioritisation board was set up in the form of the Joint Requirement Oversight Council (JROC), which replaced the Joint Requirements and Management Board (JRMB). Unlike its predecessor, the JROC could rule against the service chiefs and individual service requirements if they were found redundant or unable to justify their costs. The council is headed by the Vice Chairman of the JCS and includes Vice Chiefs of all services. In theory, this should resolve all problems since a neutral view of service requirements is jointly undertaken and adjudicated. However, JROC members also represent their services, which means that institutional preferences do not disappear merely because they are placed inside a joint forum; thus, JROC itself is subjected to external audit by the Department of Defense.

Even with JROC in place, the overlap issues in the US military have not subsided, but their negative influence has been mitigated to an extent through Joint Doctrines laying down clear command relationships. Consider the case of Theatre-wide Suppression of Enemy Air Defences (SEAD) for which the Joint Force Air Component Commander (JFACC) is the 'supported commander'. The JFACC, under the guidance of the Joint Force Commander (JFC), can aggregate assets like Army Tactical Missile System (ATACMS), Navy's Tomahawk cruise missiles or even Special Operations Command (SOCOM) assets to produce the desired effects in the Area of Operations (AO). However, such arrangements do nothing to ward off the ill effects of overlap, which is wasteful expenditure due to duplicative capability development and stunted growth in critical areas. Where compromise becomes the default method of resolving inter-service disagreement, the result is pacification rather than prioritisation. The persistence of such concerns is visible even in recent legislation. The FY 2021 William Thornberry National Defense Authorization Act required reviews in several areas flagged familiar Roles and Missions questions: redundancy, gaps, integration, operational responsibility and the rationalisation of parallel architectures.

Overall, the American case makes for a good starting line for anyone attempting to study this problem, but it is by no means the only one. An interesting example for analysis would be the Canadian military, wherein a government study in 1960 reported that, 'There is a growing range of activities of common concern to the services, for which the traditional basis of organization is unsuited. It is increasingly recognized that to maintain three separate organizations for such functions is uneconomic.' This commission finally resulted in the unification of the three services in 1968, which can be considered an extreme administrative measure. While there are problems associated with such measures, and the Canadians themselves have partly reversed the act, it does point to a very basic question – if shedding service identities solves the problem, then does it mean that the duplication existed purely because of turf wars? Perhaps the core problem needs a deeper analysis with an unbiased lens that is concerned only with national interest.

Why Air Power Bears the Heaviest Costs

This is not a hypothesis; it is observable in almost every case of overlap and duplication. Any requirement projected by other services can be argued strongly enough in the name of 'organic' tactical responsiveness. This essentially corners the bureaucracy to choose the easy way out - give each service a share and avoid a hard decision. Over time, that compromise leads to depleted capabilities in the Air Force; a service expected to deliver the widest range of joint effects while still excelling at its core missions. Once a supported service sees the Air Force operating with inadequate numbers and stunted capabilities, it naturally perceives a gap between the Air Force's stated role and its actual capacity to support coordinated operations. To close that perceived gap, it raises its own case for capability development, which obviously overlaps with the Air Force's core missions. The result is an iterative cycle: Air Force shortages generate service-specific workarounds; those workarounds dilute the Air Force's case for capability building; the numerical slump deepens, and the overlap becomes progressively harder to reverse.

If left unmanaged, this trend can erode the institutional logic of an independent air force in due course of time, not because airpower becomes less relevant, but because its core missions are gradually fragmented across all services. In this state, these services cannot, individually or jointly, reproduce effects that the Air Force does with its domain expertise. Some land-warfare experts have already made statements that put the role of the Air Force in long-range targeting into question. Most observers miss the central point – the same weapon used by a service raised for a given role and by another service desirous of organic capability may result in very different outcomes. With critical capabilities fragmented across services, Air Power may fail to produce decisive effects in the opening days of operations. The failure of Air Power in Russia is a good

example of what a conflict can look like if the Air Force fails to produce decisive effects. Those interested in alternate history may like to imagine what Desert Storm would have looked like if the USAF had lacked night interdiction capability (F-111F/F-15E and Pave Tack pods) that knocked out the majority of Republican Guard armour. Air Power comes at a cost, but the cost of having a depleted Air Force is far higher. This aspect was aptly put by General George C. Kenney of the US Army Air Force – "Air power is like poker. A second-best hand is like none at all – it will cost you dough and win you nothing."

Indian Higher Defence Organisation

Allocation of Business rules (AOB) in India assigns the following responsibility to the Department of Defence: 'Defence of India and every part thereof including defence policy and preparation for defence and all such acts as may be conducive in times of war to its prosecution and after its termination to effective demobilisation.' This essentially means that even after the formation of the Department of Military Affairs (DMA), all policy decisions must be routed through the Department of Defence, essentially the Defence Secretary. On the other hand, the Department of Defence, which handles capital acquisitions, does not have a mandate of prioritisation but only that of ensuring accountability. Essentially, this gives the DMA a jointness mandate, but not a clear capital-acquisition adjudication mandate on overlap debates. The DoD ensures that the process of acquisition will stand the test of scrutiny by the Controller and Auditor General (CAG), but they do little in terms of optimisation at the deep end. In sum, ours is a classic case of civilian control over the military where civilians do not interfere as long as the process aligns with laid-down rules. Anit Mukherjee remarked in his book, The Absent Dialogue, that "the model of 'objective control' as understood and implemented in India has not stood the military in good stead as it has compromised on its effectiveness, and there is an urgent need for change."

The change, perhaps, was to be the Chief of Defence Staff (CDS), a case as old as independent India. While the present mandate of the CDS may not align with the original concept as envisaged at the time of independence, its present charter does cover the issue at hand to some extent. Out of his eleven stated duties and functions, three are of interest: -

- To be a member of the Defence Acquisition Council (DAC), chaired by the Hon'ble Raksha Mantri.

- To assign inter-services prioritisation to capital acquisition proposals based on the anticipated budget.

- To bring about reforms in the functioning of the three Services with the aim of augmenting the combat capabilities of the Armed Forces by reducing wasteful expenditure.

From the above, it is evident that the CDS

has some US JROC-like responsibilities in inter-service prioritisation, but India still lacks an institutional mechanism designed specifically to test whether a proposed capability duplicates, complements, or undermines another service's assigned role. Advocates of various processes like the Integrated Capability Development Plan (ICDP) may cite the existence of the Defence Acquisition Council (DAC) itself as a major barrier to wasteful expenditure. To ensure credible oversight, cases of procurement above INR 300 crores are cleared by the Defence Secretary, and above INR 500 crores are cleared by the Hon'ble RM himself. But the caveat here is that both civilian bureaucrats and the politicians may not be viewing procurements through the lens of sensing duplication, but purely from a financial viability standpoint. In their defence, any procurement case reaching them would have already got the nod from CDS, and their approval would be mostly based on financial constraints. Consider this - If the Army were to make a strong case for acquiring fixed-wing transport aircraft or the Air Force asked for a regiment of Multiple Rocket Launch Systems (MRLS), the decisive filter may become financial affordability, even though the question should be whether the capability is required organically with that service at all.

Curious Case of Attack Helicopters

When the Army Aviation Corps (AAC) finally came into being in 1986, the case for command and control of Attack Helicopters was already a highlight. As per the Army, Attack Helicopters were an integral part of the land battle, with some often equating them to an elevated tank. The inter-service debate reached an extent that it required government intervention, and the same was brought out by then Defence Minister AK Antony during a 2013 parliament question on the issue - "Keeping in view operational requirements, Government has decided that ownership of future inductions of attack helicopters will vest with the Army." Interestingly, just six years later, in 2019, the Indian Air Force (IAF) inducted the first batch of AH-64 Apache Attack Helicopters with a stated role of 'enhancing the capability of IAF in providing integrated combat aviation cover to the army strike corps'. Within the next five years, the Indian Army will also induct the same platform, with the former Director General AAC reportedly declaring it as a 'game changer' in the Tactical Battle Area (TBA). However, operational experience has shown that modern Attack Helicopters are more than just flying tanks and are capable of executing missions which far surpass the traditional roles of Close Air Support. Some of these complex missions include SEAD and Combat Air Patrols (CAP) against UAS. Apaches have even been employed for Anti-Ship role by the US military during Operation Epic Fury. By splitting a relatively small fleet of highly specialised assets across two services, it would be extremely difficult to standardise TTPs and integration of the entire fleet with larger packages if the need arises. In the US military, the fleet is entirely operated by the US Army, while

in Israel, the fleet is operated by the Israeli Air Force – every country has their own operational context and reasons. The issue is not of ownership, but of optimisation and operational efficiency.

In a similar manner, the indigenous Light Combat Helicopter 'Prachand' has also been split across the Army (90) and the Air Force (66). It would be difficult to imagine how airborne assets placed under different C2 structures will operate with common Rules of Engagement, Secure Identification Friend or Foe (IFF) keys, communications plan, data-link settings, Electronic Warfare (EW) database, etc. If we circle back to the hypothetical example of a Theatre Commander having assets spread across in this manner, the outcome will be the same – aggregate operations under one component and share the capabilities. There is no question that operational integration of these platforms can be achieved by extensive joint training, cross-posting of aircrew, common TTPs, common maintenance schedules and other such measures. But as covered earlier, these are patchwork measures to enhance interoperability, not measures to prevent wasteful duplication. In the absence of publicly available MoD files explaining the adjudication logic, it is difficult to assess whether the split reflected operational necessity, industrial/budgetary considerations, or an unresolved Roles and Missions compromise.

The Attack Helicopter debate is not unique to India, and similar debates exist regarding other platforms in India and across the world. For instance, the case of the People's Liberation Army (PLA) Navy assets being transferred to PLA Air Force in 2023 would make for an interesting study. The case study highlighted here is to illustrate the larger problem of mission overlap and duplication of capabilities and not to justify the case of either service. The real question to be asked is whether India has a mechanism to decide when overlap is operationally necessary, when it is merely institutional accommodation, and when it becomes costly duplication.

Way Forward

At the outset, it must be reiterated that overlap and duplication to an extent are an operational requirement. Secondly, the role of services-led structures in adjudication of procurement cases must be subject to external audit to ascertain their ability in preventing wasteful duplication. Thirdly, there must be a mechanism for ascertaining the true cost of duplication that goes beyond acquisition costs. This would also involve deficiencies in operational employment of a given platform within a service. The adjudication, thus, will not just be limited to who can buy what, but also about what type of integration standards need to be met to ensure interoperability. This would involve dictating critical aspects like combat identification systems, networking standards and so on. The endgame, that is, operational employment, can be left to joint doctrines or other mechanisms between the services.

To achieve this, the first step would be to institute a Roles and Missions Review Committee headed by the Cabinet Secretary and consisting of representatives from the Ministry of Defence, the Ministry of Finance and the three services. The mandate of the committee can be broadly set as follows:

- To assess existing overlap between the three services, including historical records of how it came into existence.

- To carry out a study of the financial implications of maintaining duplicative capabilities across the services, including a comparative analysis of how each service operates common platforms. This would include analysis of manpower differentials, maintenance management, operational utilisation and contribution to joint requirements. The first two aspects should involve an independent study through a Comptroller and Auditor General (CAG) audit to ensure that the data captured is true and a solid foundation is laid for future models.

- Establish 'Role and Mission' clarity after careful analysis of global models. A broad framework is placed in Table 1 below.

- Modify the existing ICDP, Defence Capital Acquisition Plan (DCAP) and Annual Acquisition Plan (AAP) to include MoD oversight in terms of adjudication and prioritising, not just to ascertain adherence to procedures.

- Periodic review by the committee with findings submitted to the Standing Committee on Defence (SCOD).

- To review AOB for inclusion of three service Headquarters (HQs) directly or consider empowering DMA beyond its present scope to adjudicate in capital acquisitions.

Table 1 - Tentative Framework for Classification

Role / Missions	Logic
Primary Service Role	Core role for which a service exists
Lead-Service Mission	One service leads doctrine, standards and integration
Organic Service Capability	Unavoidable overlap for tactical responsiveness
Coordinated Missions	Capabilities used in support of other services
Shared Capability	Products used by more than one service (eg. IMINT, Cyber)
Restricted Duplication	No-Go Zone (like a negative list)

Conclusion

As America was preparing for a military intervention during the Second World War, it was President Franklin Roosevelt's foresight that allowed him to make a crucial decision regarding pre-war production – to cut the armoured vehicles production and scale up aircraft production even though some of his generals advised against it vehemently. While we can debate till eternity about the impact of strategic bombing during the war, the impact of Allied Air Superiority on the progress of operations on land and sea cannot be disputed. Had Roosevelt delayed it by deliberating too long, American Air Power may not have prevailed even if the production base was able to keep pace. The reason is that capability is not just about production or acquisition; it is about integrating that platform into the existing warfighting mechanisms and, most importantly, about

creating institutions and expertise. There were no Roles and Missions guidelines that existed then, and the USAF did not exist yet. Yet, this decision was made by a politician who understood military requirements.

While a wartime decision like the above would have entirely different connotations than those discussed here, the case should trigger some minds at the apex level as to what it takes to make this call. Does it matter if bureaucrats have an innate knowledge of military matters since they are placed in a position of authority? One may say that it would depend on the maturity and wisdom of military leaders to understand the security dynamics and contours of future warfare and take measured decisions without any service bias. That may be so, but leaving policy matters open to personal attributes is not a sound policy by any standard. The only option that remains is a bounded approach which gives the military and civilian bureaucracy a framework – well-defined military Roles and Missions. Luckily, there is enough data available globally to derive meaningful lessons and make a framework suitable for India. Whatever be the framework, the enduring and final role of civilian oversight is best stated by David Deptula while presenting his case to the US Senate, "After that quarter century of experience I have come to the conclusion that fundamental change in the roles and functions of the Armed Forces can only come from congressional legislation. The role men and women in uniform can best play is to help share insights and perspectives regarding the present state of affairs, where change is needed, and avenues for positive reform. Ultimately, I think we need to seriously consider a Commission on Roles and Missions in the 21st Century that may ultimately inform a revised National Security Act."

***

Operation Sindoor Revisited

13 May 2026

Source: CAPSS | https://capssindia.org/operation-sindoor-revisited/

Introduction

This is a joint paper written by CAPSS and CHPM to commemorate the first anniversary of Operation Sindoor. Gp Capt VP Naik writes about how the operation has reshaped regional geopolitics and reaffirmed India's strategic autonomy. Mr Adrien Fontanellaz writes about how the Indian Air Force has done what most air forces of the world only aspire to do. Together, the articles highlight a rising India and bring out that no amount of soft power can ever replace credible and effective hard power.

When Strategy Met Geopolitics: 88 Hours of Precision, Power and Purpose

Gp Capt VP Naik VM

History often treats anniversaries as occasions for nostalgia. Operation Sindoor, however, evokes something very different. For a nation long affected by state-sponsored terrorism, it represents not merely a military operation but a defining moment in India's evolving approach to deterrence, strategic signalling, and calibrated response. It demonstrated how national anger could be translated into precise military action and credible political messaging.

What will endure is not merely the strikes by themselves, but the clarity of purpose, restraint, and institutional confidence they displayed. More importantly, the operation highlighted the priorities of the Indian Armed Forces: speed over spectacle, precision over mass, integration over service-specific silos, and narrative dominance over the prevailing ambient clutter.

For decades, India's strategic resolve has been frequently questioned. Op Sindoor did not create national resolve; it organised and operationalised it. From the surgical strikes after the 2016 Uri attack to the 2019 Balakot airstrike and finally Op Sindoor, India has been progressively raising the threshold of response. For the first time, India used precision as a strategy, whose effects were forceful enough to impose costs yet restrained enough to avoid uncontrolled escalation. Equally important was India's messaging from the outset that the operation was counter-terrorism-focused and not aimed at conflict expansion. That distinction strengthened international legitimacy and prevented diplomatic isolation. In effect, Op Sindoor transformed credible military capability into strategic coherence.

India's future security environment is likely to be defined by blurred thresholds and persistent contestation, where peace and conflict coexist in a continuous grey zone. Adversaries will increasingly rely on proxy actors, cyber intrusions, disinformation campaigns, and economic coercion. Terrorism itself is unlikely to disappear; instead, it will mutate and manifest in different forms. India, therefore, requires a full-spectrum response capability extending beyond purely kinetic retaliation.

The operation also demonstrated that the requisite degree of air control coupled with precision-strike capability will determine the freedom of action of land and maritime forces. Future conflicts will demand integrated, multi-domain responses that combine cyber operations, electronic warfare, space-based intelligence, surveillance, and reconnaissance (ISR), and precision strikes within compressed timelines. Op Sindoor gave a glimpse of it; the future will demand it as a baseline.

Modern warfare will unfold simultaneously across physical and cognitive domains. In such an environment, the first narrative may matter as much as the first strike. Shaping international opinion will become as important as sustaining domestic cohesion, while the adversary's perception will emerge as a target alongside its military infrastructure. India's lack of an institutionalised information warfare architecture remains a critical weakness. Strategic communication, when decentralised, loses its significance. Dedicated structures must plan, execute and sustain narrative creation before, during and after operations.

The greatest risk is that Op Sindoor remains an exception rather than becoming an institutional practice. India must codify a doctrine of calibrated response linking different forms of provocation to kinetic, cyber, economic, informational, legal, and diplomatic options. The objective should be to maintain predictability in intent while preserving unpredictability in the response mechanism. The adversary must remain uncertain not about whether India will respond, but about how and where it will do so.

Achieving this requires structural reform. India has long acknowledged the need for integration but has struggled to move beyond institutional inertia. Decision superiority depends on information dominance, which in turn requires dismantling of bureaucratic silos and service-specific fiefdoms. Future conflict will not favour static, geography-bound structures. It will favour agile, mission-oriented organisations capable of imposing costs rapidly and repeatedly.

India should therefore move towards permanently integrated, multi-domain capable task forces supported by flexible command-and-control structures designed around missions rather than geography. These structures would enable faster

decision-making, reduce procedural delays, and provide political leadership with multiple calibrated response options.

At the same time, caution is essential. Strategic success often creates the temptation for overreach. India must avoid template thinking because no two crises will unfold identically. Escalation is not a switch but a ladder requiring constant calibration. Another Sindoor-like strike may succeed operationally while failing politically, or vice versa.

High-tempo operations also depend on accurate intelligence. Errors in target selection or delayed communication can rapidly reverse narrative advantage and impose disproportionate strategic costs. Structural agility must not create ambiguity in command responsibility. Unity of command and clarity in decision-making remain non-negotiable.

India must avoid a mismatch between ambition and capability. Sustainable strategy depends upon economic resilience, technological capacity, diplomatic influence, and military readiness. Repeated kinetic responses, even when justified, may gradually erode international tolerance if legitimacy is assumed rather than continuously reinforced. Ultimately, Op Sindoor achieved three objectives simultaneously: it restored deterrence credibility, demonstrated control over escalation, and integrated military action with political messaging. Few operations manage to accomplish all three while retaining long-term relevance.

The operation's enduring significance lies not in the scale of force employed, but in the repeatable strategic logic it revealed. It reflected an India seeking greater strategic autonomy while remaining rooted in restraint and calculated statecraft. The operation ended quickly, but its implications will shape India's strategic choices long after the headlines fade.

Operation Sindoor in the Context of Air Warfare in the 2020s

Adrien Fontanellaz

During the 2010s, air power was mainly employed in asymmetric conflicts in which advanced air forces operated against insurgent or non-state actors with little effective air defence capability. Western air forces conducted thousands of sorties against groups such as the Taliban and the Islamic State with minimal risk, particularly when flying at medium or high altitude. Likewise, the Russian Air Force carried out prolonged bombing campaigns in Syria with near-total impunity. Direct confrontations between advanced military powers were rare and limited, with Operation Bandar in 2019 among the few notable examples.

This paradigm shifted in 2020. That year, Azerbaijan successfully neutralised much of the powerful Armenian air defence network. It achieved this through the "Karabakh Chest" operation, which combined decoys, reconnaissance and attack drones, loitering munitions, electronic warfare, helicopters, and long-range

artillery coordinated through an effective command-and-control infrastructure. Once air superiority was secured, Azerbaijan used it to support rapid ground offensives, ultimately achieving victory within weeks. Although many observers credited Azerbaijan's success primarily to drones, the conflict demonstrated that unmanned systems were only one component of a broader, coordinated strategy. Manned aviation also played a key role, flying around 1,000 combat sorties during the war. Meanwhile, Armenia's own air force, including its modern Su-30SM fighters, contributed little to the fighting.

From February 2022 onward, both Russia and Ukraine deployed extensive integrated air defence systems that combined advanced radars, electronic warfare, and layered Surface-to-Air Missile (SAM) networks, severely restricting the freedom of action of manned aircraft. Ukraine entered the conflict at a major disadvantage. Its air force was far smaller than Russia's and relied largely on outdated Soviet-era aircraft, while Russia fielded advanced fighters such as the Su-30SM, Su-35S, and MiG-31BM, equipped with superior radar and missile capabilities. Even the later introduction of limited numbers of F-16AM and Mirage 2000-5 fighters into Ukrainian service did not fundamentally alter this imbalance.

As a result, Russia maintained air superiority near the front line, enabling continuous high-altitude glide-bomb attacks against Ukrainian positions. Ukrainian strike aircraft, by contrast, were forced to fly at very low altitude to avoid detection and remained vulnerable to long-range Russian missiles and S-400 systems. Moreover, both sides increasingly relied on drones and cruise missiles to strike targets deep behind enemy lines, while Russia also employed ballistic and aero-ballistic weapons. In parallel, both militaries conducted sophisticated Suppression of Enemy Air Defenses (SEAD) operations involving electronic warfare, unmanned systems, ballistic strikes, and special forces.

In June 2025, Israel attacked Iran with extensive American support. Both nations resumed their aerial onslaught at the end of February 2026 with much greater intensity. The American-Israeli coalition possessed overwhelming superiority compared to Iran's obsolete air force. Unable to challenge Israeli and American aircraft directly, Iran relied mainly on its extensive SAM network to deny complete enemy air supremacy. However, defending such a large territory against highly advanced air forces proved difficult given the limited number of modern systems available. Iran retaliated primarily with drones and missile strikes rather than manned aviation, while the survivability of many Iranian assets depended foremost on passive measures such as dispersion, camouflage, and underground facilities designed to withstand aerial attacks.

Operation Sindoor offered another example of modern high-intensity air conflict. Over 88 hours, the Indian and Pakistani air forces, together with their air

defence systems, engaged in an intense aerial duel. India initially succeeded in striking terrorist infrastructure deep inside Pakistan, but the Pakistanis responded swiftly.

Islamabad subsequently launched several waves of drones, loitering munitions, missiles, and rocket artillery, but India's air defences countered most of these attacks. At the same time, the Indian Air Force (IAF) used loitering munitions to degrade Pakistani air defences before carrying out precision strikes against several major Pakistani air bases. Though India employed relatively few air-to-ground munitions, the operation demonstrated its ability to strike critical targets at will, proving that it had achieved effective air superiority. Facing this situation, Pakistan requested a ceasefire, which India accepted after achieving its political and military objectives.

At this stage, the singularity of Operation Sindoor becomes evident. It was the only occasion on which two first-tier air forces, similarly equipped and trained, battled each other in a context of near numerical parity, considering that the IAF did not commit all of its assets. Both forces were equipped with significant numbers of 4+ and fourth-generation combat aircraft, force multipliers—including Airborne Warning and Control Systems (AWACS)—long-range air-to-air and air-to-ground munitions, and substantial arsenals of drones and loitering munitions. They could also rely on highly capable air defence systems such as the HQ-9B and the S-400. This alone demonstrates that Operation Sindoor ought to be closely studied and scrutinised by air warfare analysts worldwide. Moreover, the fact that one side emerged victorious within 88 hours, in this context of technological parity, further reinforces this point.

However, the significance of Sindoor goes beyond the tactical and operational levels for two main reasons. First, it took place under a nuclear threshold, as both sides possessed significant nuclear arsenals. Second, it is one of the rare cases in which the political leadership of one belligerent managed to develop a cohesive and realistic strategic framework, define clear and attainable objectives, and then allow its military to operate freely within those parameters. This stands in contrast, for example, to the current American administration. Therefore, Sindoor ought to attract the close scrutiny of the strategic community as well.

***

Continuity in War and Strategy in West Asia: Enduring Lessons from the Peloponnesian Wars

Wg Cdr Ashu Saxena | 11 May 2026

Source: CAPSS |https://capssindia.org/continuity-in-war-and-strategy-in-west-asia-enduring-lessons-from-the-peloponnesian-wars/

Created by the Author using AI

The "Peloponnesian Wars" is an ancient treatise detailing the events and elucidations that took place two millennia ago. It was written by an Athenian general named Thucydides, during his exile days. His narration covers a period in the Greek world, engulfed by war between the two dominant city-states, Sparta and Athens. His narrative of critically selected events in war was meant to endure through time. It is a well-known document in the realm of international relations and is referred to frequently for understanding various geopolitical events in the contemporary world.

Thucydides quotes "The absence of romance in my history will, I fear, detract somewhat from its interest; but if it be judged useful by those inquirers who desire an exact knowledge of the past as an aid to the understanding of the future, which in the course of human things must resemble if it does not reflect it, I shall be content. In fine, I have written my work, not as an essay which is to win the applause of the moment, but as a possession for all time." What is the continuity from the past as an aid to understanding which Thucydides is pointing to? As per Thucydides, the nature of human-kind is constant and predictable; it is cyclic and repeats itself in due course of time. He brought about objectivity in history and compiled it as a source of knowledge for future generations as an enduring treatise.

Many contemporary realities can be related to the Peloponnesian War. The rise of Athens and the subsequent expansion of its empire, reaching its greatest heights, which an empire could achieve, its emboldened behaviour and audacious expeditions can be related in great similarity to the United States (US) ambitions. Specific incidents from the Peloponnesian War draw similar parallels in the present-day US behaviour. Thus, revisiting the ancient text would help us relate history to present-day realities and predict future outcomes in this uncertain environment, which has mysteriously engulfed the entire world.

The Athenian empire was characterised by its unique democracy and naval might. It finds its roots in the Delian League, which was a system of tribute-paying nations for common interests in the region. Over time, the league, with Athens at the helm, began

expanding its territories. The Hegemonic intentions of Athens transformed the league into a vast empire through its imperialistic ambitions. As Robert Gilpin in his book, War and Change in World Politics states that “A state will attempt to change the international system if the expected benefits exceed the expected costs” (i.e. if there is an expected net gain)." He further states that any development that increases power and enlarges the state’s opportunity to increase its revenues will encourage political or economic expansions. In the case of the Athenians, their expansion was fuelled by highly mobile and agile naval might, which exerted its supremacy in the Mediterranean Sea. Their tactical dominance in naval warfare was unique and a capability possessed by a few. This factor had a great impact in showing their military prowess, controlling economic activities, and establishing an order to dominate and control the region.

The US, in a way, draws an interesting resemblance to ancient Athens. As per Alfred Thayer Mahan, two important requisites for a strong naval power are healthy commerce and a powerful navy. The US possesses both. It also meets what Mahan has identified as six conditions affecting the sea power of a nation, i.e. its geographical position, physical conformation, extent of territory, population, character of people, and character of government. Both nations came to prominence through a unique manifestation of chance. The removal of Spartan general Pausanias and subsequent withdrawal of Spartans from further war efforts against Persia brought Athens to the global stage. The Athenians grabbed the opportunity and emerged as heroes in battles against Persia. The US, on the other hand, emerged as the sole victorious nation capable of influencing and dominating the new world order post-World War II.

Peloponnesian Wars

Megarian Decree (Economic War)

Megara was an ancient Greek city-state placed strategically between Athens and Corinth. It was a key ally of the Spartans and shared frontiers with Athens. In the year 432 BCE, Athens, under the leadership of Pericles, imposed economic sanctions on Megara. For the global public, Megara was punished for cultivating sacred land, killing an Athenian general and supporting Athenian exiles. However, the hidden intentions were to deteriorate Sparta and its allies. This can be counted as one of the earliest instances of economic warfare. This continuity is seen even today, where the US has imposed heavy economic sanctions on countries under the pretext of security concerns with ulterior motives of controlling oil trade in West Asia.

Melos (The Melian Dialogue)

The events which occurred in the year 416 BC and beyond greatly resemble the environment which exists today. During this period in the Peloponnesian Wars,

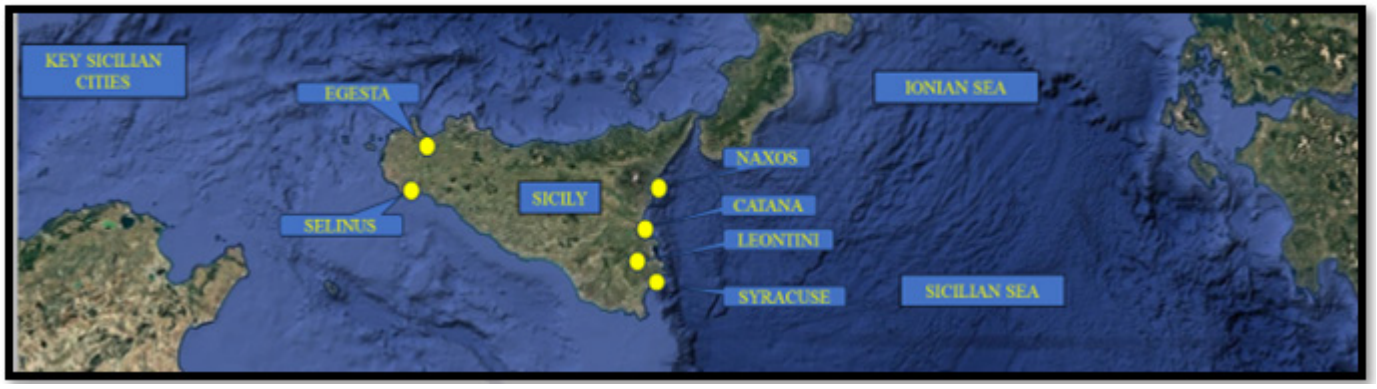
Athens subjugated Melos, and the ensuing debate brought about the hubris of Athens during the epitome of its empire. Athens actions against Melos pointed to early instances of realism that "While strong do what they can and weak must suffer what they must." This posture by Athens is spelt out by Robert Gilpin, who states that, when a state expands economically and politically, it subsumes willing and unwilling, both of economic value or not. The US has demonstrated similar behaviour recently when it carried out an invasion of Venezuela and put forward intentions of territorial claim on Greenland. Taking over Venezuela not only met its energy needs but also deterred other sanctioned states from supporting the US adversaries.

Sicilian Expedition

The Egestaeans pitched the Syracusans as a potential threat, given their malicious intent to rule Sicily and their Dorian roots (Peloponnesians), which was a concern for pro Athenian states. The Eegestaeans also promised to furnish money for the war in Sicily. Athen agrees to the proposal post the arrival of envoys who were sent to verify facts on the ground. Although falsified information, Egesta was able to persuade Athens into war, after which a council was assembled to consider the preparations for sailing to Sicily.

Three generals were nominated for the Sicilian expedition. However, among them, Nicias and Alcibiades arguments during the deliberations deserve attention. Nicias proposed a restraint approach, not to enter into others 'wars. He emphasised

Figure 1. Key Sicilian cities



In the same year after conquering Melos, Athens resolved to sail once again to Sicily. This expedition has unique lessons to offer that are highly relevant in the contemporary world. The Egestaeans (Fig 1.) approached Athens for support in their war against the Selinuntines. The Selinuntines entered into an alliance with the Syracusans, a regional power in Sicily. that respite from plague and war should be used to consolidate their own state rather than fighting a war for someone else. Refuting Nicia's proposals, Alcibiades, on the other hand, managed to convince the assembly that the Sicilian expedition would be an easy war, and Athens, with all its might and valour, should sail to Sicily rather than follow Nicias's passive

policy. He stated, “We cannot fix an exact point at which our empire shall stop, we have reached a position in which we must not be content with retaining what we have but must scheme to extend it, for if we cease to rule others, we shall be in danger of being ruled ourselves.” Hearing Alcibiades propositions, requests from Eegestaeans and Leontine’s exile request, Athens prepares for the expedition.

Meanwhile, in Syracuse, Hermocrates advised the council that the Athenian threat would manifest anytime. Their aim was to subjugate Sicily under the pretext of helping the Egestaeans and Leontini. He asked to be aware of this situation, at the same time, not to get afraid, as a common enemy would unite them all. He further stated that the Athenian audacious expedition would face logistical issues in establishing itself in Sicily. He advised sending envoys to Italy and Carthage to join hands against a common enemy. He also advocated for taking support from Corinth and Sparta in terms of military aid and continued to engage Athens in Hellas. He then proposed a plan to meet the Athenians at Tarentum and the Iapygium promontory (Italy). This entailed creating a defensive base at Tarentum and using the positioning to blockade the passage to Sicily.

West Asia Crisis (Sicilian Expedition-II)

This entire episode can be related in a big way to present-day world realities. Nicias and Alcibiades’ personalities parallel those of Republican President Donald Trump and Democratic President Barack Obama. In a recent address to the nation on April 02, 2026, President Trump said, “I want to thank our troops for the masterful job they did in taking the country of Venezuela in a matter of minutes, which was quick, lethal, violent, and respected by everyone all over the world. After rebuilding our military during my first term, we have by far the strongest military anywhere in the world. And now we're working along with Venezuela and are, in a true sense, a joint venture partner. We're getting along incredibly well in the production and sale of massive amounts of oil and gas. The second largest reserves on Earth after the United States of America. We’re now totally independent of the Middle East and yet we are there to help. We don't have to be there. We don't need their oil. We don't need anything they have, but we're there to help our allies.”

The above statement relates to emboldened Athens post recent victories, and especially after taking over Melos. The president justifies his actions for helping his allies in West Asia. Alcibiades had done the same while addressing the assembly, vouching for Athens to expand, secure resources and help its allies. He justifies that, “We did not make take them into alliance to have them help us in Hella, but that they might so annoy our enemies in Sicily as to prevent them from coming over here and attacking us.”

President Donald Trump further in his speech criticised President Barack

Obama's passive policy towards Iran regarding the nuclear deal back in 2015 and stated: "I terminated Barack Hussein Obama's Iran nuclear deal, a disaster." The nuclear agreement with Iran, formally known as the Joint Comprehensive Plan of Action (JCPOA), was President Obama's passive policy against Iran. President Obama, in the address to the nation on July 14, 2015, said, "Today, after two years of negotiations, the United States, together with our international partners, has achieved something that decades of animosity have not. A comprehensive long-term deal with Iran that will prevent it from obtaining a nuclear weapon. This deal demonstrates that American diplomacy can bring about real and meaningful change. Change that makes our country and the world safer and more secure." This situation is similar to what Alcibiades said while addressing the assembly in Athens about the passive policy of Nicias, which he believed should not be followed. Alcibiades emphasised the true character of Athens in the following statement: "My conviction is that a city not active by nature could not choose a quicker way to ruin itself than by suddenly adopting such a policy, and that the safest rule of life is to take one's character and institutions for better and for worse and to live up to them as closely one can."

President Donald Trump, during the same speech, tried to convince the American public that previous wars have been long; however, in the present war', in a matter of 32 days, US have been able to eviscerate Iran, which is no longer a threat to the world. He states, "This is a true investment in your children and your grandchildren's future. The whole world is watching, and they can't believe the power, strength and brilliance. The brilliance of the United States military. Tonight, every American can look forward to a day when we are finally free from the wickedness of Iranian aggression and the spectre of nuclear blackmail. Because of the actions we have taken, we are on the cusp of ending Iran's sinister threat to America, and when we do, when it's all over, the United States will be safer, stronger, more prosperous, and greater than it has ever been before." This statement can be related to Alcibiades' way of luring Athens into easy war (Sicilian Expedition), he cites that Sicilians are politically weak and divided and won't stand up to the might of Athens naval power. President Donald Trump, in his continuous rhetoric, has stated many times that the US has achieved its all-military objectives and, in a matter of time, we will exit the war. What both Alcibiades and Trump don't understand is the trap which has been set up by Syracuse (present-day Iran), which would be difficult to escape.

Figure 2. Cape Iapygium

Hermocrates in Syracuse proposed plans to counter Athens. This plan involved meeting Athens in the Cape of Iapygium (Fig 2.), which in modern-day parallels the Strait of Hormuz. His plans of blockading the cape by establishing a defensive base at Tarentum and creating a blockade in a way create a similar situation in the Strait of Hormuz. Iran's use of ballistic missiles to deter an enemy at the farthest distance is a continuation of a strategy long thought of in the Greek world. Although Hermocrates's plan was not accepted, the same stratagem was utilised in the battle which ensued in Great Harbour in Syracuse. The absence of NATO allies and the hesitancy of other nations not actively participating in the ongoing war is a similar scenario which happened with Athens when it set course for the Sicilian expedition. The Athenians were denied entry by most of the city-states primarily for two reasons, firstly, this was not the first time that Athens came to Sicily. In the previous Athenian expedition to Sicily, Hermocrates got all of Sicily together to make them understand that war would divide them and make them vulnerable to being subjugated by others (Athens), and secondly, all city-states understood the outcome of an inconclusive war and devastation, which was caused by internal war, fought earlier. In the present situation in West Asia, the countries are passively supporting the war without any active participation due to the same analogy; they have already seen the devastation caused by earlier wars in the region.

Iran has a civilisational history. It is fighting its battle on its own turf, which it masters. Iran keenly monitored the US's previous engagements in the region and developed efficient measures to counter the threat to its existence. It has followed Deng Xiaoping's policy, "Hide your strength, bide your time." It utilised the interwar period to train and build effective tactics to deter foreign aggression. The same analogy can be seen in the battles that were fought in Syracuse. After the initial offensive, when the Athenians retreated, the interwar period was utilised

to train the hoplites in efficient war-fighting skills and build a naval armada with critical capabilities to offset the advantage of the Athenians navy. They carefully chose the battle space in their favour, i.e. in Great Bay, to limit the major advantage of Athens, which was offensive manoeuvres. This draws a strong parallel to what Iran is doing in the Strait of Hormuz today.

Continuity-Factors

Overconfidence (Hubris)

The Peloponnesian Wars are replete with instances where this factor emboldened Athens and subsequently led to its demise. Whether it is the imposition of the Megarian Decree, the Melian Dialogues or the Sicilian Expedition. This factor is time-sensitive, as a single incident cannot be attributed as the reason for failure. A unique perspective is given by Dominic D.P. Jhonson in his book Strategic Instincts- The Adaptive Advantages of Cognitive Biases in International Politics, where he treats overconfidence as a positive illusion and a bias which has positive effects, but even he treats this topic with caution and states that, “A modest amount of overconfidence is adaptive. It evolved to become the norm in the population because it represents an advantageous strategic instinct. It may be that, in the modern world, overconfidence leads to failure more often than in the past, and only a few freakish outliers lead to success.” In the present scenario in West Asia, with the US under hubris, whether it will gain or decline is a matter of debate, which can be judged with time sensitivity. However, it leads to another factor: Imperial Overreach.

Imperial Overreach

The Sicilian expedition marked the beginning of a phase that signalled the decline of the Athenian empire. The expedition can be marked as an event which can be stated as an imperial overreach of Athens. Robert Gilpin states, “Expanding state at first increases its power and control over the system; the power of the state and the expansion of its control reinforce one another with the enhanced flow of resources into the coffers of the state. Eventually, countervailing forces come into play to slow down and finally arrest the expansion of the state.” He further states that these “Countervailing forces, as a state increases its control over an international system, it begins at some point to encounter both increasing costs of further expansion and diminishing returns from further expansion; that is to say, there are decreasing net benefits to be gained from further efforts to transform and control the international system. This change in the returns from expansion imposes a limit on the further expansion of a state.” The argument leads us to examine whether the US has attained the state that Robert Gilpin is trying to describe. Is this the Imperial Overreach of the US? The answer to this question lies only in future. We cannot predict the time when it’s going to happen, but we can only be sure that it will happen

***

Air Power

Born to Save, Pressed to Kill: How IAF Helicopters Became Tankbusters

Ms Smriti Singh Mahajan | 19 May 2026

Source: CAPSS | https://capssindia.org/born-to-save-pressed-to-kill-how-iaf-helicopters-became-tankbusters/

The Mi-4s flying in formation over Bangladeshl

Introduction

The history of helicopters began like a scene from an old war film—a bulbous, vulnerable craft hovering over a clearing, its rotors scattering dust and grass, a stretcher being pulled aboard as men dive for cover. In the early years, the helicopter was the gentle soul of the battlefield: fragile, vulnerable, expensive, and never meant to kill. Its purpose was mercy, its mission to save.

But history has a dark sense of irony. And on the chessboard of mid-20th-century South Asia, necessity wrote a new script. The machine that started as a rescuer of the wounded, and sometimes be hunted, would within a generation, learn to hunt and return- bristling with rocket pods and guided missiles— transformed by fire, fear, and necessity into one of war's most versatile predators— descending as combat machines, stalking tanks across the desert.

This is the story of that transformation—of how Sikorsky S-55s and Bell 47s, once known as "friends in distress," gave way to Alouette-IIIs (Chetaks) armed with anti-tank guided missiles and then to the ultimate war machines like HAL Prachand and Rudra; of the improvised Mi-4 gunships that struck back on battlefields; and of the birth of formal Anti-Tank Guided Missile (ATGM) units within the Indian Air Force. Across the world, others were learning the same hard lessons—in the jungles of Vietnam, the mountains of Algeria, and the deserts beyond. It is a tale of doctrine catching up to combat, of workshops and tireless engineers bending metal and weapons, and of the complex trade-offs in airframe, weight and survivability that turn a rescue craft into an instrument of attack.

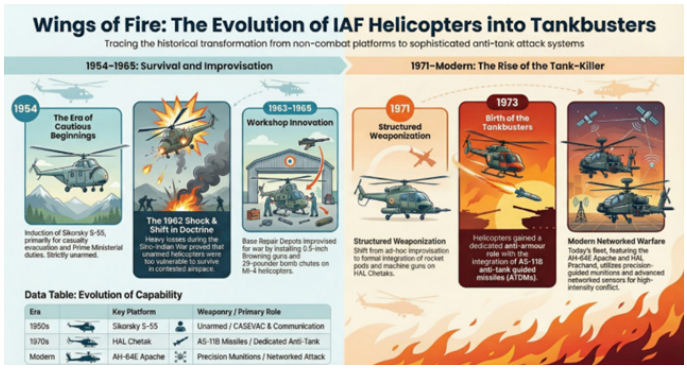


Figure 1. A brief glimpse of the IAF helicopters' evolutionary journey.

I. The Benign Beginnings (1949- 1961): "A Friend in Time of Distress"

When the Joint Planning Sub-Committee first assessed helicopters for the Indian Armed Forces in 1949, the verdict was cautious. Helicopters were mechanically complex and fragile in the eyes of planners, useful primarily for resupplying isolated posts, jungle and mountain rescue, delivering intelligence teams behind enemy lines, and reconnaissance and artillery observation. Their slow, low-level flight profile also made them vulnerable; deployment in forward areas required local air superiority. In short: utility, not combat.

The IAF's first dedicated rotary wing unit, raised in 1954 as 104 Helicopter Flight, operated Sikorsky S-55s and later Bell 47 G-3s. The unit's motto and reputation, "Aapatsu Mitram" (friend in time of distress), reflected its original mandate: casualty evacuation, logistics support, communication, and rescue. The Soviet Mi-4, inducted around 1960, expanded its lift capability and range, but it, too, operated as a workhorse in utility roles rather than as a strike aircraft.

The helicopter entered Indian service as a lifeline, literal and doctrinal, not as a predator. But that would change, and quickly.

II. The Shock That Changed Everything: 1962 and the Need to Fight Back

The decisive pivot from "rescue only" to "armed for survival" did not emerge from theory; it was forced by combat experience during the 1962 Sino-Indian War. In forward areas, helicopters- slow, low-flying, and unarmed- became easy targets. Even air ambulances marked with red crosses were fired upon, shattering any lingering assumptions about battlefield immunity.

Aircrews, unarmed and exposed, felt helpless. A lesson unravelled itself for them: survival could no longer depend on markings or mission type. It would require the ability to fight back.

In the years immediately following 1962, this realisation triggered not just a shift, but a profound institutional awakening within the Indian Air Force. What began as a question of survival: how an unarmed helicopter could endure in contested airspace, quickly grew into something far larger. The experiences of that war had exposed a fundamental flaw in existing assumptions: that helicopters could remain. non-offensive assets on a modern battlefield.

This was a turning point. And this set in motion a chain of innovations that would

ultimately transform the very character of the IAF's rotary-wing fleet…

The great wheels started churning not in headquarters, but in workshops. Across the IAF's network of Base Repair Depots (BRDs), engineers started experimenting with locally engineered solutions. Facilities such as No. 1 Base Repair Depot (Kanpur) - with its legacy of heavy maintenance and wartime salvage dating back to the Second World War- became centres of innovation.

III. 1965: The Birth of a Revolution

By 1965, this culture of improvisation had matured into operational capability. The Mil Mi-4, originally a utility transport, became the platform on which the IAF conducted its first experiments in helicopter armament.

Crucially, these modifications were not the product of a single location. Evidence points to a distributed engineering effort across major technical hubs. No. 1 Base Repair Depot, Kanpur, is widely credited with the successful integration of 0.5-inch Browning machine guns, repurposed from decommissioned B-24 Liberator aircraft - mounted in a belly-mounted gondola. Alongside this, engineers devised a bomb-release mechanism consisting of a chute with three vertical channels, allowing the release of up to nine 25-pound bombs in quick succession. Once the nine bombs were released, the chutes had to be manually reloaded for subsequent passes.

At the same time, unit-level accounts, particularly from No. 104 Helicopter Unit, also state that their helicopters were modified at Chandigarh for offensive roles.

Given that the Mil Mi-4 was available with factory-configured armament options, it is necessary to examine why the Indian Air Force opted for an unarmed transport variant and how this decision shaped the nature of subsequent indigenous modifications.

The answer lies in procurement philosophy and operational context. India inducted the Mi-4 as a pure transport platform, consciously omitting factory-fitted weaponisation packages, largely due to cost considerations and doctrinal assumptions about helicopter roles in the late 1950s. The Soviet Union, by contrast, had already begun conceptualising helicopters as integral battlefield assets, capable of transitioning from logistics to fire support within a unified design philosophy. What followed in India after 1962 was adaptive innovation under constraint. Where the Soviets engineered vertically integrated assault systems, Indian engineers improvised modular, locally fabricated solutions, repurposing legacy systems such as the B-24 Liberator. The result: a "semi-gunship" born out of necessity, decentralised engineering, and battlefield urgency.

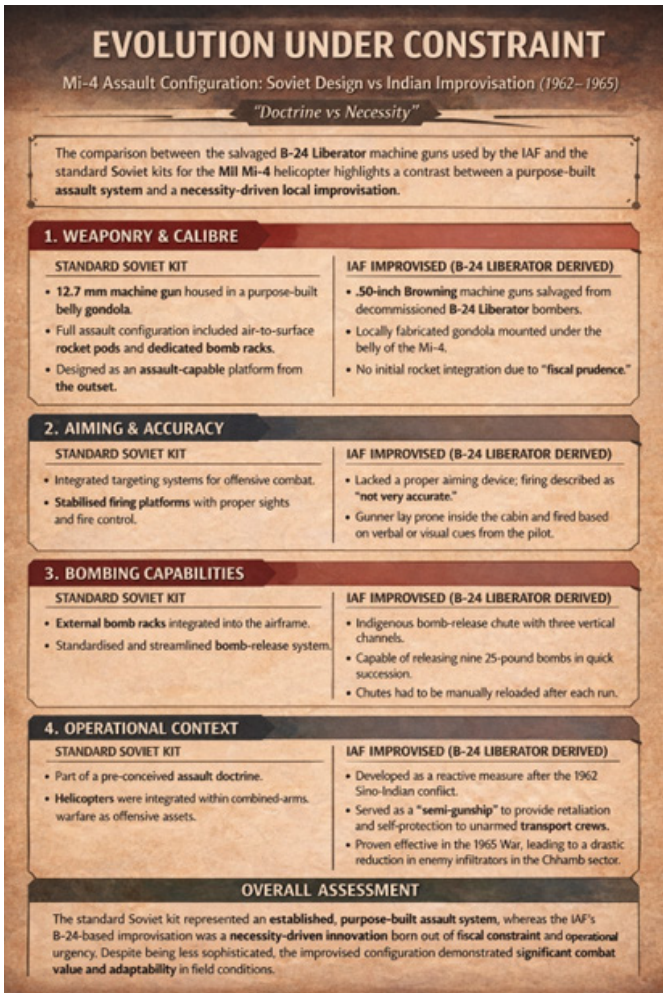


Figure 2. Table charting out the differences between the Soviet and the Indian Mi-4 armament structure.

Source 1: History of No. 104 HU. Air Force, "Brief History of 104 (H) SQN Formation and First Mission; Wing Commander BS Nijjar, Evolution of IAF Helicopters- I: Inception To 1971 Operations.

The resulting system was crude but effective. The machine gun, fixed under the belly, was fired forward by a gunner inside the cabin, often lying prone, on the pilot's command. There were no stabilised sights, no fire-control systems, and only rudimentary aiming. Accuracy was limited, and exposure to ground fire remained high, but for the first time, IAF helicopters possessed an offensive capability.

The First Test: War Comes to the Gunship

The true test of these improvised modifications came sooner than expected. In August 1965, as the Indo-Pak War of 1965 escalated, the Indian Air Force found itself confronting a new kind of threat: large-scale infiltration across the Western Front. In response, the IAF assembled a dedicated helicopter task force: drawing aircraft and crews from 107, 109, and 111 HU. Forward-based at Chandigarh, Jammu, and Srinagar, these units were tasked with something unprecedented: using modified Mil Mi-4s not just to support the battlefield, but to shape it… A significant tactical shift, turning previously passive transport assets into offensive "semi-gunships".

By August 5, the modified helicopters were operational. Within two weeks, on 20 August, they went into action over the Chhamb sector.

A New Way of Fighting: The Multi-Role Gunship

What followed was not a conventional air operation, but a new method of warfare.

Each helicopter sortie blurred the line between combat and support. A Mi-4 would lift off carrying supplies or ammunition for forward troops. En route to or in the vicinity of its destination, it would descend into an attack run, bombing and strafing suspected infiltrator positions or movement routes (using its rudimentary weapons: the belly-mounted 0.5-inch Browning machine gun

and the improvised chute that released the 25-pounder bombs) . There were no targeting systems, no stabilised sights, only coordination between pilot and gunner, and the willingness to fly low and exposed.

After the attack, the same helicopter would land, often in makeshift clearings barely the size of its rotor span, deliver its supplies, load casualties, and lift out again. Additionally, documents such as the official historical record of 107 HU (compiled under HQ, SWAC) detail the additional tasks the units were executing, including facilitating VIP movements, recce, counter-insurgency ops, and troop induction.

In a single mission, the helicopters had become transport, ambulance and gunship.

Across the campaign, from 20 August until the end of the war, these modified Mi-4 'semi-gunships' carried out 79 offensive sorties in the Chhamb-Jaurian sector, specifically targeting infiltrators with bombing and strafing runs.

Yet, these offensive missions were only one part of a much larger operational picture. Records from No. 109 Helicopter Unit illustrate this vividly: the unit alone flew a total of 225 sorties across all assigned roles during the war (including bombing, strafing, CASEVAC, and supply drops). The IAF helicopters had now evolved into a flexible, multi-role instrument of war.

Measured purely in terms of firepower, the results were modest. Small bombs and machine-gun bursts inflicted limited physical damage. But the psychological and tactical effects were disproportionate. For infiltrators moving across difficult terrain, the sudden appearance of armed helicopters, machines previously associated with evacuation and logistics, introduced immediate disruption and fear. Movements slowed. Routes were abandoned. Reports indicate a marked reduction in infiltration activity in areas where these missions were conducted.

For the IAF, the lesson was even more significant: helicopters could survive in contested airspace and fight.

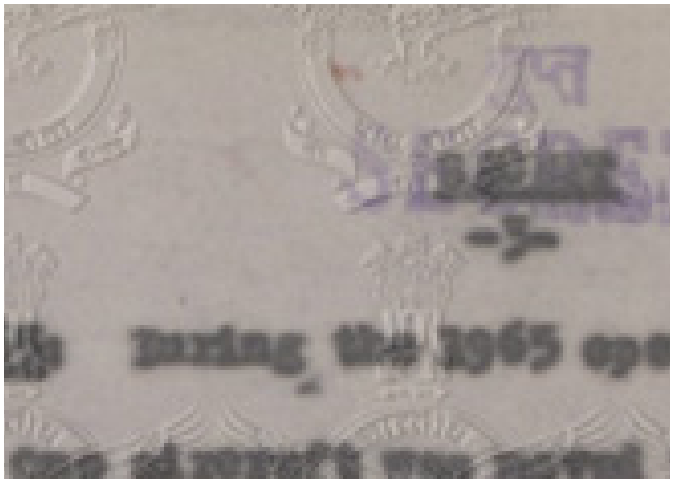


Figure 3. 107 HU's ORB stating how the unit "came out with flying colours in its operations against infiltrators."

Source: History of No. 107 HU, AIR FORCE.

This was, by contemporary IAF testimony and reporting, unique: "never before or since then have helicopters of this class been used in this role in the IAF"- a high-risk, high-ingenuity improvisation that forced planners to reckon with new capabilities and vulnerabilities.

However, these operations were not without leadership and courage. Aircrew flew repeated missions under fire, navigating without modern aids, coordinating attacks by instinct and experience. Squadron Leader B. Johnson of 104 HU, who led from the front during this period, was awarded the Vayu Sena Medal for his “incessant efforts.” In 109 HU, Warrant Officer Sansar Singh became the first from his unit to receive the same honour.

In the final assessment, these missions stood apart. They achieved something far greater than their immediate tactical objectives. A foundation was laid here. In 1965, over the dust and heat of Chhamb, a handful of modified machines and determined crews rewrote the role of the helicopter in the future of Indian air power.

IV. The 1970s: From Makeshift to Missiles- Chetaks, Rockets and the First Attack Units

The improvised approach of 1965 demonstrated two things: helicopters could be weaponised, and improvisation was painfully limited. The next step was systematic adaptation- converting light utility helicopters into anti-armour platforms and training whole units in their employment.

1971: Chetaks with Guns and Rockets

By 1971, the IAF’s Aérospatiale Alouette III (locally called Chetak) had become a common light utility helicopter. BRD workshops modified at least one Chetak by fitting a twin-barrel machine gun and rocket pods capable of firing a volley of rockets (reports say seven rockets arranged for paired or salvo firing), an attempt at a compact self-contained striking unit that could operate at night. This was an important precursor to the formal anti-tank mission: the Chetak proved adaptable, small, and agile enough to carry weapons that made a tactical difference.

1973- 1977: The Tankbusters and the Formal ATGM Role

The success of improvised gunships in 1965 and their continued utility into 1971 had already demonstrated that helicopters could survive and influence combat. But by the early 1970s, the IAF recognised another clear tactical requirement: a highly mobile, responsive platform capable of neutralising enemy armour within the Tactical Battle Area (TBA). Fixed-wing aircraft were fast but less flexible; ground forces were powerful but constrained by terrain.

The helicopter offered something different: precision, mobility, and persistence.

And so, 116 HU was chosen to pioneer this role. With that decision, helicopters were no longer an adjunct to combat; they had become part of the fighting arm.

116 Helicopter Unit

If 1965 proved that helicopters could

fight, the transformation of 116 HU in the 1970s proved that they could be designed to hunt.

Formed on 27 July 1967 at Air Force Station Sarsawa, 116 HU began its life like most helicopter units of the era- rooted in support roles. Known then as the 'Whirly Wizards', it operated the Mi-4 on tasks such as communications, liaison, and casualty evacuation. There was little to distinguish it doctrinally from other units still shaped by the pre-1962 mindset. That would change, decisively.

In December 1973, the unit underwent a transformation that marked one of the most significant inflexion points in the history of rotary-wing aviation in the Indian Air Force. It was re-equipped with the HAL Chetak and, more importantly, assigned a specialised anti-tank role.

In place of the 'Whirly Wizards' emerged 'The Tankbusters'. A name that reflected a new operational purpose and a new kind of confidence in what helicopters could achieve. It was the first IAF unit adapted specifically to fire anti-tank guided missiles from helicopters.

The shift to an anti-armour role was made possible through a carefully engineered integration of guided weaponry onto a light helicopter platform. And for the first time, an IAF helicopter could:

(a) Stand off from enemy armour
(b) Track and guide a precision weapon
(c) Deliver a lethal strike without closing into direct fire

At the heart of this transformation was the AS-11 missile (SS-11), a wire-guided, command-to-line-of-sight anti-tank missile.

104 Helicopter Unit

In 1977, 104 HU, the oldest IAF helicopter unit, was also re-designated as an ATGM unit. Its Chetaks were modified to carry (the same) four AS-11B (air-launched SS.11/AS.11 family) wire-command guided missiles, providing an effective anti-tank reach of about 3,000 metres.

The AS.11/SS.11 story is worth pausing over. The SS.11 family, developed by France's Nord Aviation in the 1950s, was one of the earliest widely adopted wire-guided anti-tank missiles. The air-launched AS.11 (sometimes referred to in Indian service variants as AS-11B) came with an air-stable sighting system that made it practical to launch from a helicopter in forward battle conditions; its effective range extended to the order of 3 km, and early warhead variants could penetrate several hundred millimetres of rolled homogeneous armour, sufficient against many Cold War tanks of the era. The family's adaptability had earlier produced French helicopter-fired ATGM operations in Algeria in the late 1950s and early 1960s- a global precedent India could observe.

But the technology alone was not enough. Pilots underwent intensive training,

including dummy and live missile firing, to master guidance techniques, engagement profiles, and battlefield coordination. The units participated in joint Army-Air Force exercises to master tactics for employing these weapons . A new set of tactics was written from scratch because nothing like this had existed in the IAF before.

Other Armament Trials: 119 HU and Display Ranges

Besides those unit conversions, other IAF helicopter units carried out armament trials through the 1970s, experimenting with 57 mm rockets and 75 kg bombs, and integrating rocket and bomb drops into live-fire practices and demonstration events (the IAF's long-running Fire Power Demonstrations at Tilpat and other ranges were venues where aircraft- fixed and rotary-practised and exhibited armament techniques). The broad pattern of trials, demonstrations and field conversions across units in the 1970s drove doctrine toward formal ATGM wings and greater integration with Army tactics.

V. A Helicopter Becomes a Gunship: Decoding the Changes

You can draw the lineage from a Chetak carrying a handful of rockets to a dedicated attack helicopter like the AH-1 Cobra or a modern Rudra, but the engineering trade-offs are stark and unavoidable. Mounting weapons, pylons or missile rails on a helicopter is not a trivial "bolt-on": it changes the aircraft's structure, aerodynamics, flight envelope and survivability.

Airframe and structural work: Hardpoints and rails require reinforced structure where the pylons attach; dynamic loads from rockets and missiles create stress concentrations that utility airframes were not originally designed to handle. Base repair depots that performed early conversions would necessarily evaluate local attachment points, strengthen skin and substructure, and ensure the rotor/drive train would not be overstressed by asymmetric loads. Kanpur's BRDs, historically the IAF's major overhaul and repair hubs, were where such modifications were planned and executed.

Weight, Balance and Flight Performance

External pylons increase drag and reduce maximum speed, range and endurance. Payload limits become binding. Adding missile rails and ammunition reduces fuel and troop or casualty capacity and can lower the service ceiling. Pilots and engineers must recompute centre-of-gravity envelopes; an out-of-limits CG can make the helicopter harder to control, particularly at low speed and during hover, when weapons employment is often required. Engineering literature and patents on payload/pylon effects generally show these performance impacts.

Avionics and Sights

A major practical step from improvised guns to guided missiles is the need for

stabilised sighting systems. The AS.11 (air variant of SS.11) included a sighting/ stabilisation solution enabling a moving helicopter to track a target while guiding the missile along a wire- a huge leap in practical usability compared with an improvised belly gun without proper aiming gear. In short, going from guns to guided missiles requires fire control, sight stabilisation and crew training.

Survivability Modifications

Utility helicopters were notoriously vulnerable to small-arms fire. The US Army and others quickly produced survivability guides in the 1960s–70s that recommended local armour for crew stations, redundancies for critical systems, self-sealing fuel tanks, and tactics that reduced exposure. Many of these lessons are generalisable and would have informed any effort to turn IAF helicopters from evacuation machines into strike platforms- even if the IAF's early conversions were necessarily minimalistic.

Taken together, weaponising a helicopter is a cascade of changes: from reinforced structure and degraded flight performance to new avionics and a direct need to improve crew protection. Those are engineering realities, not doctrinal choices, and they explain why purpose-designed attack helicopters (or thoroughly rebuilt utility platforms) eventually became the logical endpoint of the ad-hoc path that began in the 1960s.

VI. Global Parallels: India's Path Followed a Pattern

What happened in India mirrored global lessons. Two parallel strands stand out:

(a) **France and the SS.11/AS.11 Experiments:** French forces experimented with the SS.11 and AS.11 on light Alouette helicopters and small fixed-wing types in the Algerian conflict in the late 1950s and early 1960s- arguably the first use of a guided anti-tank missile fired from aircraft. Those experiments demonstrated the feasibility of mounting relatively heavy anti-tank firepower on light airframes and provided early engineering solutions (sighting stabilisation, wire guidance) that later users adopted. The AS.11 family's very existence as an air-launched variant was an early template India could study.

(b) **The US Experience:** Huey gunships to the AH-1 Cobra: In Vietnam, the UH-1 "Huey" started as a utility ship that rapidly acquired guns and rocket pods as field improvisations (door gunners, gun-pods and rocket racks) to support ground troops. That combat improvisation drove the development of a dedicated attack helicopter, the Bell AH-1 Cobra (first flown 1965; in service 1967), a narrower fuselage, tandem crew, stub wings for ordnance and a purpose-designed gun turret- the archetype of the modern attack helicopter. The Cobra's development shows the evolutionary path from field-modified utility helicopters to purpose-built attack platforms.

(c) **Soviet Developments:** The Soviet Union moved in parallel by adapting transport and assault helicopters with weapons and by eventually fielding purpose-built types (e.g., later the Mi-24 Hind family). The global trend was clear by the late 1960s–1970s: combat conditions had shown both the need for helicopter fire support and the limitations of merely bolting weapons onto utility frames.

India's story fit into these global contours: early observation and transport roles to field improvisation under fire, to systematic conversions and training, to eventual adoption of missile-armed tactics and later acquisition/development relevant to purpose-built attack rotorcraft.

VII. The Human Element: Workshops, Pilots and the Doctrine Catching Up

Two groups deserve the credit line in any honest account: the technicians who turned theory into hardware and the pilots who trained until the near-impossible became routine.

The IAF's Base Repair Depots, Kanpur among them, were the sites where real modifications happened: adapting bomb chutes, fabricating mounts, and testing gun pods under operational pressure… The gritty work of skilled maintainers and engineers solving real battlefield problems with what they had.

On the flying side, pilots of early ATGM units, such as 104 HU, trained for months with both dummy and live firings to master the new weapons and the tactics of Army-Air cooperation. The learning curve was steep: missile guidance in a moving, vibrating platform; coordinating with ground forwards; and shaping manoeuvres to expose tanks while minimising vulnerability. The creation of unit identities- the Tankbusters, the Desert Hawks- shows a doctrinal as well as cultural metamorphosis inside IAF squadrons.

VIII. Where the 1970s Left Off. And What Followed

What began as improvisation under fire did not remain improvisation for long. The lessons of 1962 forced a reckoning; the experiments of 1965 revealed a possibility; and the structured developments of the 1970s turned that possibility into doctrine.

By the end of that decade, the Indian Air Force had crossed a decisive threshold. The helicopters were no longer merely a lifeline to the battlefield; they had become a participant in it… Precision platforms that could reach out three kilometres and threaten enemy armour from unexpected axes.

Figure 4. IAF helicopters- transforming from benign to attack roles.

But the deeper story is not about machines. It is about a shift in thinking.

What emerged from those years was a profound realisation: that vulnerability could be engineered out, survivability could be designed in, and that even the most unlikely platform could be reshaped into a weapon system through necessity and ingenuity.

Today, that lineage is visible in indigenous platforms such as the HAL Prachand, India's first purpose-built combat helicopter, designed for high-altitude warfare and capable of anti-armour and multi-role strike missions, and in the weaponised HAL Rudra, where sensors, guns, rockets and guided missiles are fully integrated into a single combat system. The ongoing integration of indigenous systems such as the HELINA anti-tank guided missiles further underscores how far that journey has progressed.

From the workshops of Kanpur and Chandigarh, to crude gun mounts and hand-released bombs, to pilots flying low over Chhamb, discovering in real time what their aircraft could become, the helicopter in the Indian Air Force was not designed to be a predator.

It was compelled to become one.

And in that compulsion, in that adaptation, lies one of the most consequential and least acknowledged revolutions in Indian air power.

***

Why Bangladesh could Raise Indian Red Flags by Buying a China-Pakistan Fighter Jet

Seong Hyeon Choi | 24 May 2026

Source: SCMP | https://www.scmp.com/news/china/military/article/3354643/why-bangladesh-could-raise-indian-red-flags-buying-china-pakistan-fighter-jet?module=top_story&pgtype=homepage

Bangladesh's acquisition of a simulator for the JF-17 Thunder signals "serious intent to field modern fighters", an observer says. Photo: Handout

Bangladesh's potential purchase of a Sino-Pakistani fighter jet could raise tensions in India's sensitive northeast, as relations between Dhaka and New Delhi remain tense, analysts said.

According to Pakistani media reports, the country has transferred a fully operational simulator of a JF-17 Thunder Block III combat aircraft to Bangladesh.

Fighter jet simulators replicate the experience of flying an aircraft and are used to train pilots in combat tactics and systems management.

Jointly developed by the Pakistan Aeronautical Complex and Chengdu Aircraft Corporation, the fighter is one of the main combat aircraft operated by the Pakistan Air Force and has also been exported to Azerbaijan, Myanmar and Nigeria.

Pakistan's reported transfer of the simulator follows a meeting between the two countries' air force chiefs in Islamabad in January which included "detailed discussions" on potential procurement of the jet, according to the Pakistani military.

If confirmed, the purchase would boost Dhaka's air combat capabilities, replacing its ageing Russian-made MiG-29s and Chinese-made F-7s, also known as J-7s.

Jagannath Panda, head of the Stockholm Centre for South Asian and Indo-Pacific Affairs at the Institute for Security and Development Policy in Sweden, said that the simulator transfer was a signal of a "possible acquisition".

"For Bangladesh, the JF-17 Block III would offer a relatively affordable multi-role platform with beyond-visual-range missile potential, modern avionics and Chinese-Pakistani support infrastructure," Panda said.

"It would not make Bangladesh an air-power peer of India, but it could strengthen Dhaka's deterrence."

Liselotte Odgaard, a senior fellow at the Hudson Institute in Washington, said the

transfer of the simulator marked a "critical enabling step" towards a major capability upgrade, and signalled "serious intent to field modern fighters".

"Militarily, simulators are typically deployed only when acquisition is likely or imminent because they form part of pilot conversion pipelines and doctrine integration," Odgaard said.

"Strategically, Bangladesh appears to be preparing for a generational capability jump."

Despite the war that led to Bangladesh's secession from Pakistan in 1971, relations between the two countries have eased since protests forced Bangladeshi prime minister Sheikh Hasina out of office in 2024, after 15 years in power.

However, Bangladesh's relations with India have been strained since Delhi refused the new government's demand to extradite Hasina, who sought refuge in India and was given a death sentence in absentia.

India has reinforced its military presence near Bangladesh, particularly around the geopolitically sensitive Siliguri Corridor.

Also known as the "Chicken's Neck", the Siliguri Corridor is a narrow strip of land bordering Bangladesh and Nepal, which links India to its seven northeastern states.

In November, the Indian Army set up three new military garrisons to bolster surveillance and combat readiness around the Siliguri Corridor, following its deployment of the Russian S-400 air defence system and a squadron of French-made Rafale fighter jets near the area in April last year.

Odgaard said Delhi's "comfort margin" around the corridor would be reduced, and mutual threat perception would increase, but direct conflict between India and Bangladesh was unlikely as the JF-17 would "not overturn the military balance or enable decisive force projection into India".

"India already operates advanced fighters from multiple bases, and it is expanding its forward infrastructure and fighter-capable bases for rapid deployment. India has enjoyed clear air superiority over Bangladesh, but the JF-17 Block III would narrow that gap," Odgaard said.

"Therefore, India may increase air surveillance and readiness in the east, accelerate modernisation and deployments, and integrate the eastern theatre more tightly into two-front planning vis-a-vis China and Pakistan, with Bangladesh in a potential role. Improved Bangladesh-Pakistan defence ties add strategic suspicion in India."

Panda said purchases of JF-17s by Bangladesh would add a "military layer" to an "already politically sensitive relationship", with India likely reading it not only as Bangladesh's modernisation, but also as a "Pakistan-China-linked platform entering its eastern security environment".

He said that while Bangladesh's acquisition should not be "overread" as preparation for confrontation, even limited modernisation could prompt Indian counter-deployments, tighter surveillance and more rigorous threat assessments.

"In a hypothetical India-Bangladesh military crisis, the JF-17 would likely serve three roles: air defence, limited strike and coercive signalling. Its most important value would be to complicate Indian air planning rather than defeat the Indian Air Force," Panda said.

He added that the JF-17 would have "psychological and operational" relevance in the Siliguri Corridor, but any move by Bangladesh in the area would be "extraordinarily escalatory and would invite an overwhelming Indian military response".

"The India-Bangladesh relationship is likely to remain tense but not necessarily militarised … The more realistic risk is a cycle of suspicion: defence deals with Pakistan or China, Indian force posture adjustments, nationalist rhetoric and border incidents. The danger is not planned war but miscalculation," he said.

However, Michael Kugelman, senior South Asia fellow at the Washington-based Atlantic Council, said the new government in Dhaka would likely take "cautious steps" to "patch up ties" with Delhi.

"The trajectory for India-Bangladesh relations is much more positive now than it was during the period of the interim government that preceded the recently elected Tarique Rahman administration."

"I think that there is a genuine desire to better balance Dhaka's relations with its key neighbours, and that will entail trying to better balance its relations with India, Pakistan and China, and that will entail patching up ties with India," he said.

***

IAF Crippled Pakistan, Iran Devastated Gulf Airbases: The Hard Lessons on Surviving Drone & Cruise Missile Attacks

Air Marshal Anil Chopra (Retd) | 24 May 2026

Source: Eurasian Times | https://www.eurasiantimes.com/iaf-crippled-pakistan-iran-devastated-gulf-airbases-the-hard-lessons-on-surviving-drone-cruise-missile-attacks-oped/

File Image: A fighter jet takes off from a highway in southern Taiwan. (Image: CNA)

The Indian Air Force (IAF) conducted precision strikes against 11 Pakistani airbases, including Nur Khan (Chaklala), Rafiqui, and Sargodha, and damaged runways, hit command-and-control centers, and destroyed technical and operational infrastructure. The farthest being around 200 kilometers from the border. Nearly 10 Pakistan Air Force (PAF) airbases are less than 100 kilometers from the border or Line of Control (LoC).

More recently (April/May 2026), high-impact airbase strikes took place in the Middle East where Iran targeted multiple US military bases, hitting over 100 US-based targets across Qatar, Kuwait, Bahrain, the UAE, and Saudi Arabia. A significant strike at Prince Sultan Air Base in Saudi Arabia reportedly damaged a US E-3 Sentry AWACS aircraft. These retaliatory strikes followed a joint US-Israel operation against Iran.

Both Ukraine and Russia targeted each other's airbases using cruise missiles and drones with great impact. Airbase strikes are causing extensive, high-cost damage and forcing operational changes in regional military structures.

History of Airbase Strikes

Airbase strikes, aimed at destroying aircraft, infrastructure, and operational capacity, have been pivotal in military history, evolving from World War I raids to precision missile strikes in the 21st century.

Airbase strikes in World War I were a significant evolution in aerial warfare, marking a shift from early reconnaissance to strategic efforts to destroy enemy aircraft and airships on the ground. The first large-scale air raids began with German Zeppelin dirigibles bombing London. British air raids targeted both Zeppelin sheds, which were crucial for long-range bombing, and forward airfield infrastructure.

Strategic bombing targets throughout 1916–1918, often aimed at industrial sites, while significant effort was also directed towards coastal aerodromes. German counter-raids targeted British airfields in France and England as part of their broader

strategic bombing campaigns.

All this led to the development of specialized bombers and long-range strike aircraft. These raids led to improvements in airfield defenses, including anti-aircraft guns, and to the development of organized, coordinated, and sometimes independent air forces to protect home territory and attack enemy bases.

Airbase strikes were a decisive strategy in WWII, aimed at achieving air supremacy by destroying aircraft on the ground, damaging infrastructure, and neutralizing air defense. During the Battle of Britain (1940), the Luftwaffe targeted RAF airfields in southern England. Major campaigns included the 1941 German invasion of the Soviet Union, the Japanese attack on Pearl Harbor, and Allied raids to destroy the Luftwaffe's capacities before D-Day.

But airfields were notoriously hard to keep out of commission for long; engineers could repair runways, and planes were often replaced.

Some of the most successful strikes were the H-3 Air Base Strike (1981) during the Iran–Iraq War. Iran launched a daring, long-range surprise attack, destroying at least 48 Iraqi aircraft while losing none of their own. Operation Focus (1967), Israel's opening move in the Six-Day War, destroyed the Egyptian Air Force on the ground within hours, securing air superiority.

Typical Targets on an Airbase

Military airbases are complex installations designed to support aviation operations and are composed of several critical infrastructure components. Runways and taxiways, aircraft tarmacs, Hardened Aircraft Shelters (HAS), and hangars housing aircraft for maintenance. Flight Line is the operational area where aircraft are prepared for flight, fuelled, and armed. Logistics and support areas such as fuel storage facilities, munitions storage areas.

Maintenance workshops. Command and Communications, including Air Traffic Control (ATC) Tower. Operational facilities that coordinate mission planning, communications, and base-wide logistics. Radar and sensor arrays for monitoring of the surrounding airspace. Modern airbases employ advanced systems, including the S-400 and Akash, to intercept incoming missiles and aircraft. Administrative and residential areas.

The design of an airbase prioritizes the protection of these assets through strategic placement and hardened construction to ensure operational continuity.

Vulnerabilities to Airbases

To begin with, satellite-based ISR allows clear mapping of all facilities at an airbase with very accurate coordinates.

Secondly, it is impossible to put everything under a hardened shelter. Airbases are therefore highly vulnerable

to air attacks, particularly from precision-guided munitions, drones, and cruise missiles, which target parked aircraft, runways, and fuelling infrastructure to neutralize airpower.

Key vulnerabilities include the inability to fully protect critical infrastructure such as runways, dependence on fixed locations, and susceptibility to both high-tech precision strikes and low-cost swarm-drone attacks. Parked aircraft are most vulnerable. Runways are difficult to protect and can be quickly disabled, albeit temporarily, halting all operations. Technical infrastructure, electronic repair bays, radar, and electronic warfare repair centers are important operational targets.

Historically, roughly 75% of past airbase attacks utilized standoff weapons to destroy aircraft. The proliferation of long-range ballistic and cruise missiles and drones means bases can be attacked from vast distances, bypassing traditional perimeters. Sabotage by individuals with base access is another threat. Swarming or kamikaze drones can overwhelm base defenses.

Terrorist attacks and unexpected ground assaults can complement air strikes to destroy aircraft. Attacks targeting fuel storage and ammunition depots significantly restrict continued operations.

Defence from Airbase Attack

Passive air defense means include camouflage nets (visual/IR spectrum). Rapid Runway Repairs (RRR) are performed by specialized teams to quickly repair damage to landing surfaces. Utilizing fortified hardened shelters protects aircraft. Advanced surveillance technology helps detect drones and intrusions early. Aircraft and Ground-Based Air Defense (GBAD) deployed locally to intercept incoming missiles and drones.

Risks Closer Vs. Farther Airbases

Choosing between closer and farther airbases involves balancing rapid response capabilities against survivability. Modern, accurate, and long-range weapons have significantly increased the risks to forward-deployed (closer) airbases, while advances in range and refueling make distant bases more viable, albeit with reduced mission rates. Aircraft and operations at forward bases can be monitored and attacked immediately upon take-off. Closer bases face higher risks from behind-the-lines sabotage, Special Forces, and drone attacks. Short-range threats afford defenders less time to respond.

Longer distances increase flight times, significantly reducing the number of missions that aircraft can generate per day. Operating from farther bases may require aerial refueling and logistical support (e.g., tankers) to sustain combat power.

On the other hand, distance does not make them impervious to long-

range strike weapons. Relying on far-off bases, particularly in foreign nations, poses geopolitical challenges, including permission for use or for overflights.

Closer airbases are highly efficient but risky; far bases are survivable but less efficient. Mid-distance airbases around 100 kilometers or beyond are perhaps desirable. To counter risks, military forces are investing in hardening airfields, improving missile defense systems (such as the S-400), and developing faster runway repair methods to maintain operational capacity. Overall, modern warfare demands a hybrid approach, using hardened forward locations for swift action while relying on deeper bases for long-term sustainability.

Agile Air Operations Concept

The ability to project power cannot be compromised. Major air forces of the world, especially those that have to plan for out-of-area contingencies, have thus begun to develop a new concept in which self-contained mobile air force units are created and will use specially designed highway stretches as operating surfaces. Such a concept has existed in the IAF mainly to take over an enemy or disused airfields during contingencies.

Highways exist in most major countries, including India. A forward arming and refueling point (FARP), or forward area refueling point, is a NATO term for an area where aircraft (typically helicopters) can be refueled and rearmed closer to their area of operations than to their main operating base. This was also used for Harrier vertical Take-off jet operations. The concept on a bigger scale is now being applied to fighter operations.

Agile Combat Employment (ACE) is a proactive approach to air power projection at short notice. The concept requires identification of road/highway stretches that have been prepared for possible air operations. These stretches are duly marked for air operations. There are no access roads crossing these stretches. Small aircraft parking and servicing aprons are created at either or both ends. Such aprons would be suitably camouflaged and may be set in forest-like surroundings.

The Command and Control (C2) will be through minimal secure satellite mobile communications. Each launch pad will have man-portable AD systems. It will have a counter-drone capability.

A mobile servicing cum replenishing unit is especially designed for the purpose. This includes vehicles for Fuel, Oils, and Lubricants (FOL), as well as dedicated armament-carrying and loading vehicles.

Normally, their requirement will be to only service around four aircraft at a time. There will be a universal power generation unit for both lighting and powering the aircraft. The storage and replenishment point for these vehicles could be a ubiquitous warehouse in the

neighborhood.

It will require minimal manpower. In the event of a major technical problem on the aircraft, the modern fault diagnostic system will transmit information to the major repair base, which could be a few hundred kilometers away. A crack team of specialists would be heli-lifted for further repairs.

Modern fifth-generation aircraft that require conformal carriage would have limitations on the quantum of on-board fuel. They would invariably require aerial refueling. With very long-range aerial missiles, the Flight Refueling Aircraft (FRA) will be forced to maintain a greater distance from the frontline. The ACE concept will be advantageous in that context, too.

Leveraging local commercial markets can alleviate stress on the distribution system. It can thus be seen that the infrastructure requirement is minimal. A cluster of launch pads or contingency locations can be fed by a central logistics and maintenance support center, like a hub-and-spoke setup. Such launch and recovery pads can be built in larger numbers, often at short notice. ACE offers great flexibility. ACE will work well, especially since in a contested environment, air superiority may not be easy to achieve.

Complicate Enemy Targeting

The ACE will certainly complicate the enemy's targeting process and create operational dilemmas for the adversary. The system will be highly mobile. After forward objectives are achieved, the launch pad can be deactivated. In case of advancing forces, fresh pads can be created ahead. All launch pad relocations will be proactive maneuvers that alter adversaries' or enemies' understanding of friendly intentions and capabilities. It will be an aggressive use of mobility and dispersion of forces and assets.

ACE positions the observe, orient, decide, and act (OODA) loop for all domains. It will increase survivability and support reposition forces for follow-on operations. It will also complicate the adversary's Anti-access and area-denial capabilities. It will create a dilemma and complicate the adversary's operational response and tempo. This will make targeting by adversaries much more complex and put a premium on timely intelligence.

India's Highway Operational Landing Strips

All the new expressways being built in the country have 3-kilometer-or-longer straight stretches for IAF aircraft to operate. The stretches have approach paths clear from obstacles as per specifications. The stretches have runway markings exactly as they are at IAF airfields. The side berms have been kept clear of obstructions. The highway pole lights have been replaced with ground-mounted lighting to support aircraft

operations.

At the ends of these highway-runway stretches is a larger area where aircraft can turn around. Securing these strips and the IAF assets is being managed by the IAF in close coordination with civil police or even paramilitary agencies. The IAF has been conducting landings and takeoffs on most of these stretches.

Such highway strips are created for use in emergencies and wartime situations, which may render air force bases inaccessible due to bombing or other calamities such as earthquakes, as happened in Bhuj in January 2001. The Indian government has recognized the operational importance of these strips and is now accelerating efforts to build many more. Various government departments could now explore the possibility of greater civil use during calamities.

As of date, India has 44 operational expressways. Most expressways are fit for fighter jet operations. The expressways connecting Jammu and Kashmir, Punjab, Haryana, U.P., Bihar, West Bengal, the northeastern states, Rajasthan, and Gujarat have immediate operational significance due to proximity to borders.

To Summarise

Forward airbases continue to remain relevant in 2026, but their role has shifted from safe, permanent power-projection platforms to highly vulnerable, contested, and fluid operational hubs. While long-range stand-off weapons allow for strikes from a distance, forward bases are essential for sustaining high-tempo operations, providing intelligence, and enabling close air support.

The consensus among military planners indicates that rather than becoming obsolete, forward bases must be adapted to survive in an era of precision-guided munitions (PGMs). Despite the vulnerability, forward bases offer advantages that long-range, rear-based assets cannot fully replicate.

Proximity enables faster turnaround times and more frequent sorties than distant bases, which require longer transit times and extensive aerial refueling.

Forward locations are essential for quick-reaction alerts, intercepting incoming cruise missiles, and protecting regional airspace. Forward bases enable forces to operate within enemy anti-access/area-denial (A2/AD) envelopes, which is crucial for strategy-of-denial scenarios.

They support local surveillance, forward-deployed “sensors and shooters,” unmanned aerial systems (UAS) operations, and ISR networks that feed high-fidelity data into multi-domain, networked kill webs. Vulnerabilities in the age of Long-Range weapons of modern warfare have to be handled.

Long-range precision weapons render geographical distance less protective, placing logistical infrastructure at risk.

Defending against sophisticated missile threats is expensive and demands a mix of active defenses and passive resilience.

Basing doctrine is evolving quickly. To remain relevant, air forces are adopting new strategies to ensure that forward bases remain functional "under fire." Dispersal and mobility are the buzzwords.

Moving away from reliance on one or two large bases toward distributing aircraft among many small, austere, and flexible operating sites. Forward bases are being integrated with rapid, expeditionary techniques for operating from temporary "non-traditional" surfaces. The concept of ACE operations must be put in place and deployed regularly.

Installing hardened shelters, developing rapid runway repair capabilities, using decoys, and creating underground infrastructure are important. Airbases in the sub-continent, like Pathankot, Lahore, Nyoma, and Amritsar, are very close to the border and well within artillery shelling range. But so is the Chinese Lhunze Airbase (Tibet), located approximately 40 km from the LAC, which has 36 hardened aircraft shelters for fighters and drones. Nyingchi Mainling Airport (Tibet) is located about 15 km from the border and serves as a key dual-use military node with rapid transit access for forces and nearby garrisons.

Large strategic assets such as AEW&C and FRA must be kept at airbases beyond 400 kilometers, and only selectively brought forward. Major fighter airbases must be at least 100 kilometers apart. Helicopters must be moved to FARPs or dispersed in hidden, camouflaged places.

Drones' bases can be as forward as possible. Air Defense must be mobile and move fairly forward. Hardened shelters are a must. Aside from antennas, most radar assets must be moved underground or into hardened shelters.

Forward airbases are no longer "fortresses" but high-risk, high-reward assets. In 2026, they are crucial for providing rapid, persistent combat power that stand-off weapons cannot fully achieve alone, but they must be designed to survive in a highly contested, long-range weapon environment.

***

Space

Growing Threats to Dual-use Critical Information Communication Technology (ICT) Infrastructure in Contemporary Wars

Ms Gowri R | 04 May 2026

Source: CAPSS | https://capssindia.org/growing-threats-to-dual-use-critical-information-communication-technology-ict-infrastructure-in-contemporary-wars/

Created by the Author using AI

Introduction

Contemporary warfare increasingly relies on non kinetic means such as cyber intrusions, exploitation of vulnerabilities, zero day attacks, and supply chain compromises. State and non state actors often use Artificial Intelligence (AI) generated images, videos and text to manipulate public opinion and wage information warfare. The 2026 war in West Asia involving Israel, the United States (US) and Iran has escalated beyond a significant threshold by targeting the critical ICT (Information Communication Technology) infrastructure, including data centres, to impose strategic and operational costs. This article analyses the effects of kinetic operations against critical dual-use ICT infrastructure, particularly data centres, which are the backbone of non-kinetic operations. Further, it focuses on the growing threats of targeting dual-use infrastructure with pervasive dependence on emerging technologies in contemporary armed conflicts. Thereby, this article examines the implications for India's digital battlespace, both on Earth and in outer space.

AI as a Modern Military Weapon in Warfare

Recent armed conflicts show that AI has been deeply embedded in both kinetic and non-kinetic operations. The AI-generated videos and AI agentic bots have been used to shape public opinion. It also functions as a strategic signalling tool, projecting military success and resolve to shape adversaries' perceptions of your capabilities, costs, and escalation risks. Advanced AI-based systems are being used by the US military to develop war plans, analyse military deployment, and even suggest the course of operations. The US has deployed military AI applications using Maven Smart Systems (MSS), built by Palantir Technologies, in combination with Large Language Model (LLM) Claude, developed by Anthropic, in the Iran conflict. These systems have been used for

decision support systems, drones, cyber and electronic, and information warfare. With AI playing a decisive role in both kinetic and non-kinetic operations, these systems depend on large-scale compute, storage, and connectivity. This reinforces the strategic importance of protecting critical ICT infrastructure and data centres required to build, train, and run cognitive systems in a contested environment, wherein civil and military networks share a common backbone. This dual-use or dual-purpose technology creates a dilemma about the legitimacy of targeting ICT and its supporting infrastructure. At the same time, AI as a weapon system complicates its legitimate use in warfare with its existing technical maturity, as it cannot distinguish between civil and military objects.

Kinetic Strikes on ICT Infrastructure in West Asia

The air strikes conducted by the United States of America (USA) and Israel against the Iranian ICT infrastructure included the destruction of the AI research facility at Sharif University of Technology in Tehran, research centres at Shahid Beheshti University (photonics laboratory), Iran Science and Technology University (satellite development facility) and Bank Sepah digital security centre which hosted Islamic Revolutionary Guard Corps (IRGC) salary and military banking systems. Iran carried out strikes on the Amazon Web Services (AWS) data centres of the United Arab Emirates (UAE) and Bahrain and explicitly warned the 18 privately owned USA technology facilities in the region of West Asia of possible air strikes in the future. This indicates that privately operated cloud and data infrastructure facilities would be treated as legitimate military targets in escalation scenarios. Internet connectivity and datacentres have emerged as digital chokepoints in the current national and military security environment.

Subsea Cables as a Strategic Chokepoint

Subsea fibre optic cables carry the majority of the world's international internet traffic, with an estimated 95 percent of global internet data flowing through them. This is significantly higher than the space-based systems. Across continents, these undersea cables interconnect cloud infrastructure and data centres, enabling large scale data movement and low latency connectivity required for AI training and cloud computing. When these cables are threatened or damaged by state or non-state actors, they become strategic chokepoints that can potentially disrupt communications, financial transactions, and critical ICT services across the entire region. As a result, deliberate attacks on subsea cables have emerged as a strategically significant digital chokepoint.

Space Systems for Internet Connectivity

Vulnerabilities and challenges of existing terrestrial and subsea ICT infrastructure have led to the deployment of space systems for internet communication and the ideation of installing data centres in orbit. As subsea

cables have become strategic chokepoints, satellite broadband connectivity offers an alternative to mitigate the risks. However, the current space-based capabilities are still being built and maturing. The satellite internet or broadband, formally called Global Mobile Personal Communication by Satellite (GMPCS), is being deployed using Low Earth Orbit (LEO), Medium Earth Orbit (MEO), and Geostationary Earth Orbit (GEO) or Geosynchronous Earth Orbit (GSO) satellites to extend connectivity across all geographies, including sea, mountains, and other remote areas. In India, OneWeb India Communications, Jio Satellite Communications and Starlink Satellite Communications have received GMPCS licences. These industries are expected to play a central role in universal connectivity strategies, primarily through LEO constellations. Presently, Indian Defence Forces continue to rely primarily on dedicated military communications satellites and dual-use communication satellites for secure, near-real-time voice, data, and video connectivity in remote and contested environments. Therefore, both internet and operational network connectivity need to be deployed as a resilient satellite communication grid in a layered architecture to meet the future military and civil requirements.

Space-Based Data Centres

Research indicates that data centres currently consume around 1.5 per cent of global electricity, which is expected to grow significantly in the coming years as AI workloads expand. Space-based data centres are being explored as a potential solution to address this sustainability challenge. The availability of continuous solar energy in orbit, the possibility of free radiative cooling, scalability, three-dimensional architecture for low-latency processing, and high-capacity laser communications for data transmission motivate researchers to implement data centres in space. The emergence of space-based data centres is merely a sustainable solution rather than a strategic choice.

However, moving data centres and communication satellites to space does not reduce the risk of kinetic and non-kinetic attacks. The kinetic Anti-Satellite (ASAT) tests conducted by the USA, China, Russia, and India have demonstrated their capabilities to physically destroy satellites. This signalling showcases that states have the credible capabilities to attack satellites at will. This could possibly threaten the data centres in space. Similarly, the potential of non-kinetic attacks is evident during the armed conflicts, such as the famous Viasat KA-SAT cyberattacks in the Russia-Ukraine War, wherein wiper malware was used, and the Global Positioning System/ Global Navigation Satellite System (GPS/GNSS) spoofing and jamming in the Iran-US-Israel conflict, affecting more than 1,100 ships in the Persian Gulf and Strait of Hormuz. The various platforms in the contested area experienced navigation disruptions. This shows that space infrastructures are also vulnerable and services can be degraded or denied even without physical

destruction, with cascading effects across multiple domains and geographies.

Dual-Use Technology and Growing Threats

Targeting of data centres is not an irrational act of destruction; it is rooted in the strategic effects of dual-use technology. Dual-use refers to facilities, platforms, and systems that can be used for both civilian and military purposes. As per Article 52 of Additional Protocol I to the Geneva Conventions, only the military objectives shall be attacked, and the objects that offer a definite military advantage by virtue of their nature, location, purpose or use contribute to military action. This raises the following questions: "Is the privately owned ICT infrastructure considered as Critical Information Infrastructure (CII) ?" and "Do attacks on the private industrial complex violate the Geneva Conventions or International Humanitarian Law (IHL)?"

Under IHL, dual-use ICT infrastructure such as data centres may be lawfully targeted only when it qualifies as a military objective under Article 52(2) of Additional Protocol I. By making an effective contribution to military action, the dual-use ICT infrastructure becomes a valid target as they offer a definite military advantage. The same dual-use logic extends to space-based infrastructure. Communication satellites, navigation systems, and any future orbital data centres can simultaneously support civil functions such as commercial broadband, banking, disaster response, and scientific research, as well as military functions such as command-and-control, facilitating, and ISR analysis. This makes space-based infrastructure a classical dual use object providing military advantage. At the same time, their global civilian dependence on space-based services creates a dilemma. This means that applying the principles of distinction, proportionality and precaution to attacks on space infrastructure is even more complex than ground-based data centres. Therefore, these concerns are reflected in recent international humanitarian law and space law discussions on cyberspace and counterspace operations.

Securing India's Digital Battlespace on Earth and in Outer Space

The conflicts in West Asia confirm that, in modern warfare, information infrastructure has also become a primary battlespace. Kinetic strikes on data centres in Tehran, Dubai, Manama and other Gulf cities, combined with cyber and electronic attacks on satellite communication networks, show that adversaries now treat data infrastructure, subsea cables and space systems as strategic targets alongside conventional military targets. The evolution of using dual-use technology with modern ICT assets enables AI-driven targeting, command and control, and battlefield intelligence, which has forced militaries to target them to achieve military objectives.

India depends mostly on fibre-optic cables for internet communication, with international connectivity landing in coastal

cities like Mumbai, Chennai, Cochin, Tuticorin, and Trivandrum. The major number of data centres are concentrated in Mumbai, Bengaluru, Chennai, Hyderabad, and Noida. As the government is pushing many initiatives to build AI technologies and the underlying infrastructure, it becomes critical to geographically distribute data centres across the country rather than clustering them in important cities. Because dual-use technologies are tightly intertwined, the key national systems, including Unified Payments Interface (UPI), Adhaar, e-governance portals, Banking and Stock Exchanges and defence ICT infrastructure, depend on this shared digital backbone.

Section 70 of the Information Technology Act, 2000, defines Critical Information Infrastructure (CII) as any "computer resource, the incapacitation or destruction of which shall have a debilitating impact on national security, economy, public health or safety." This definition aligns with the National Critical Information Infrastructure Protection Centre's (NCIIPC) criteria, which focus on the criticality of functions and services and their impact on national security, economy, public health, or safety. The existing Indian framework for CII offers coverage for the digital ecosystem, but it does not explicitly guarantee security.

The recent West Asia conflict suggests that states have must strengthen their own infrastructure and also actively push for international norms against striking dual use digital systems. So that the essential digital services are not treated as legitimate targets in the generation of AI-enable conflic.

***

A Cloud Above the Clouds: US, China Race to Make Space a Computing Platform

Wency Chen | 23 May 2025

Source: SCMP | https://www.scmp.com/tech/tech-war/article/3354516/cloud-above-clouds-us-china-race-make-space-computing-platform

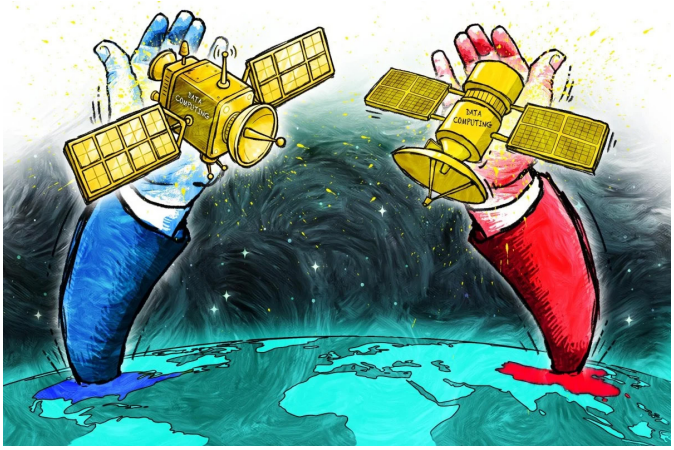


Illustration: Henry Wong

In 1957, the Soviet Union kicked off the Cold War's space race, shocking the world by sending Sputnik, the world's first artificial satellite, into orbit.

Four years later, it did the same to cosmonaut Yuri Gagarin, making him the first human in space. In 1969, the US provided another image that defined the era: Neil Armstrong leaving the Eagle lunar lander and planting the American flag on the moon, declaring it "one small step for

man, one giant leap for mankind."

For the two superpowers, the space race was an ideological contest measured in firsts – with each milestone setting down a marker for technological know-how, national pride and a renewed commitment to push beyond the bounds of Earth.

Half a century later, a new space race is taking shape, with China emerging as one of the leading actors.

However, this competition is about more than symbolic firsts. Countries are seeking to make the technological achievements necessary to occupy, operate and utilise space, creating a new layer of digital infrastructure through satellites, networks, sensors and computing systems.

SpaceX, the US tech giant gearing up for what is expected to be the world's biggest initial public offering as early as next month, has become a major player in this contest, releasing plans for orbital data centres, an experimental technology that is nonetheless sending ripples through global supply chains by driving demand for base metals, chips, satellites and rockets.

China, nurturing its own commercial space sector, is racing to keep up. Industry insiders and analysts based in the country said space was the new battlefield for technological competition, and Beijing could not afford a strategic absence.

"Talking too much about 'the first' is meaningless in a truly innovative context," said Wang Jian, an academician at the Chinese Academy of Engineering, adding he wanted the country to "send computing power and AI into space".

Wang, a founder of Alibaba Cloud, helped build China's cloud computing industry. He now leads a research institute backed by Zhejiang's provincial government, known as Zhejiang Lab. Its flagship Three-Body Computing Constellation project aims to build a thousand-satellite network for space computing.

Calculating Beyond the Clouds

"Space computing refers to shifting computing capability into orbit," said Lin Guangrong, constellation communications systems architect at Chinese satellite maker GalaxySpace. "[It lets] satellites and spacecraft perform sensing, processing and data transmission directly in space."

The ultimate vision is "space-based primary computing" – data centres that float in a layer above the actual clouds – according to China's Academy of Information and Communications Technology, a think tank affiliated with the Ministry of Industry and Information Technology.

For decades, the aerospace industry operated under a standard procedure: sense in space, compute on Earth. Satellites were merely orbital cameras and mirrors, capturing raw data and waiting for a designated "downlink window" to beam it to a terrestrial ground station.

But a paradigm shift is under way, accelerated by rapid changes in the terrestrial economy and their attendant challenges.

On Earth, there are fears the boom in artificial intelligence data centres – described by Nvidia CEO Jensen Huang as "the largest infrastructure buildout in human history" – could run into crippling physical constraints such as land shortages, strained power grids and access to the water required for cooling.

"Current advances in AI are dependent on large terrestrial data centres," wrote SpaceX CEO Elon Musk in a February memo announcing SpaceX's acquisition of xAI. "In the long term, space-based AI is obviously the only way to scale."

Tech leaders have begun to make the case for moving heavy AI workloads into orbit – where solar energy is abundant and the vacuum of space, in theory, would provide unlimited coolant – arguing it is the only sustainable way to ease the compounding infrastructure pressures on Earth's ecosystems.

But more immediately, space computing would serve as a boon for data preservation – a wide-ranging benefit.

"As the number of satellites in orbit continues to grow alongside mission density, the volume of space data is rising rapidly," Lin said.

Wang said about 90 per cent of remote-sensing satellite data was discarded in space because Earth-based networks could not handle the sheer volume of information.

That could result in delays and, sometimes, missed signals. Information about floods, wildfires, ship movements or cosmic ray bursts lasting only seconds could lose much of its value by requiring a downlink window before being analysed on Earth.

The Race Begins

China entered the space race relatively late. Its first satellite, Dongfanghong 1, lifted off from Jiuquan in 1970 and broadcast the revolutionary song "The East Is Red" from orbit.

"From the perspective of technological competition, China cannot afford a strategic absence," said Mi Lei, founder of CAS Star, a venture capital firm backed by the Chinese Academy of Sciences whose portfolio spans low-Earth-orbit communications, launch companies and satellite makers.

"Space is too important. In the new round of technological competition, a country has to be good at everything."

While China does not face the same severe electricity and land constraints limiting the US capacity for data centre construction, it wants a central role in the next race.

Its advantage lies in its ability to fully mobilise a centralised industrial system – uniting components, satellites, rockets, launch sites, measurement systems, applications and a manufacturing base – under state command, according to a recent report by a research institute affiliated with the information technology ministry.

That holistic ecosystem allows China to bypass some of the fragmented commercial inefficiencies that can plague Western tech deployment.

Chinese authorities have voiced their support for space-based computing, sending a clear signal for capital and industry players. At a news conference last month, an official from the ministry said China would "support forward-looking research into space computing technologies and promote the orderly development of the space-computing industry".

In the blueprint for the latest five-year plan, which runs through 2030, the commercial space sector was listed as one of 10 new industries and growth areas China would nurture and develop, as Beijing for the first time included the goal of becoming a "space power" among its national "strong country" objectives.

Against that backdrop, new research labs and companies are emerging.

The Three-Body Computing Constellation, designed to solve space's data problem in space with AI, successfully launched an initial batch of 12 computing satellites in May last year. It is aiming for 100 next year and is equipping each spacecraft with an onboard computing unit capable of delivering up to 744 trillion operations a second.

Zhejiang Lab said in February it had deployed 10 AI models in orbit, including a remote-sensing model, an astronomical time-domain model, and a Qwen large language model from Alibaba Group Holding, owner of the South China Morning Post. Several of the models can be updated while in orbit.

In one recent experiment, satellites equipped with cosmic ray detectors used a space-based astronomical model to rapidly identify and classify gamma-ray bursts.

Zhejiang Lab also established in-orbit network links between six satellites this year, marking a significant step towards inter-satellite networking.

"The field is still in an early phase of exploration and technical validation," said Lin of GalaxySpace.

The US' Head Start

The most immediate hurdle facing China's ambition is the infrastructure required to get orbiting computers into the sky efficiently – an area where the US holds a long-standing advantage.

Driven by tech titans with deep pockets, the American aerospace industry has made strides in high-frequency, low-cost reusable

rockets.

SpaceX completed roughly 165 orbital launches last year, with that rapid-fire capability enabling the construction of Starlink – a fully functioning global broadband low-Earth-orbit network with over 10,000 satellites.

Musk's company is now leveraging that dominance, seeking US regulatory approval for a constellation of up to 1 million solar-powered satellites engineered specifically as orbital data centres. Such a massive fleet would solidify America's architectural dominance over the lower atmosphere.

China, however, has yet to master high-frequency, SpaceX-style reusable rocket technology.

While its Qianfan and Guowang megaconstellation plans are ambitious, each has only launched a few hundred satellites so far.

Compounding the hardware gap is the nature of the competition itself. Beijing is primarily relying on state-directed labs, targeted pilot programmes, and a still-maturing commercial space industry, while Washington's space computing push is being propelled by an aggressive, cash-rich alliance of private AI and chip giants.

Google is advancing its Project Suncatcher, a moon-shot effort to link solar-powered satellites equipped with its proprietary Tensor Processing Units in an orbital AI cloud.

AI start-up Anthropic struck a deal with SpaceX this month to use the latter's Colossus 1 data centre, while signalling interest in a broader partnership to develop gigawatt-scale AI computational processing power in orbit.

Nvidia, meanwhile, unveiled a Space-1 Vera Rubin module at its GTC conference in March, describing it as part of a new accelerated computing platform for space applications. The company has already placed an H100 graphics processing unit in orbit on a satellite launched by Starcloud, a start-up it backs.

Humbled by Physics

Yet both sides must confront the laws of physics, which favour no superpower.

"To make space computing work at scale, onboard computing, inter-satellite links, space-ground integration and thermal management all have to move forward together," Lin said.

High-power computing units generate massive amounts of heat, but cooling is an issue in such a brutal environment. While space is cold, it is also a vacuum – meaning there is no air for convection.

Instead, heat must be laboriously conducted through the structural body of the spacecraft and radiated away through large thermal panels, making high-power space computing a heavy, complicated and expensive thermodynamic challenge.

Then comes the power paradox. Running trillions of operations per second requires immense energy, forcing engineers to develop lightweight, foldable, radiation-resistant solar arrays that must constantly balance thermal design with spacecraft orientation.

It is a systems-level conundrum, and no current solar cell has presented a clear solution. Every material choice involves severe trade-offs between weight, flexibility, lifespan and radiation tolerance.

To combat these challenges, industry players like GalaxySpace have not only poured capital into mass production of synthetic aperture radar satellites, but also into complex pumped fluid-loop thermal management systems and advanced flexible solar arrays.

According to a paper written by Google researchers, the engineering hurdles also encompass high-bandwidth inter-satellite laser communications, radiation-hardened components and long-term hardware reliability in an environment hostile to delicate silicon.

Google's researchers were not as positive as Musk, who frames orbital data centres as a near-term possibility. They said the cost of launching and operating a space-based data centre would not become economically comparable to terrestrial infrastructure until the mid-2030s, assuming launch prices fall below US$200 per kg.

To put that into perspective, SpaceX says its Falcon 9 can send up to 22,800kg (50,265 pounds) into low-Earth orbit, and with each launch reported to cost about US$74 million, that implies a full-capacity launch cost of roughly US$3,245 per kg.

***

Can Space Be Disrupted Like the Strait of Hormuz?

Clayton Swope | 01 May 2026

Source: CSIS | https://www.csis.org/analysis/can-space-be-disrupted-strait-hormuz

Photo: Andriy Onufriyenko/GETTY IMAGES

During the conflict in the Middle East, Iran has exploited its location next to a transit corridor vital to international commerce and energy markets, effectively closing the Strait of Hormuz to international maritime traffic. To achieve this feat, Iran neither established sea control nor air superiority over the strait; instead, it applied a relatively small amount of force—and the threat of using more—to achieve its goals. A nation applying this playbook to outer space could produce equally consequential results. Similar to transit rights through the strait, all nations have the right to freely

use space—a right that is perhaps taken for granted. Unlike the Strait of Hormuz, all countries border space and, with the right technology, can threaten it. Nearly 80 percent of all operational satellites orbit less than 800 km from the Earth's surface, a distance within reach of many ballistic missiles. The fact that space is under threat has been known for years. The lesson on display in the Strait of Hormuz is that disruption can be achieved and sustained without having domain superiority, and that, once disrupted, it is hard to return things to the old normal.

Although the Strait of Hormuz is located in the territorial waters of both Oman and Iran, it is recognized under customary international law and the UN Convention on the Law of the Sea as an international strait, which means ships from any nation are guaranteed the right of transit passage. All nations enjoy similar rights to send spacecraft through outer space. The Outer Space Treaty of 1967 (OST) states that space is free for "exploration and use by all States." This right, first de facto exercised a decade earlier, in 1957, with the launch of Sputnik by the Soviet Union, has been an essential lubricant for the growth of humankind's activities in orbit since the dawn of the space age. Given the nature of orbital dynamics, a regime modeled like the one used for international aviation would have been unwieldy, requiring spacecraft operators to obtain permission from countries when satellites overflew their terrestrial boundaries. In 1976, eight equatorial countries asserted sovereignty over positions in geostationary orbit located above their national territories—but no spacefaring nation at that time supported the declaration.

Today, more nations use space—around 100 nations currently operate or in the past have operated spacecraft—than at any time in history, with most satellites owned and operated by companies and not government agencies. In the 1970s, the most important satellites were located in higher orbits, like geosynchronous orbit, which is over 35,000 km from Earth. But things look different today. Space is still critically important for national security, but also incredibly valuable from an economic standpoint, with the space economy positioned to grow to $1 trillion by 2034. Of all nations, the United States reaps the most economic benefit from space through its dominance of the space economy. The United States also depends on space for its defense. With initiatives like the Golden Dome, the United States looks to further expand its use of space for national security.

Any nation that can build and launch ballistic missiles has the basic building blocks for an anti-satellite weapon. As of 2023, about 30 countries possessed ballistic missiles. A credible weapon would only need to reach low Earth orbit (LEO)—this is the choke point in space analogous to the Strait of Hormuz. As already noted, nearly 80 percent of all satellites are below 800 km in altitude, with about 91 percent of all U.S.-registered satellites below that altitude. As the crow flies, the distance

between the Iranian border and Israel is around 950 km—a range Iran has had no trouble reaching with missiles. Such distances are within range of a medium- or long-range ballistic missile, whose trajectories take them hundreds, if not thousands, of kilometers into space. Beyond missiles, cyberattacks, signal jamming, energy weapons, and laser dazzlers could also be used to cause disruptions or exert control of space.

A nation would not need space superiority to cause meaningful disruptions to LEO. Destroying or disabling even a small number of satellites—or merely just detonating devices in LEO that generate high-energy debris fragments—would cause considerable problems. It would inject a considerable amount of new risk into the business case for space, with implications for the space economy. This is like the risk Iran's actions have imposed on maritime commerce, with impacts to insurance, through the Strait of Hormuz. It would also make space operations much more complicated—more debris makes safely flying satellites harder. For the most part, countries that have demonstrated the ability to strike satellites in space—China, India, Russia, and the United States—have all had to balance the advantages of using such weapons with the downside of debris creation. To date, that means that no nation has used a destructive anti-satellite weapon against a space system operated by another country.

But the calculus for using a destructive weapon in space may be changing. Russia has been accused of developing a space-based nuclear anti-satellite weapon. The commander of U.S. Space Command said Russia would use such a weapon to gain an advantage over the United States and NATO, such as by "neutralising our space capabilities, [helping] them to level the battlefield." Russia is also reportedly looking at a weapon that would eject thousands of "high-density pellets" into LEO. Could Russia use these weapons as a means to disrupt the economic viability of space? This would look similar to how Iran—which itself is a beneficiary of economic gains derived from the strait—has used force to disrupt the Strait of Hormuz. Perhaps, like Iran, there may come a time when Russia sees more to gain from disrupting LEO, which Russia uses for its own benefit, for everyone. No doubt disrupting space would disproportionately negatively impact the United States.

Rather than to disrupt, a nation might seek to control space, perhaps arguing for the right to tax some or all satellites passing over its national territory. A nation might also assert the right to ban certain types of satellites from flying overhead, an action not compatible with the OST's free use provision. Before the launch of any space-based interceptor satellites as part of the Golden Dome initiative, China or Russia could proclaim a ban on satellites armed with missiles from flying over their national territories. Either nation could back up such an assertion with a threat to shoot down any missile-carrying satellite

that overflies its territory. The United States could call their bluff and launch the space-based interceptors—but it should be clear that such a chain of events could quickly lead to unintended escalation. It is worth thinking now: How would the United States respond to such a scenario, should a nation try to restrict space overflight rights by threat or force?

For one, the United States should diplomatically engage, in coordination with its allies, with China and Russia to address the underlying U.S. strategic concerns driving the need for space-based interceptors, as part of the Golden Dome, and the broader question of modernizing space governance. Such engagement would be more efficacious if it happened before China or Russia develops a new military or political response to the deployment of space-based interceptors. Dissuading a roguish actor, like Iran, from disrupting space may prove challenging. This also goes to the challenge of dissuading Russia from developing a space-based nuclear weapon, which was in the works before the announcement of the Golden Dome. The United States and its allies could include scenarios in which a nation tries to deny overflight rights for some or all satellites as part of wargames and tabletop exercises.

Rather than assuming it is possible to convince Iran, Russia, or any other country that it is not worth disrupting space, a parallel-path solution may be to develop ways to mitigate the impacts of anti-satellite weapons. This might include technologies that protect remote sensing satellites from laser dazzlers and quickly mitigate and remove debris from LEO. Focusing on technologies that could help satellites conduct more maneuvers over their lifetimes, as a way to raise their altitudes to escape debris fields and then return to the proper orbits, is another possible way to mitigate the threat of debris. A solution is possibly satellite refueling technologies, particularly for high-value spacecraft. The Pentagon may also want to rethink the wisdom of putting so many eggs in the LEO basket, terminating programs in higher orbits that might be harder, though not impossible, for our adversaries to reach than satellites in lower orbits, and leaning heavily on LEO for future military global communications capabilities.

But ultimately, should any of the aforementioned series of events play out, it might prove difficult to quickly resolve disruptions to the free passage of spacecraft in orbit. The United States would have few immediate options other than the application of its own superior military force, in space or other domains, to remove such a threat. This is a reality the world now faces in the Strait of Hormuz. The United States has time now to consider how best to avoid this reality from materializing—time that it should spend coordinating with allies and, when appropriate, engaging with counterparts in China and Russia. That time should also be spent assessing the value of maintaining more key space capabilities in diverse, farther-away orbits and developing and operationalizing

technologies to mitigate the causes of disruptions, such as debris creation..

***

Aerospace Industry

ISRO Clears Gaganyaan G-1 Mission for Launch in Next Four Months

Mr Vedant Saigal | 12 April 2026

Source: Indian Defence News | https://www.indiandefensenews.in/2026/05/isro-clears-gaganyaan-g-1-mission-for.html

ISRO's Gaganyaan G-1 mission has officially been cleared for launch within the next three to four months, marking a decisive step forward after earlier delays.

The National Review Committee granted approval in May 2026, with campaign activities set to begin 90 days before lift-off due to the complexity of human-rated systems.

The G-1 mission represents the first of three unmanned flights planned before India attempts its maiden crewed space mission. This flight will carry a half-humanoid payload designed to validate critical systems and procedures.

Unlike standard satellite launches, which typically require 60 days of campaign preparation, the G-1 mission demands a longer 90-day window. This extended timeline reflects the intricate safety and reliability requirements of human-rated technology, all of which are being developed indigenously.

The clearance comes after a turbulent period. Originally announced in December 2024 with a target launch in March 2025, the mission was halted when reviews revealed that none of the systems were ready.

Officials admitted that the premature announcement misled stakeholders, including the Ministry of Space and the international space community, and posed risks to India's credibility.

In January 2025, an internal review highlighted four critical errors:

- premature launch activity,
- unrealistic launch targets,
- inadequate review processes, and
- delayed acceleration of development.

These missteps cost ISRO valuable time and necessitated a complete reset of the program.

From March 2025 onwards, development accelerated significantly. Engineers focused on upgrading key systems across the launch vehicle stages — S-200, L-110, and C-32 — while also refining

aerodynamics, parachute deployment, thermal protection, pyro-mechanisms, propulsion, avionics, software, structural design, and recovery systems.

Life support systems and robust safety features were also prioritised to ensure the mission's integrity. ISRO emphasised that new, reliable designs and subsystems were introduced, with third-party inspections conducted before final clearance was sought from the National Review Committee.

Officials acknowledged that earlier lapses in protocol could have had cascading effects on India's international space relations. By correcting these errors and instituting rigorous checks, ISRO has now positioned the G-1 mission as a credible precursor to human spaceflight. The mission will be followed by G-2 and G-3, both unmanned, before India attempts to send astronauts into orbit under the Gaganyaan program.

The Gaganyaan initiative is a landmark in India's space journey, aiming to place three astronauts in low Earth orbit for up to three days before a splashdown in Indian waters. Success with G-1 will validate critical technologies and reassure both domestic and international observers of India's readiness.

It also underscores the nation's commitment to indigenous innovation, with every major subsystem designed and built within India.

The upcoming campaign will be closely watched, not only for its technical execution but also for its symbolic significance. India stands on the threshold of joining the select group of nations capable of human spaceflight, and the G-1 mission is the first tangible step towards that historic achievement.

***

Defence Ministry Issues Proposals for Anti-Jamming System from Indigenous Firms for IAF's Entire Sukhoi-30MKI Fleet

25 May 2026

Source: India Sentinels | https://www.indiasentinels.com/air-force/defence-ministry-issues-proposals-for-anti-jamming-system-from-indigenous-firms-for-iafs-entire-sukhoi-30mki-fleet-7378#google_vignette

An IAF Sukhoi-30MKI. (File photo)

New Delhi: The Ministry of Defence has issued a request for proposal to fit all 258 Sukhoi-30MKI fighter jets of the Indian Air Force with an advanced anti-jamming, anti-spoofing navigation system. This procurement move underscores the military's mounting concerns about electronic-warfare threats from both China and Pakistan.

The tender, restricted to only Indian companies, requires suppliers to design, deliver, and install a multi-constellation GPS antenna electronic unit across the Air Force's entire Su-30MKI fleet – the country's primary air superiority platform. The move comes as GPS jamming and signal spoofing have emerged as standard tools of modern aerial warfare, used extensively in theatres from eastern Europe to the Middle East.

The military concerns on two fronts make the timing pointed. A prolonged border standoff with China in Ladakh and Arunachal Pradesh, combined with a sharp military exchange with Pakistan during Operation Sindoor in May last year following the Pahalgam terror attack, have sharpened attention on electronic warfare vulnerabilities. Both adversaries operate capable jamming systems.

In any aerial conflict, disrupting an opponent's navigational accuracy – particularly for strike missions – offers a significant tactical advantage. The Su-30MKI, built under licence by Hindustan Aeronautics Limited from a Russian design, forms the core of India's strike capability, and navigational degradation of this fleet would carry serious operational consequences.

Technical Specifications

The antenna electronic unit will draw simultaneously from six satellite navigation networks: India's own NaVIC, the American GPS, Russia's GLONASS, China's BeiDou, Europe's Galileo, and GAGAN, India's satellite-based augmentation system. Tapping multiple independent constellations makes it considerably harder for a jammer to blind the aircraft entirely.

The specifications are demanding. The antenna must suppress a single jamming source by up to 85 decibels and handle multiple simultaneous interference sources with a rejection of up to 80dB – figures in line with the upper range of current military-grade anti-jam technology. The unit must also operate across the Su-30MKI's full flight envelope: altitudes up to 21 kilometres, speeds up to Mach 1.5, and G-loads ranging from -2G to 9G.

The contract calls for delivery of 300 antenna units – sufficient to equip all 258 aircraft with spares – along with 50 field-level testers and 10 base-level testers. The winning firm will also be required to carry out certification trials on two aircraft, manage fleet-wide installation, and provide structured training for Air Force technical personnel at 9 TETTRA School, the service's technical training establishment.

The entire programme must be completed within 24 months of the contract being signed. Online bids are due by June 22, 2026, with technical bids scheduled to open the following day.

Indigenous Mandate

Participation is limited to Indian companies, consistent with the government's defence indigenization drive. Over the past several years, procurement rules have progressively reduced the eligibility of foreign firms for contracts covering critical subsystems, nudging development of navigation electronics, radar components, and electronic warfare hardware towards domestic industry.

Public-sector firm Bharat Electronics Limited and a cluster of private defence electronics companies have been building capacity in GPS signal processing and anti-jam antenna design. The ministry has not disclosed the estimated contract value.

The Sukhoi-30MKI has been the subject of incremental upgrades since it entered Air Force service in the early 2000s. India operates the largest fleet of the type outside Russia, making it the single most consequential platform in any effort to modernize the Air Force's electronic warfare resilience.

***

May 2026 may have Changed India's Space Future Forever and No One Paid Attention

Sibu Tripathi | 23 May 2026

[Source: India Today | https://www.indiatoday.in/science/story/india-private-space-sector-in-may-2026-skyroot-pixxel-and-agnikul-signal-isro-shift-2915696-2026-05-23](https://www.indiatoday.in/science/story/india-private-space-sector-in-may-2026-skyroot-pixxel-and-agnikul-signal-isro-shift-2915696-2026-05-23)

Individually, each announcement represented a technological leap. (Photo: India Today)

India's private space sector may have just entered its defining moment.

In a matter of weeks during May 2026, Indian space startups unveiled a string of breakthroughs that signalled a dramatic shift in the country's commercial space ambitions, from rockets and satellites to orbital AI infrastructure, defence applications and constellation-scale manufacturing.

At the centre of this momentum was Skyroot Aerospace, which became India's first space-tech unicorn, cementing the rise of a private ecosystem that was almost non-existent just a few years ago.

The flurry of announcements also included Pixxel unveiling plans to develop AI-powered orbital data centres with Sarvam AI, alongside new hyperspectral imaging contracts from the United States. Meanwhile, Agnikul Cosmos successfully conducted a cluster firing of four 3D-printed rocket engines, marking another milestone in indigenous propulsion technology.

At the same time, Dhruva Space secured Rs 105 crore in Research, Development, and Innovation Fund (RDIF) backing for "Project Garud," aimed at developing India's private-sector 500-kilogram class satellite capability for constellation-scale missions.

A Pivotal Moment for Indian Space Ambitions

Individually, each announcement represented a technological leap.

Collectively, they signalled something larger: India's private space ecosystem is no longer trying to merely support the Indian Space Research Organisation (ISRO). It is beginning to evolve into an independent strategic and commercial force capable of competing globally.

For decades, India's space ambitions revolved almost entirely around ISRO. But reforms opening the sector to private participation, combined with new foreign direct investment rules and growing investor confidence, a brand new space policy have transformed the landscape.

"The whole space environment in India had a transformative change when the Government decided to open space to private players," said Lt Gen A K Bhatt, Director General of the Indian Space Association. "The new liberal policy, along with inflow of capital has boosted this change."

Industry leaders now believe India is entering a phase where private companies are building complete space ecosystems, not just components.

Pixxel founder and CEO Awais Ahmed told IndiaToday.in that Indian startups are increasingly developing "full-stack capabilities: satellites, software, analytics, manufacturing, and AI-led infrastructure versus just components or services for someone else's value chain."

That transition is critical because the next global space race is expected to be driven not only by launches, but by space-based intelligence, AI-powered infrastructure and sovereign technological capabilities.

Pixxel's orbital data centre plans reflect that shift. Rather than simply imaging Earth, future satellites could process massive volumes of data directly in orbit using AI systems, reducing transmission delays and enabling faster intelligence generation.

"Orbital data centres are still an emerging category globally, but the rationale is becoming clearer," Ahmed said. "As satellites generate complex datasets, it becomes more valuable to process intelligence closer to where the data is generated."

Built for India

The implications extend far beyond commercial use. Satellite intelligence now underpins agriculture, climate monitoring, disaster response, border security and defence operations.

Lt Gen Bhatt believes defence applications and climate intelligence will become two defining sectors of India's future commercial space economy.

"One is being given impetus by the current geopolitical instability and growing relevance of space for defence, while climate intelligence is most critical for handling huge climate changes which affect mankind," he said.

The rise of Indian private space is also changing how global investors view the country.

Previously, Indian startups were often perceived as low-cost engineering partners. But technologies such as hyperspectral imaging, OptoSAR systems, satellite constellations and reusable launch systems are beginning to reposition India as a deep-tech innovator.

"The ecosystem is not asking whether Indian private space can exist, but how

large and globally influential it can become," Ahmed said.

That confidence is increasingly backed by hardware milestones. Agnikul's successful cluster firing of four 3D-printed engines demonstrated advances in rapid rocket manufacturing, while Skyroot's upcoming orbital launch is expected to become another watershed moment for the sector.

"The importance of strategic autonomy in launch capability is becoming increasingly clear globally," says Pawan Kumar Chandana, Co-founder and CEO, Skyroot Aerospace, adding that there is an acknowledgement across the world that access to space is no longer a nice-to-have, but a strategic capability that will factor into several sectors, including communications, disaster and crisis management, shipping and logistics, and national security.

At the same time, Dhruva Space's constellation-focused satellite programme points toward India's ambitions in high-volume satellite manufacturing — a capability expected to dominate the next decade of the global space economy.

The broader strategic implications are enormous.

As countries increasingly rely on satellite infrastructure for communications, surveillance, navigation and AI-driven intelligence, space capability is rapidly becoming intertwined with geopolitical influence and technological sovereignty.

As technologies like IoT, climate monitoring, and Earth observation scale globally, demand for Low Earth Orbit satellite constellations will continue to rise. Since these satellites typically have operational lifespans of only five to eight years, there will also be a continuous need for replenishment launches.

"For any nation to have a credible security posture, the importance of space-based assets and space capabilities becomes an imperative," Lt Gen Bhatt said.

Money is not an Issue Anymore

India's private space surge is also arriving at a moment when the global space economy is projected to cross $1 trillion within the next decade. The country is betting that startups, not just state agencies, will help capture a share of that opportunity.

When the private space ecosystem began sproting companies did face a dearth of investments.

"The first hurdle Skyroot faced was capital. When we started in 2018, there were hardly any venture capital funds with a space thesis, as India at the time did not even have a policy in place for space-tech," sais Pawan. But that time is in the past.

He adds that investors are now recognising the market opportunities

and that the impact Indian space-tech companies present are global-scale. "This is also reflected in our latest funding round, which was co-led by GIC, Singapore's sovereign wealth fund, and Sherpalo Ventures, founded by Ram Shriram, one of the earliest investors in Google who continues to serve on the board of Alphabet Inc," Pawan said.

India is rapidly emerging as a formidable space power, backed by world-class engineering talent, decades of spaceflight expertise, increasing private-sector participation, and an ability to build highly sophisticated systems with exceptional efficiency.

If May 2026 is remembered as a turning point, it may not be because of one rocket test, one satellite or one funding round. It may be remembered as the moment India's private space industry stopped emerging and started arriving.

***

"The high relative (to land power) degree of technology dependency inherent in airpower poses characteristic dangers as well as provides characteristic advantages."

- Colin S. Gray

The Centre for Aerospace Power and Strategic Studies (CAPSS) is an independent, non-profit think tank that undertakes and promotes policy-related research, study and discussion on defence and military issues, trends and developments in air power and space for civil and military purposes, as also related issues of national security. The Centre is headed by Air Vice Marshal Anil Golani (Retd).

Centre for Aerospace Power and Strategic Studies
P-284 Arjan Path, Subroto Park, New Delhi - 110010
Tel.: +91 - 11 - 25699131/32 Fax: +91 - 11 - 25682533
Email: capsnetdroff@gmail.com
Website: https://capssindia.org/

Advisor : AVM Ashish Vohra VSM (Retd)
Editor, Concept & Content : Ms Gowri R

Composed by Mr Rohit Singh
Tel.: +91 9716511091
Email: rohit_singh.1990@hotmail.com