



CENTRE FOR AEROSPACE POWER AND STRATEGIC STUDIES (CAPSS)

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AEROSPACE NEWSLETTER



Indian Air Force Bids Farewell to MiG-21 in Chandigarh with Defence Minister Rajnath Singh as Chief Guest

<https://www.newsonair.gov.in/indian-air-force-bids-farewell-to-mig-21-in-chandigarh-with-defence-minister-rajnath-singh-as-chief-guest/>

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"Six decades of service, countless tales of courage, a warhorse that carried pride of a nation into the skies"

Indian Air Force

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Opinions and Analysis

Why Air Power Continues to Dominate Modern Warfare

Air Vice Marshal Anil Golani | Director General, Centre for Aerospace Power and Strategic Studies | 02 September 2025

Source: Business Standard | https://www.business-standard.com/blueprint-defence-magazine/opinion/why-air-power-continues-to-dominate-modern-warfare-125090200915_1.html



Deterrence by punishment through air power is carried out to convince the enemy that the cost of continuing the conflict would outweigh any potential gain (Photo: IAF)

Recent conflicts across the world have once again proved the efficacy of air power as a powerful arrow in a nation's quiver of military power. From the ongoing Russia-Ukraine conflict to the Israel-Iran and the India-Pakistan 'Operation Sindoor', there are important lessons to be learnt on the salience of air power. Air power, with its flexibility, reach, precision, and lethality, invariably becomes the preferred tool for policymakers when faced with a situation

that calls for the employment of force against both state as well as non-state actors. With the 'utility of force' and the penchant for using it in crisis situations going up several notches, there exists a need to carry out a fair and unbiased assessment of the role of air power in modern warfare. Technological developments have increased the range, autonomy and speed of modern weapons, both air-to-ground as well as air-to-air to the extent that air combat today takes place with the adversaries well beyond visual ranges. Moreover, the ability of air power to influence the battle of the surface forces makes it the preferred choice for multi-domain operations.

The Feb 26, 2019, 'Op Bandar', popularly known as the Balakot strike, when Indian Air Force (IAF) fighter aircraft crossed the international border for the first time to carry out an attack on terror infrastructure in Pakistan, marked a significant shift in India's response to state-sponsored terrorism from Pakistan. Viewed in hindsight, India's strategy of coercive diplomacy by resorting to deterrence by punishment had its effect, albeit limited in time and space. The unprecedented heinous terror attack on innocent tourists in Pahalgam on April 22, 2025, called for an unprecedented response from India. Expectations had grown since the Balakot strike of 2019, as also the capability of the IAF with the induction and operationalisation of 4.5 generation Rafale fighter aircraft. The IAF, meanwhile, had also upgraded its Integrated Air Command and Control System (IACCS), acquired the S-400 surface-to-air missile system from Russia, operationalised the indigenous Akash system and integrated precision weapons with the Rafale. While actions across the

diplomatic, political and economic domains were taken immediately after the Pahalgam massacre, military action took some time..

'Operation Sindoor' launched on the intervening night of May 6-7, 2025, witnessed India carrying out a punitive strike on nine terror camps and infrastructure across Pakistan and Pakistan-occupied Kashmir, including the headquarters of Jaish-e-Mohammed at Bahawalpur and the Lashkar-e-Taiba at Muridke. These attacks were measured, non-escalatory and focused only on the terror infrastructure in Pakistan, avoiding any military or civilian targets. The response from Pakistan targeted Indian military installations, cities and places of worship with drones and missiles all along the international border. The Indian retaliation, subsequently on the night of May 9-10, 2025, was targeted at Pakistan Air Force (PAF) airfields, air defence radars and command and control structures across the Pakistani heartland, inflicting substantial damage to PAF capability. Pakistan requested a ceasefire that came into effect less than four days after the conflict had started. Indian air power had achieved the political objective of deterrence by punishment in a short timespan while controlling the escalation ladder.

The combat effectiveness of air power needs to be measured against strategic outcomes and political objectives. The role of air power is ideally suited for the strategies of risk, punishment, denial and decapitation. Deterrence by punishment through air power is carried out to convince the enemy that the cost of continuing conflict would outweigh any potential gain. This is carried out by inflicting deliberate damage

on enemy assets, as was done by carrying out the strikes by the IAF on Pakistani terror infrastructure on May 6-7, 2025. Risk, on the other hand, is gradually increasing the threat or use of force to actual damage by signalling resolve to use force and inducing policy change before escalation to an all-out war. India has attempted to do this as well with the attack on Jabba Top during Op Bandar' in February 2019 to induce policy change by Pakistan in their tacit support to terrorist organisations. Air power can also be used for coercion by compelling the enemy to do something or refrain from doing something by using force or threatening the use of force. This could be done by targeting enemy leadership or other targets, as was done by Israel on Iranian military leadership and nuclear sites in 'Operation Rising Lion' as a strategy to ensure counter proliferation of nuclear weapons. Finally, air power could be used to decapitate enemy leadership and command and control centres by paralysing the enemy's decision-making capability, leading to operational collapse.

Operation Sindoor clearly demonstrated the ability of the IAF to respond with alacrity and precision in a no war, no peace situation, to deliver while controlling the escalation ladder. This operation in some ways was also a test of the higher defence organisation comprising the intelligence agencies, bureaucracy and the military, after the defence reforms of 2019, wherein the CDS and Secretary DMA were appointed. The synergy and integration between the armed forces towards joint planning and decentralised execution worked perfectly to deliver within the existing structures. Future integration towards operationalisation of theatre

commands, however, would have to factor in the lessons learnt from Operation Sindoor.

The IAF delivered in a short and intense skirmish that lasted for less than four days; however, the capacity of the IAF to engage in a conventional conflict over a prolonged period of time is stymied by the lack of resources. The IAF as on date may have the capability to deliver, but the capacity in terms of platforms, fighter aircraft and combat enablers like airborne early warning and control systems (AWACS) and flight refuelling aircraft (FRA) needs to be augmented post haste, as quantity has a quality of its own. Development of indigenous weapon systems, software-designed radios and operational data links for secure communication needs to be fast-tracked.

The active collusion between People's Liberation Army Air Force (PLAAF) and PAF in real time, as also between Pakistan and Turkiye towards the supply of drones, is another factor that India needs to be wary and cognisant of. Aatmanirbharta is the way forward, and the push towards research & development, indigenous design development and manufacturing in the aerospace sector needs to be pursued in mission mode. The effort towards this has to be top-driven, facilitating the private sector in collaboration with public sector undertakings and strategic collaboration with foreign original equipment manufacturers to not only 'Make in India for domestic consumption but also for export to make for the world.

A dispassionate assessment of recent conflicts that have employed air power provides lessons that are contextual and cannot be

universally applied. Israel-Iran and the ongoing Russia-Ukraine conflicts have both witnessed the employment of air power in situations that have had an asymmetric force ratio with respect to the respective adversaries. Ukraine, without a credible air force consisting of manned aircraft, has used drones, missiles and asymmetric unconventional tactics to carry out offensive action and ensure air denial to the Russian Air Force (VKS). VKS, doctrinally employed in support of the surface forces, being vastly superior to the Ukrainian Air Force, has not been able to achieve military objectives. Similarly, Iran, without significant manned aircraft capability, has used drones, but with limited effect. Israel and the United States have both used their air forces with telling effect to inflict damage on Iranian nuclear infrastructure and military leadership. The jury is out on whether this would deter Iran from pursuing its nuclear weapons programme. These operations, therefore, though tactically brilliant in execution, may prove to be futile in the use of air power to achieve political objectives.

The asymmetry between the IAF and PAF over the years has continued to decrease in favour of Pakistan, while that between the IAF and PLAAF has continued to increase in favour of China. The technological gap between India and China continues to increase, and this would indirectly affect the IAF during a face-off with Pakistan as well, due to the latter's 'higher than the mountains and deeper than the oceans' relationship with China. The IAF has repeatedly vindicated the faith reposed in its capability by the political leadership; however, much needs to be done to enhance its capacity and keep its cutting edge sharpened. With the IAF and air

power as the instrument of choice for military action, the nation would do well to ensure that the 'utility of force' should not turn into 'futility of force.'

Will India Acquire Russia's Su-57E as a True Stealth Fighter or a Su-30MKI-Style 'Mini-Bomber'?

M S Chatterji | 26 September 2025

[Source: Defence.in | https://defence.in/threads/will-india-acquire-russias-su-57e-as-a-true-stealth-fighter-or-a-su-30mki-style-mini-bomber.15651/](https://defence.in/threads/will-india-acquire-russias-su-57e-as-a-true-stealth-fighter-or-a-su-30mki-style-mini-bomber.15651/)



Renewed discussions surrounding India's potential acquisition of Russia's Su-57E fifth-generation fighter have sparked a significant debate within defence circles.

As the Indian Air Force (IAF) contends with a shortfall in squadron numbers and heightened security challenges in the region, the Russian aircraft is being considered as a potential solution.

However, questions are emerging about its intended role: will it be employed as a premier stealth aircraft, or as a heavy strike platform in the mould of the Su-30MKI, prioritising firepower over low observability?

Reports suggest that India is exploring a deal for two squadrons, comprising 36 to 40 aircraft, to be purchased directly from Russia.

The proposal may also include a provision for Hindustan Aeronautics Limited (HAL) to assemble a small number of additional jets at its Nashik facility, which has extensive experience with Russian aircraft.

This potential procurement is viewed as a separate, interim measure to bolster the IAF's capabilities, distinct from the long-delayed Multi-Role Fighter Aircraft (MRFA) tender.

The focus appears to be on leveraging the Su-57E for long-range strike missions, particularly for the Suppression of Enemy Air Defences (SEAD)-a high-risk task of neutralising enemy radar and missile systems.

This strategic thinking is partly influenced by the IAF's successful adaptation of its existing fleet.

The Sukhoi Su-30MKI, originally inducted as an air superiority fighter, has been progressively transformed into a formidable ground-attack aircraft, capable of launching heavy standoff weapons like the BrahMos cruise missile.

The Su-57E, with its superior 10-ton

payload capacity and ability to carry advanced long-range weapons like the R-37M air-to-air missile and hypersonic Kinzhal missiles internally, could further enhance this doctrine of heavy, long-range strikes.

The strategic compulsions for such an acquisition are clear.

China's air force is rapidly expanding its fleet of stealth J-20 fighters, estimated to number over 200, while Pakistan continues to modernise its air force.

To counter these integrated air defence systems, the IAF requires a versatile and powerful platform. The Su-57E's combination of advanced sensors and supermaneuverability makes it a potent aircraft, but its effectiveness depends heavily on its ability to survive in heavily contested airspace.

Questions Over Stealth Performance

The primary concern for analysts is the Su-57's stealth capability, which is measured by its Radar Cross-Section (RCS)-essentially, how visible it is to an enemy radar.

The Su-57E's estimated RCS is between 0.1 and 0.5 square metres. While this is a significant improvement over fourth-generation fighters like the Su-30MKI (which has an RCS of around 10-20 m²), it is considerably higher than the American F-35's estimated RCS of 0.0015 m², making the Russian jet far more detectable.

These concerns are not new. In 2018, India withdrew from the joint Fifth Generation

Fighter Aircraft (FGFA) program with Russia, which was based on the Su-57 platform, citing dissatisfaction with the aircraft's stealth performance, engine technology, and development timeline.

Defence experts point out that for SEAD missions requiring external missiles and pods, the Su-57E's RCS would increase further, potentially diminishing its stealth advantage over modern 4.5-generation jets like the Dassault Rafale.

Ultimately, the discussion highlights a pragmatic choice for the IAF: embrace the Su-57E as a powerful "mini-bomber" that uses its heavy payload and speed for deep strike missions, or continue the search for a true stealth fighter.

While proponents argue for its value as a flexible, multi-role asset until India's indigenous Advanced Medium Combat Aircraft (AMCA) is ready in the 2030s, critics warn against repeating past issues and urge a thorough evaluation before any commitment is made.

“They’re Tracking Every Single Satellite”: America’s Secret Space Mission Exposes How We Monitor Enemy Movements Worldwide

Rosemary Potter | 20 September 2025

Source: [Rudebague](https://www.rudebague.com/en/2025/09/us-defense-satellite-unveiled-were-becoming-completely-autonomous-amid-chinas-terrifying-space-advancements/) | <https://www.rudebague.com/en/2025/09/us-defense-satellite-unveiled-were-becoming-completely-autonomous-amid-chinas-terrifying-space-advancements/>



Illustration of the Anduril and Impulse Space demonstration satellite designed for rendezvous and proximity operations.

In a rapidly evolving space landscape, the United States is making significant strides in satellite technology, aiming to maintain its competitive edge. Recent announcements from defense technology company Anduril Industries and propulsion startup Impulse Space have marked a pivotal moment in satellite innovation. Their collaboration on a demonstration satellite designed for rendezvous and proximity operations (RPO) is set to revolutionize how satellites maneuver in space. As global powers like China continue to advance their satellite capabilities, the U.S. is accelerating efforts to enhance space awareness and defense. This collaboration is not just about innovation; it’s a strategic move in an increasingly contested domain.

Impulse’s Role and Technology

Impulse Space is spearheading the propulsion technology that will power the new satellite’s capabilities. At the heart of their offering is the Mira spacecraft, which is integrated with the Helios kick stage. This system, powered by the Deneb engine, is designed to act as a rapid transport mechanism, shifting satellites from low Earth orbit (LEO) to geostationary orbit (GEO) in under 24 hours. This is a significant reduction from the months typically required for such maneuvers.

Geostationary orbit, located approximately 36,000 miles above the Earth, is a critical zone for many military and communication satellites. Impulse Space has secured contracts worth millions, including a \$34.5 million deal with the Space Force and Defense Innovation Unit, to develop rapid-response capabilities. Their technology aims to compress extensive orbital transfers into just a few hours, thereby enhancing the flexibility and responsiveness of U.S. space operations.

According to Impulse president Eric Romo, the design of the spacecraft allows for adaptations that would enable operations in LEO, offering versatility across various missions. This adaptability is crucial as it provides a multi-mission platform for future space endeavors.

Anduril’s Contribution

Anduril Industries is contributing the mission payloads, which include sophisticated imaging and processing technology. The

payload comprises a long-wave infrared (LWIR) imager and a mission data processor based on Anduril's Lattice software. These tools are essential for satellite tracking and identification, especially under challenging conditions such as eclipses when sunlight is absent.

The LWIR imager enhances the satellite's ability to detect dim targets and objects within Earth's shadow. This capability is vital for maintaining awareness and tracking satellites during periods of darkness. Anduril's integration of Lattice software, already a part of the Space Force's Space Surveillance Network, allows for autonomous operations, enabling the satellite to identify and approach other objects in space autonomously.

The companies assert that these technologies will enhance the precision and safety of RPO missions. Moreover, the collaboration showcases how commercial entities can provide military-grade solutions at a lower cost, underscoring the increasing role of private companies in national defense strategies.

Commercial Deals and Future Plans

Impulse Space is extending its reach beyond defense, venturing into commercial partnerships to highlight the broader applications of its Helios system. Among its collaborators is Astranis, a startup specializing in GEO communications, which plans to use Helios for a mission in 2027. This partnership will enable Astranis to quickly deliver its MicroGEO satellites from LEO to

GEO, significantly shortening the timeline for initiating broadband services.

Additionally, Impulse has inked a multi-launch agreement with French company Infinite Orbits. This venture involves a program named Caravan, designed to transport multiple servicing satellites to GEO in a single mission. The first Caravan mission, fully booked for 2026, marks a substantial step in commercial space logistics.

These endeavors reflect a broader trend of diversification and innovation within the space sector. By securing commercial contracts alongside defense projects, Impulse is positioning itself as a versatile player capable of catering to a wide array of space industry needs.

Strategic Implications of the Anduril–Impulse Collaboration

The upcoming Anduril–Impulse demonstration mission, scheduled for late 2026 on a SpaceX Falcon 9 rocket, is poised to set a new standard in satellite operations. The Mira spacecraft, weighing approximately 661 pounds without payloads, will be launched alongside other satellites, including one for the Space Force's Victus Surgo mission. This mission underscores the shifting focus toward geostationary orbit as a new frontier for space innovation, even as recent growth has centered on LEO.

As global competition intensifies, the U.S. is strategically enhancing its space capabilities. The collaboration between Anduril and

Impulse epitomizes the blend of technological innovation and strategic foresight required to maintain a competitive advantage in space. The mission will offer insights into how commercial technology can be leveraged for national defense, setting a precedent for future collaborations.

With the space domain becoming increasingly contested, the question remains: How will international collaboration and competition shape the future of space exploration and security?

AIR POWER

Indian Air Force Bids Adieu to its Workhorse, the MiG-21

Air Marshal Anil Chopra (Retd) | 20 September 2025

Source: [rt.com](https://www.rt.com/india/624917-india-mig21-fighter-jet/) | <https://www.rt.com/india/624917-india-mig21-fighter-jet/>



The Indian Air Force (IAF) is finally set to retire its MiG-21 fleet this weekend after over 60 years of glorious service. India was among the three major operators after the Soviet Union and China (licensed variant Chengdu J-7).

The MIG-21 has been the workhorse of the IAF. It was inducted in 1963 and has continued in service ever since. In August 2019, the IAF made headlines when its jets launched airstrikes on a Jaish-e-Mohammed (JeM) terrorist facility in Pakistan, known as the Balakot strikes. IAF Wing Commander Abhinandan Varthaman shot down a Pakistani F-16 while flying a MiG-21 Bison, during a showdown between the IAF and Pakistan Air Force (PAF).

The iconic MiG-21 protected the Indian

skies through major conflicts. Its retirement is an emotional time for several generations of Indian fighter pilots. Indian media is replete with nostalgic reminiscences of great aviators and air veterans.

This author himself honed his combat flying skills in this aircraft starting in 1974, and was Team Leader of the MiG 21 Upgrade project in Russia during 1996-2000.

Legend in the making

The Mikoyan-Gurevich MiG-21 was designed as a supersonic jet interceptor aircraft by the MiG Design Bureau of the Soviet Union. The MiG-21 was an airplane that hewed to the classic “perfect is the enemy of good enough” approach. The Soviets wanted to fill the sky with thousands of simple, lightweight, reliable jets. That strategy had worked splendidly with the Soviet AK-47 rifle.

Over 60 countries across four continents have flown the MiG-21, and it still serves in a few smaller air forces 65 years after its maiden flight. It made aviation records, and became the most-produced supersonic jet aircraft in aviation history (11,496), the most-produced combat aircraft after the Korean War, and once the longest production run of a combat aircraft, now exceeded by both the McDonnell Douglas F-15 and the Lockheed Martin F-16. Its baby brother, the transonic MiG-15, holds the all-time jet record with around 18,000 units produced. The MiG-21 had a long production run from 1959 to 1985, and the airplane was thereafter upgraded by India and Romania.

Development of what would become the MiG-21 began in the early 1950s, when Mikoyan OKB finished a preliminary design study for a swept-wing prototype designated Ye-1 in 1954. After evolution, the first prototype with a delta-wing was the Ye-4. It made its maiden flight on June 16, 1955, and its first public appearance at Moscow’s Tushino airfield in July 1956.

The MiG-21 was the first successful Soviet aircraft combining fighter and interceptor capabilities. It was a lightweight Mach 2 fighter with a relatively low-powered afterburning turbojet when compared to the American F-104 or F-5, or even the French Mirage III. The very characteristic shock cone in the front air intake was unique and peculiar, and left little space for a decent-sized radar. Like many aircraft designed as interceptors, the MiG-21 had a short range.

The MiG-21’s simple controls, engine, weapons, and avionics were typical of Soviet-era military designs. The use of a tail with the delta wing aids stability and control at the extremes of the flight envelope, enhancing safety for lower-skilled pilots. This, in turn, enhanced its marketability in exports to developing countries with limited training programs and restricted pilot pools.

The maximum permitted speed was 2,237 km/M2.05 at 13,000 m (42,651 ft), and 1,300 km/h/M1.06 at sea level. The service ceiling was 17,500 m (57,400 ft). The aircraft could operate from semi-prepared surfaces. The aircraft armament included one GSh-23 mm gun with 200 rounds. Aircraft had five hard-

points with a capacity of up to 2,000 kg of stores, with provisions to carry combinations of bombs rockets and missiles or fuel drop-tanks. In later variants it included the latest air-to-air missiles the R-73, R-77, and R-27. Its low production and maintenance costs made it a favorite of many nations.

A total of 10,645 aircraft were built in the USSR. They were produced in factories at Moscow, Gorky (now Nizhny Novgorod) and Tbilisi. A total of 194 MiG-21F-13s were built under license in Czechoslovakia and India's Hindustan Aeronautics Ltd (HAL) built 657 MiG-21 variants. About 2,400 J-7s were manufactured in China, including for export. Due to the mass production, the aircraft was very cheap. The MiG-21MF, for example, was cheaper than the BMP-1 Soviet amphibious tracked infantry fighting vehicle. The American F-4 Phantom cost several times as much as the MiG-21.

Operational History India

In 1961, the IAF opted to purchase the MiG-21 over several other Western competitors. As part of the deal, the Soviet Union offered India full transfer of technology and rights for local assembly. Since 1963, the IAF has inducted more than 1,200 different MiG fighters. In 1964, the MiG-21 became the first supersonic fighter jet to enter service with the IAF. Meanwhile, factories were set up at Nasik (aircraft), Hyderabad (Avionics), and Koraput (engines) with Soviet assistance. HAL produced 657 aircraft of three variants: MiG-21FL, MiG-21M, and MiG-21bis.

Due to limited induction numbers and insufficient pilot training, the IAF MiG-21 played a limited role in the Indo-Pakistan war of 1965. However, the IAF gained valuable experience.

The capabilities of the MiG-21 were put to the test during the 1971 Bangladesh Liberation War. MiG-21s played a crucial role in giving the IAF air superiority in both western and eastern theaters. The 1971 war witnessed the first supersonic air combat in the subcontinent when an Indian MiG-21FL claimed a PAF F-104A Starfighter with its GSh-23 twin-barrel 23 mm cannon. By the end of the hostilities, the IAF MiG-21FLs had shot four PAF F-104s and two Shenyang F-6, and one PAF Lockheed C-130 Hercules.

In the eastern sector, the MiG-21 played a crucial role for the IAF, earning the moniker "runway buster" for its ground attack capabilities. Repeat attacks on December 6 and 7, 1971, successfully cratered the runways at Tejgaon and Kurmitola near Dhaka, effectively grounding the PAF in the eastern sector. On December 14, 1971, four MiG-21s from Tezpur airbase led by Wg Cdr Bishnoi (VrC & Bar) attacked the Governor's House in Dhaka, paving the way for the surrender of Pakistani forces.

Because of the performance of India's MiG-21s, several nations, including Iraq approached India for MiG-21 pilot training. By the end of the 1970s, more than 120 Iraqi pilots were being trained by the IAF. On August 10, 1999, two MiG-21Bis of the IAF intercepted and shot down a Pakistan's Naval Air Arms

Atlantic maritime patrol aircraft with an air-to-air missile after it entered Indian airspace for surveillance, killing all on board.

However, the plane had been plagued by safety issues. Since 1970, more than 170 Indian pilots and 40 civilians have been killed in MiG-21 accidents. The aircraft engine operates very close to its surge line in some regimes, and the ingestion of even a small bird can lead to an engine surge/seizure and flame out. On December 11, 2013, the MiG-21FL was decommissioned after being in service for 50 years. The final Soviet-produced variant was the MiG-21bis, manufactured between 1972 and 1985.

MiG 21 Bison

To stretch its operational life and to give it significant multi-role capability, the IAF went for the MiG-21 upgrade, in the mid-1990s, jointly with the MiG Design Bureau in Russia. The aircraft was named “Bison”.

It had a MiG-29 bubble canopy and wraparound windscreen; far more capable radar; a helmet-mounted weapons sight; and beyond-visual-range, fire-and-forget advanced missile missiles such as the R-73 and R-77. These and other modifications created a fourfold increase in the airplane’s capability and brought it up to roughly the level of the early F-16 variants. It also got a radar warning receiver, an internal jammer, improved avionics and a new head-up display. It also received TV-guided bombs. In total, 125 jets were inducted in six squadrons.

The Indian Upgrade Team operated with the MiG Design Bureau in Moscow. The physical modification was at the “Sokol” Aircraft Plant in Nizhny Novgorod. During 45 years of serial production this plant manufactured about 13,500 combat aircraft, including MiG-15, MiG-17, MiG-19, MiG-21, MiG-25, MiG-29, and MiG-31, among others.

Indian pilot Harish Nayani and flight test engineer VT Nathan actively participated in the Bison test flight testing in Russia. The Indian team had excellent working relations with the Russians, and some old-timers had worked in India to help set up the MiG plant at Nasik. We also had skiing, camping, and cruise outings together.

The final MiG-21 Bison proved a formidable fighter.

'Rock-Solid Airframe'

The MiG-21 has been called the AK-47 of airplanes. “Rock-solid airframe,” a former MiG-21 ground technician once told this author. “Really, the thing only needs to be topped off with fluids, and it just goes and goes.”

When the US Air Force operated MiG-21s as adversary aircraft combat trainers, they found them to be, in the words of one crew chief, “Just like your family car. As long as it’s full of fuel, you pull it out of the garage and start it up.” “With a set of home socket wrenches and screwdrivers, you could get a lot of maintenance done on the little jet,” said another crew chief.

The fact that a MiG-21 can cost just \$500,000 as compared to a second-hand F-16C, which can cost a small country \$15 million. MiG-21s or their Chinese-produced variants were flown in more than 60 countries. During the Cold War, the United States acquired many MiG-21 variants. American pilots spoke highly of the plane, and it performed more than adequately in aggressor training situations. Indeed, highly trained American pilots probably pushed the MiG-21 farther than most Soviet pilots could have done. There still are around 44 privately owned MiG-21s in the US. Draken International acquired 30 MiG-21bis/UM, mostly ex-Polish, and was last known to be still operating them.

Robert Farley wrote in the “National Interest” portal that a few designs stand the test of time. The B-52 Stratofortress first flew in 1952, and is expected to cross a century in service. New C-130s continue to roll off the production line, based on a design that became operational in 1954. But those are bombers and transport aircraft; they don’t fight one another. Fighters face a special problem of longevity, because they must compete directly with newer models. Thus, very few fighters have had long life spans, either in production or in service. The MiG-21 was an exception. The MiG-21 would exceed Mach 2.0, with an internal cannon and the capacity to carry between two and six missiles. Like most fighters, the MiG-21 would eventually serve in a ground attack role, in which it can carry a limited number of bombs and rockets.

Most modern fighters don’t fly much faster than the MiG-21 or maneuver much more

capably. While they do carry more ordnance and have more sophisticated electronic equipment, many air forces can treat these as luxuries, as they simply want a cheap, fast, easy-to-maintain aircraft that can patrol airspace and occasionally drop a few bombs. The MiG-21 fitted the bill. The MiG-21 has reached 65 years, and probably will reach 70 years. It remains one of the iconic fighters of the supersonic age.

Several pilots attained ace status (five or more aerial victories) while flying the MiG-21. Nguyen Van Coc of the VPAF, who scored nine kills in MiG-21s, is regarded as the most successful MiG-21 pilot of all time. Twelve other VPAF pilots were credited with five or more aerial victories while flying the MiG-21. Additionally, three Syrian pilots are known to have attained ace status while flying the MiG-21.

The record for highest number of sorties in a MiG-21 belongs to Air Commodore Surendra Singh Tyagi (Retd.) of the IAF, with 6,316. He also holds the world record for the most flying hours in the aircraft, with 4,306. His extensive experience with the MiG-21 is recognized by the Russians. As a great era comes to an end, some ancient MiGs may still be flying in the hands of war-bird enthusiasts long after the last B-52 shuts down forever.

Operation “Summit of Fire” Another Feather in Airpower’s Cap

Wg Cdr Akash Godbole | 13 September 2025

Source: CAPSS | <https://capssindia.org/operation-summit-0f-fire-another-feather-in-airpowers-cap/>



The Times of Israel

Introduction

On the afternoon of September 09, 2025, Israel conducted a bold aerial attack targeting senior Hamas leadership in Doha, Qatar. This operation was named Operation “Summit of Fire.” It marked the first time that Israeli forces executed an offensive action within the sovereign territory of a country considered a United States (US) ally. Recently, Israel has consistently demonstrated a growing willingness to undertake operations on foreign soil in pursuit of its national goals, even at the cost of diplomacy. This operation also highlighted the Israeli Air Force’s (IAF) ability to adapt to evolving doctrines, incorporate advanced technologies, and act upon real-time intelligence. Importantly, it validates Israeli leadership’s decisiveness in a complex diplomatic environment.

Operation “Summit of Fire”

The operation had been planned for some time, with operational details worked out over several months. Apparently, a meeting was scheduled among senior Hamas leaders to discuss a new US-proposed ceasefire deal for Gaza in Doha. Israeli intelligence agencies tracked the gathering, identified it as an opportunity, and provided the necessary operational intelligence for the operators to undertake the mission. The Israel Defence Forces (IDF), Shin Bet, and Mossad collaborated closely with real-time intelligence support. Operational control was exercised by senior political and military leadership, including Mossad and Shin Bet. The operation has been in the planning stage for several months, involving regular meetings and classified simulation exercises that picked up pace in the past weeks. The green light for the strike was given on September 09, just hours before the scheduled attack was to take place. The use of the Shin Bet’s special operations command centre for mission direction highlights the role of integrated, multi-domain coordination.

Over 15 IAF fighter jets (primarily F-35I “Adir” stealth fighters), supplemented by drones for real-time surveillance and targeting, were involved. These advanced platforms ensured penetration of Qatari airspace while evading detection by modern air defence systems, including US-supplied Patriot Advanced Capability (PAC)-3 and NASAMS (National Advanced Surface-to-Air Missile System) batteries. At least ten to twelve precision-guided munitions (heavy bombs, air-to-ground missiles, and Delilah

loitering munitions) were delivered onto a single compound with near-simultaneous impact. The fighter jets flew a whopping distance of about 1,800 to 2,200 km either way, conducting multiple air-to-air refuellings during the transit on each leg. The flight path allegedly avoided Jordanian airspace, crossing Syrian and Iraqi sectors. Advanced Electronic Warfare (EW) assets jammed radar and radio communications, suppressing both Qatari and US-operated surveillance and early-warning systems at Al-Udeid Air Base, located only 30 km from the target. The entire operation, from take-off to landing, took roughly five hours, suggesting intense operator training and rapid tasking enabled by robust C4ISR integration (Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance). The West Bay Lagoon district, the heart of the strike zone, is home to embassies, luxury residences, foreign diplomats, and the US ambassador's residence, underscoring the operation's complexity and high-risk threshold. Subsequent developments have indicated that prior information was provided to the US by Israel, and in turn, to Qatar agencies by US agencies. However, such claims have been refuted by Qatari government sources.

Operational accounts indicate a direct hit on the targeted complex and surrounding compound, with physical damage and fatalities. Reportedly, the airstrike resulted in six deaths (five Hamas operators and one Qatari security officer). Despite the successful attack in terms of precision and effect, it appears that senior Hamas leadership managed to survive due to last-minute movement or successful deception

regarding their real location within the district. Prominent among the fatalities were Humam al-Hayya (son of Hamas chief Khalil al-Hayya) and Jihad Labad (director of Al-Hayya's office). Notwithstanding the tactical impact, Israel did manage to communicate strategic reach and ability to disrupt Hamas leadership during sensitive negotiations. Intimidation has been reestablished by the conduct of such an audacious airstrike. Despite Qatar's extensive investment in air defence (Patriot PAC-3, NASAMS, Rafale, and F-15QA jets), the Israeli strike went undetected and unchallenged. Al-Udeid is one of the foremost military bases outside of the US mainland holding critical US military assets. The proximity of the target to this base is another unique aspect of this strike. It appears that the Qatari air defence command centres failed to respond, a direct testament to Israel's potent electronic warfare and stealth capabilities. Defence analysts cite this as a demonstration of modern EW and cyber capabilities, aimed at paralysing well-trenched defences.

Lessons for Contemporary and Future Air Operations

(a) Extended Reach and Rapid Power Projection: The IAF demonstrated its ability to plan and execute an ambitious strike over trans-regional distances. This was achieved by effectively utilising air-to-air refuelling, precise coordination, and complementary logistics. Such operations encourage modern air forces to invest in combat enablers such as refuelers and EW systems. Although India does not have any expeditionary intentions, such actions reignite discussions about the

relevance of stealth bombers. Diplomatically, cross-border operational agreements are crucial, as they must be carefully negotiated to remain effective across different geographies.

(b) Stealth, Precision, and EW: The successful evasion of advanced air defences while carrying out simultaneous successful air attacks demonstrates the pivotal role of stealth platforms and EW in modern warfare.

(c) Intelligence, Integration, and Time-Sensitivity: Months of preparatory intelligence, fused with Intelligence, Surveillance, and Reconnaissance (ISR), and cyber support, permitted time-sensitive targeting. Future airpower applications must couple layered intelligence with rapid decision cycles.

(d) Strategic Communication and Risk Management: Achieving tactical success does not necessarily guarantee the fulfilment of political goals. This is especially true for countries like India, which value strategic autonomy. Additionally, considerations such as narrative building, diplomatic fallout, and alliance management will influence decision-makers' calculations going forward.

(e) Redefining Deterrence and Security Architecture: The strike catalysed re-evaluation of regional security, exposed vulnerabilities, and prompted debate on defence, intelligence sharing, and escalation management in the Middle East.

Conclusion

The conduct of Operation “Summit of Fire” has reaffirmed the growing prowess of dynamic air operations in pursuit of strategic effects. Israel’s innovative and audacious use of Air power has transformed the calculus of alliance coordination on the diplomatic front while showcasing tremendous reach and striking capability based on accurate intelligence. Air power has again proven its capability to achieve desired effects and shape strategic manoeuvres. Another important outcome has been the efficacy of enablers such as integrated ISR, AAR, EW, and stealth. This event will provide enduring principles for future procurement, force structuring, employment, and doctrines for the use of Air power.

Intermediate Range Agni-Prime Missile Successfully Test-Fired from Rail-Based Mobile Launcher System

25 September 2025

Source: *The Hindu* | <https://www.thehindu.com/news/national/intermediate-range-agni-prime-missile-successfully-tested-from-rail-based-mobile-launcher-system/article70091825.ece>



India successfully carries out launch of Intermediate Range Agni-Prime Missile from a Rail based Mobile launcher system on September 25, 2025. Photo: DRDO *The Times of Israel*

According to the Ministry of Defence (MoD), designed for a range of up to 2,000 km, the next-generation missile incorporates advanced features and marks the first launch from a specially developed rail-based system capable of rapid, low-visibility deployment with cross-country mobility.

The missile's trajectory was tracked by multiple ground stations, with the test meeting all mission objectives. Officials said the success paves the way for the induction of the futuristic rail-mobile launch systems. The road-mobile version of Agni-P has already been inducted after a series of trials, the MoD added.

Defence Minister Rajnath Singh

congratulated the DRDO, SFC and the Armed Forces, stating that the test places India among select nations with rail-based canisterised launch capabilities. DRDO Chairman Dr. Samir V. Kamat also lauded the teams for the achievement.

Europe's 'Drone Wall' Against Russian Incursions? How it Will Work

25 September 2025

Source: *The Times of India* | <https://timesofindia.indiatimes.com/toi-plus/international/europes-drone-wall-against-russian-incursions-how-it-will-work/articleshow/124116481.cms>



On the night of September 22, multiple unidentified drones prompted the closure of the airspace over Copenhagen Airport in Denmark, sparking suspicions of Russian involvement. Security personnel chose not to shoot the drones down due to the high risk posed by crowded terminals, aircraft on runways, and nearby fuel depots.

The incident comes in the wake of Poland's

recent downing of up to 20 Russian drones and Estonia's reports of Russian fighter jet incursions - developments seen as spillover from Moscow's war in Ukraine.

These events have renewed focus on NATO's air defences, with officials acknowledging that drones present a growing challenge.

Addressing the issue, European Union chief Ursula von der Leyen had said in her September 10 State of the Union address that Europe "must heed the call" of the Baltic states to "build a drone wall".

"This is not an abstract ambition, it is the bedrock of credible defence," she was quoted as saying in media reports.

Following her remarks, EU defence commissioner Andrius Kubilius has convened talks with defence ministers this week on creating a "drone wall" along the bloc's eastern flank.

Meanwhile, on September 24, Russia dismissed allegations of violating NATO airspace as "hysteria", a day after US President Donald Trump said the allies should shoot down Russian jets if they breach their territory.

What is a Drone Wall?

In February, the Estonian Defence Industry Cluster introduced the concept of the 'Baltic Drone Wall', aimed at strengthening the more than 1,000km-long eastern border of the EU

and NATO.

This cooperative initiative involves Poland, Finland, Estonia, Latvia, and Lithuania.

The centrepiece of the project is an artificial intelligence (AI)-based "multilayered drone defence system" called Eirshield a platform developed jointly by Estonian company DefSecIntel and Latvian firm Origin Robotics.

According to Euronews, Eirshield uses radars, cameras, radio frequency detectors, the drone's direction, and its threat level to determine whether a hostile drone's signal should be jammed or blocked, or if it should be intercepted by another drone.

Agris Kipurs, co-founder and CEO of Origin Robotics, told the European news outlet that Eirshield - partially deployed already - is designed to target "fast-flying unmanned" drones carrying warheads that can reach speeds of more than 200km per hour.

Niccolò Comini, a foreign policy analyst with the American Enterprise Institute, notes, "If Russia's hybrid attacks continue, introducing a drone wall will be crucial for the cost per interception of enemy drones.

"Scrambling F-16s and F-35s against Shahed drones is economically unsustainable. In a larger conflict, as seen in the Israeli-Iranian confrontation this year, Europe would quickly exhaust expensive missile interceptors on cheap drones, and fighter jets would be diverted from more important missions."



A safety net for EU

- The 'Baltic Drone Wall' is aimed at strengthening EU's eastern border
- This initiative involves Poland, Finland, Estonia, Latvia, and Lithuania
- They are urging EU to prioritise funding for the project to deter Russia



How Eirshield works

- AI-enabled autonomous surveillance systems for continuous monitoring
- Integrated counter-drone systems (C-UAS) to neutralise drone threats
- Multilayer sensor networks for detecting and monitoring threats in the air, land, and water
- Automated interceptor drones deployed along the border for rapid response and to combat hostile drones
- Mobile anti-drone systems and platforms for flexible and rapid countermeasures in a changing environment
- All sensor and mobile unit data is fed into a central command and control system that would provide a real-time operational overview of the entire border
- As this border runs through multiple countries, the system would integrate third-party sensors, communication networks and defence systems, ensuring seamless interoperability between different countries

Source: Defence Estonia

Will the Rest of the EU Join this Project?

There is growing support among European leaders for establishing some form of drone wall along the EU's eastern border, although the 27-nation bloc denied funding for the Baltic project in March.

"The EU needs to prioritise funding for the project," Estonian defence minister Hanno Pevkur said. But while support for the idea is increasing, building an effective drone defence system will be challenging.

Defence commissioner Kubičius told Euractiv, a pan-European media network, that the EU could significantly improve its drone detection capabilities within a year. However, developing a full network across land and sea capable of tracking and destroying targets will take much longer.

Drones come in many forms, including those used for intelligence and reconnaissance that fly at high altitude, drones used in attacks, and even those tethered to thin fiber-optic cables while flying, making them impossible to jam. Russia also employs decoy drones in Ukraine that carry no payload and are designed to exhaust air defences.

Any plan to defend against drones requires a multilayered approach, including sensors, "electronic warfare... also low-cost small missiles or attack drones", Lt Gen Andrus Merilo, an Estonian military commander, told the Associated Press.

Europe needs cheaper technology to

accelerate slow production and procurement cycles, according to the officials cited above. Yet even then, drone technology is advancing so rapidly that equipment purchased now could become outdated within months.

"What I need is technology that is good enough, affordable and can be produced in mass," said Merilo. "I don't need high-end capabilities of which I can fire only one, against targets which will be attacking in hundreds."

"Russia is using drones every night in Ukraine, because each drone is a 'lottery ticket that always wins,'" said Kusti Salm, a former top official at Estonia's defence ministry.

That is because a drone either hits something or, if Ukraine shoots it down with a missile, it drains Kyiv's air defences and finances, since missiles are more expensive than drones, said Salm, who now runs Frankenburg Technologies, a company developing low-cost anti-drone missiles.

According to Salm, the EU needs to invest more in European startups, which can turbocharge drone defence production for use by allies across different weapons systems.

How to resolve the Funding Issue?

Von der Leyen is expected to propose funding options for the drone wall during an informal meeting of EU leaders in Copenhagen on October 1, two diplomats told Politico.

So far, the governments of Estonia, Latvia, and Lithuania have dedicated portions of their

national budgets to the drone wall.

Estonia has allocated €12mn over the next three years to the drone wall programme. Latvia awarded €10mn through three research contracts to Origin Robotics and other members of its Defence Industry Cluster.

Lithuania has reportedly received €11mn from the EU to purchase drones, with €3mn of that sum dedicated specifically to anti-drone equipment.

As Russian aerial aggression intensifies, Tomas Godliauskas, Lithuania's vice-minister of national defence, emphasises that Europe must adopt "semi-wartime thinking" and foster greater collaboration between the military, government, and defence industries to close its technology gap.

India Tests its Longest-Range Ballistic Missile

20 September 2025

Source: [IPDE Defence Forum](https://ipdefenseforum.com/2025/09/india-tests-its-longest-range-ballistic-missile/) | <https://ipdefenseforum.com/2025/09/india-tests-its-longest-range-ballistic-missile/>



Domestically developed Agni missiles are displayed during India's Republic Day Parade in New Delhi in January 2025. ANI VIA REUTERS CONNECT

India successfully tested another of its Agni-5, an intermediate-range ballistic missile capable of carrying a nuclear warhead into China.

India's Strategic Forces Command (SFC) launched the missile in August 2025 from a test range in the state of Odisha. India's Defence Research and Development Organisation (DRDO) developed the Agni-5, which has a range of more than 5,000 kilometers, putting it well within reach of neighboring China and Pakistan, according to The Times of India newspaper. India has long-standing disputes with both nations, which have led to deadly clashes over the years.

The launch followed a 2024 test of an Agni-5 equipped for the first time with a multiple independently targetable reentry vehicle (MIRV), the newspaper reported. A MIRV

enables a single missile to carry multiple nuclear warheads. Currently, the SFC has only single-warhead ballistic missiles, according to the newspaper.

“While the 2025 test focused on standard configurations, it builds on these [MIRV] innovations, ensuring the system's readiness for real-world scenarios,” noted an article in The National Interest magazine.

Such scenarios could include a submarine-launched version of the three-stage Agni-5, according to analysts.

“With India working on different variants of Agni with multiple capabilities, this test was a technological demonstrator for India's emerging submarine-launched ballistic missile capability,” Mansoor Ahmed, of the Strategic and Defence Studies Centre at Australian National University, told the Al Jazeera news network in August 2025.

“India's requirement for a long-range, but not intercontinental, missile is dictated by its threat perception of China,” Dr. Manpreet Sethi, a distinguished fellow at New Delhi's Centre for Aerospace Power and Strategic Studies, told Al Jazeera.

The DRDO is developing an upgraded variant of the Agni-5 with a range of 7,500 kilometers, The Times of India reported. Ballistic missiles are classified by their maximum range, with only those that can exceed 5,500 kilometers considered to be intercontinental, according to the Arms Control Association.

“India is playing catch-up as [China’s] People’s Liberation Army expands its arsenal and tensions continue to simmer along their disputed [Himalayan] border,” United States-based broadcaster CNN reported in August 2025.

China has about 600 nuclear warheads, while India has 180, according to the Stockholm International Peace Research Institute.

The latest Agni-5 test came just before Indian Prime Minister Narendra Modi’s trip to China for the Shanghai Cooperation Organization summit in September 2025. “India has been developing [the missile] as part of its nuclear deterrence capability against China,” Sethi told Al Jazeera.

Sentry is a professional military magazine published by U.S. Strategic Command to provide a forum for national security personnel.

Space

Space: India’s Fourth Warfighting Domain

Joseph P Chacko | 20 September 2025

[Source: Raksha Anirveda | https://raksha-anirveda.com/space-indias-fourth-warfighting-domain/?srsltid=AfmBOoooo0MHFUS5d4PELN6B3-QsQ6c_KGIPbzNb9w65n2uOMbUhSFk87](https://raksha-anirveda.com/space-indias-fourth-warfighting-domain/?srsltid=AfmBOoooo0MHFUS5d4PELN6B3-QsQ6c_KGIPbzNb9w65n2uOMbUhSFk87)



The Joint Military Space Doctrine, which was recently released in the Kolkata Combined Commanders Conference 2025, is a significant and strategic milestone in the formal institutionalisation of space as a critical operational domain within India’s national security and defence architecture. This doctrine has been disclosed in the context of escalating global competition in space, particularly in light of China’s accelerated development of military space capabilities and the escalating tensions in the region. It establishes space as a unique and essential domain of military operations and outlines the roadmap for the integration of space assets and functions throughout the Indian Armed Forces.

Space as a Critical Operational Domain

Space has gained recognition as an independent operational domain on par with land, sea, and air, despite being traditionally regarded as an extension of air and missile defence. Specialised strategies and capabilities are required due to the doctrine's emphasis on distinctive spatial characteristics, including orbital dynamics, electromagnetic spectrum access, and external environmental challenges. Space is now recognised as the enabler of critical functions, such as surveillance, reconnaissance, satellite communications, navigation, and missile monitoring. These capabilities are essential for command, control, and situational awareness in contemporary warfare, in addition to serving as force multipliers.

The formalisation of space as an operational domain is indicative of a strategic transition in India's approach to defence in a multi-domain battlespace, which prioritises freedom of action and dominance in space as critical components of national security.

Addressing the Emergence of Space Threats

The doctrine's publication emphasises India's acknowledgment of the changing nature of space threats, particularly those posed by regional adversaries such as China and Pakistan. New vulnerabilities have been introduced by the rapid development of anti-satellite (ASAT) weapons, satellite interference, and cyber and electronic warfare that target space assets. A strong response is required in light of China's ongoing efforts to militarise the space environment and its

demonstrated ASAT capabilities. The doctrine therefore emphasises the development of rapid response mechanisms to neutralise adversary actions, the protection of Indian space infrastructure, and the enhancement of space situational awareness to detect potential threats.

This methodology acknowledges that the operational efficacy of all domains would be substantially impaired by the disruption or degradation of space-based capabilities.

Promoting the Integration of Tri-Services

One of the doctrine's primary objectives is to promote synergy and jointness among the Indian Army, Navy, and Air Force in space operations. It is consistent with the broader initiatives to establish joint military stations and establish unified structures, such as the Tri-Service Education Corps, to facilitate interoperability. Space capabilities will provide direct support for land, sea, and air operations in an integrated manner, particularly through secure communications and intelligence, surveillance, and reconnaissance (ISR).

"India's space doctrines have been primarily fragmented among the Army, Navy, and Air Force until recently, with each service establishing its perspective and capabilities for space operations. The absence of a unified approach resulted in the formation of operational divisions, which impair the integration and coordination of space functions that are essential for the joint military's effectiveness. The new Joint Military Space Doctrine addresses this issue by integrating all three services for

integrated space operations within a cohesive framework, thereby improving India's overall defence posture in the space domain."

This integration enables the efficient utilisation of data and resources from space, thereby increasing their effectiveness in a variety of mission scenarios.

Adopting a Future Driven by Technology

The doctrine recognises that technology will influence future conflicts and underscores the importance of utilising advancements such as artificial intelligence and machine learning to improve space operations. It promotes the rapid development and deployment of indigenous space systems to reduce external dependencies, in accordance with India's Aatmanirbharta (self-reliance) vision. The doctrine also emphasises the critical importance of incorporating sophisticated electronic warfare capabilities and enhancing cyber resilience.

India will be able to effectively counter emerging threats and maintain operational agility in a swiftly evolving space environment by establishing strategic technological self-reliance.

Global and Strategic Consequences

India's defence posture is in alignment with that of global powers such as the United States, Russia, and China by institutionalising space as a military domain. These nations regard space as a contested frontier that is essential to national security. The doctrine acknowledges the strategic significance of space dominance

for the stability of the broader geopolitical landscape and regional security.

India's dedication to responsible space behaviour and its contributions to global space security and sustainable use are emphasised in addition to its assertion of sovereignty over its space assets and capabilities.

Capacity Development and Implementation

The doctrine establishes a structured roadmap for the development of capacity by implementing reforms in operational concepts, training, and force structure. The Tri-Service Education Corps and the ongoing establishment of joint military stations will institutionalise joint space operations and improve personnel readiness. The objective of these initiatives is to guarantee that space elements are thoroughly integrated into coordinated multi-domain operations, rapid decision-making, and consistent doctrine-based planning.

The necessary knowledge and skills for space-centric warfare will be provided to future military leaders and operators through reforms in training and education.

In conclusion, the Joint Military Space Doctrine is a significant development in India's defence strategy, as it acknowledges space as a sovereign and critical operational domain. The doctrine establishes a clear strategic orientation for the effective protection and utilisation of space capabilities by addressing emerging threats, promoting tri-service integration, and emphasising indigenous technological innovation. It equips India's armed forces to

operate seamlessly across multiple domains, including the increasingly contested space frontier, thereby ensuring national security and contributing to global stability in the decades ahead. This doctrine is a critical step in the development of a military posture that is future-ready and integrated and that completely leverages the strategic potential of space..

Armed Forces shape future roadmap at Combined Commanders' Conference 2025

17 September 2025

Source: [PIB | https://www.pib.gov.in/PressReleasePage.aspx?PRID=2167585](https://www.pib.gov.in/PressReleasePage.aspx?PRID=2167585)



The Combined Commanders' Conference (CCC) 2025 was conducted by the Armed Forces in Kolkata, West Bengal from September 15 to 17, 2025. As the apex-level forum of the Armed Forces, the conference brought together the highest decision-makers from the Ministry of Defence and the three Services to foster strategic & conceptual dialogue. The CCC plays a pivotal role in shaping the Armed Forces' future roadmap, enhancing jointness, guiding capability development and ensuring alignment with national security priorities. This year's theme 'Year of Reforms - Transforming for the Future' reflected a focused agenda to prepare the forces for emerging challenges.

Prime Minister Shri Narendra Modi and Raksha Mantri Shri Rajnath Singh graced the conference, lauding the exemplary dedication of the Armed Forces in safeguarding the Nation. They underlined the need for continuous reforms and technological self-reliance, particularly emphasising indigenous development in defence technology and manufacturing.

The conference commenced with a high-

impact demonstration by the Joint Operations Command Centre, followed by a live Air Defence demonstration showcasing state-of-the-art capabilities in air surveillance, missile defence and counter-drone operations. This was followed by vibrant discussions on the evolving character of future warfare, examining the shifting paradigms of multi-domain operations in the context of rapid technological advancements. A comprehensive review of major reforms of the last two years and transformational steps was carried out by Chief of Defence Staff (CDS) General Anil Chauhan which provided clarity on progress achieved.

Subsequent sessions facilitated a robust open forum discussion on the strategic neighborhood, analysing the evolving security dynamics across India's borders and beyond. Critical issues relating to procurement processes, financial powers delegation, and the challenges faced by the Armed Forces in acquiring state-of-the-art equipment were debated, with a view to enhancing efficiency and promoting transparency. The performance and future trajectory of the Ex-Servicemen Contributory Health Scheme were also reviewed, underlining that the welfare of personnel and veterans remained our central focus.

The day witnessed valuable remarks by Raksha Mantri, wherein he exhorted the Armed Forces to go beyond the traditional concepts of war and remain alert & ready to deal with invisible challenges emanating from unconventional threats such as information, ideological, ecological and biological warfare. In view of the turbulent global order, regional

instability and the emerging security landscape, Raksha Mantri emphasised the need for constant assessment of the changes taking place across the globe, and its impact on the security system of the country.

It was followed by a session led by Headquarters Integrated Defence Staff, which deliberated on translating strategic vision into actionable plans, defining the future roadmap and turning vision into executable outcomes.

Day-3 focused on understanding emerging threats and future challenges in a rapidly evolving security landscape. An insightful session by the CDS provided a detailed update on the Year of Reforms, elaborating on the action plans formulated in line with the Prime Minister's and Raksha Mantri's directions.

The discussion emphasised on enhancing jointness and integration across the Services, fostering interoperability, streamlining decision-making and reforming institutional structures for space, cyber, information and special operations domains. The session underlined the critical importance of adopting a technology-led approach to modern warfare, with innovations integrated seamlessly into operational doctrine.

The conference concluded with the CDS' remarks as he summarised key outcomes and reiterated the commitment of the Armed Forces to continually transform in order to remain agile, self-reliant and future-ready. He highlighted the need to institutionalise reforms as an ongoing process, aimed at preparing the Forces to effectively tackle challenges in an

increasingly complex global environment.

The successful conduct of CCC 2025 marks a major step in transforming the Armed Forces into a more integrated, technologically advanced, and operationally agile force - fully capable of addressing multi-domain threats, safeguarding national interests and contributing to nation building, global peace and stability.

Next Chapter in Space Defense: Satellites that Never Stop Moving

Sandra Erwin | 24 September 2025

Source: [Space News](https://spacenews.com/next-chapter-in-space-defense-satellites-that-never-stop-moving/?utm_source=linkedin&utm_medium=jetpack_social) | https://spacenews.com/next-chapter-in-space-defense-satellites-that-never-stop-moving/?utm_source=linkedin&utm_medium=jetpack_social



Illustration of in-space refueling of satellites. Credit: Orbit Fab

NATIONAL HARBOR, Md. — U.S. companies in the emerging in-space servicing, assembly, and manufacturing (ISAM) sector are working to better understand military needs as the U.S. Space Force prepares to rely on commercial firms for satellite refueling and other orbital services, industry officials said this week.

The push comes as military space operations evolve beyond traditional fixed-orbit satellites toward more agile spacecraft capable of sustained maneuvering to counter threats in space.

“When we start to talk about dynamic space operations, the ears of our U.S. Space Command and U.S. Space Force members perk up,” said Monty Greer, outreach coordinator for the COSMIC consortium at the Aerospace Corp., speaking Sept. 23 during a panel discussion at

the Air Space & Cyber conference.

COSMIC, or Consortium for Space Mobility and ISAM Capabilities, is a national coalition working to facilitate the operational, technical and policy integration of ISAM capabilities now being developed by commercial space firms. The consortium includes representatives from government, academia and private industry.

Military Terminology

Topics like “dynamic space operations” and “sustained space maneuver” are now part of regular conversations within the consortium, Greer said. These military phrases refer to the ability for satellites to conduct continuous or frequent maneuvering rather than remaining in fixed or highly predictable orbits, and to maneuver rapidly, unpredictably and frequently to counter adversary threats and enable responsive actions such as evasion and deception in orbit.

In consortium meetings, military officials stress that these capabilities go beyond simply extending satellite operational life by adding fuel, but would also enable satellites to survive threats and create challenges for adversaries, Greer explained.

Understanding military needs for in-space maneuvering and dynamic operations is important for startups and large companies that need the Space Force and U.S. Space Command as customers, he said. “The first folks who are going to want to do that, we think, are those flying U.S. government satellites.”

The commercial foundation for such services is taking shape. Companies like Northrop Grumman’s SpaceLogistics have performed in-space satellite servicing for commercial customers, and the company is preparing to deploy a new servicing vehicle in 2026.

“There’s an opportunity for the government to build on that capability, which right now we’re using for the commercial market,” said Rob Hauge, president of SpaceLogistics, at the conference.

Space Force Maj. Gen. Dennis Bythewood, special assistant to the chief of space operations, explained the military is seeking to enable the “movement and maneuver of spacecraft in order to gain some level of ability against an adversary.”

Beyond life extension

In the ISAM sector, sustained space maneuver is seen as a more advanced capability than life extension, as the military is now envisioning deploying satellites that can “take action ... maybe move to the next place and take more action. That’s sustained by refueling and refitting,” Greer said.

Unlike traditional satellites limited to occasional stationkeeping or repositioning, satellites with sustained maneuver capability can change their position and orbital path unpredictably, making them harder to target or track by adversaries.

The sensor and interceptor satellites envisioned for the Golden Dome missile

defense system may require these capabilities because they could be targeted by adversaries, Greer suggested. “We’ll see how that plays out. But I think sustained space maneuver is much more than life extension” because it takes place in a military warfighting context, he added.

Space Force Studying Requirements

Bythewood said the Space Force continues to analyze its needs and is working to define them more clearly. “In some cases, the answer is, I’m going to extend a mission that’s largely static or needs a new payload or an upgrade. Other missions are inherently driven by maneuver,” he said.

The next question is “what is the architecture that we need to put in place that will enable” sustained space maneuver, he added.

The Space Systems Command has established an office focused on space logistics, including in-orbit refueling. Separately, Bythewood said, “we’ve kicked off some concept work that will flow over the course of next year, that looks at what are the military advantages of movement and maneuver.”

“Specifically, what types of movement and maneuver within our domain drive the most military advantage, and what are the architectural choices that we’d have to put in place in order for them to be viable,” he said.

“We’re kicking off that work to really get past the ‘hey, this is a good thing,’ to specifically, what are we looking at for advantage? How would we architect this

in order to deliver that advantage, and what are the implications of that on future force structure?” Bythewood said.

Infrastructure Requirements

Hauge said achieving sustained maneuver in geostationary orbit will likely depend on technologies such as in-orbit refueling and more efficient propulsion systems, because traditional satellites are limited by their onboard fuel, which constrains both lifetime and maneuver options.

To provide sustained maneuver for satellites, especially in geostationary orbit, a dedicated logistics infrastructure is required to support refueling and repair. With civilian and commercial applications of ISAM still at the nascent stage, the industry is looking to the military to become an anchor customer.

The Space Force is funding the development of refueling vehicles and in-orbit refueling experiments. It is also supporting the development of commercial robotic servicing “space tug” spacecraft that enable in-space repair, the swapping of components, and may also help reposition satellites, manage failed or damaged units and provide spare parts in-space.

Officials and industry executives point out that sustained satellite maneuver requires a multi-layered logistics infrastructure that includes on-orbit refueling spacecraft, servicing vehicles, standardized hardware interfaces, and the industry is looking to the Space Force to help get these capabilities off the ground.

Test Case: RG-XX Constellation

A key test case for “dynamic space operations” will be whether the Space Force will have a refueling infrastructure available to support a future constellation of surveillance satellites the service already decided will need to be refueled in space.

A future constellation of satellites will be acquired in the coming years to replace the Geosynchronous Space Situational Awareness Program (GSSAP) constellation. The GSSAP satellites face significant operational constraints because they cannot maneuver due to fuel restrictions, as their limited onboard fuel severely constrains their operational flexibility and responsiveness.

GSSAP satellites are tasked with “neighborhood watch” surveillance in geosynchronous orbit, tracking objects and threats, but because they cannot maneuver freely or frequently without using up their finite fuel, their ability to respond swiftly to suspicious or threatening objects in orbit is limited, officials have said.

The new program, called RG-XX, “absolutely has a refueling requirement,” Maj. Gen. Stephen Purdy, the Space Force’s top acquisition official, told reporters Sept. 24 at the Air Space & Cyber conference. “I mandated that, and was very militant about that, to be blunt,” he said. “U.S. Space Command has been very open about that desire for on-orbit servicing and mobility.”

Commercial Service Model

Purdy, who serves as the acting assistant secretary of the Air Force for space acquisition and integration, said the plan is to select multiple satellite suppliers to build and launch RG-XX spacecraft. The program is still in the early planning stage but Purdy was clear that whoever builds these satellites will have to make sure they can get refueled so the military is able to maneuver these satellites as much as needed without worrying about running out of fuel.

“I might ask them to bring their own refueler,” he said. “I absolutely want a refueling capability.”

These RG-XX satellites illustrate the concept of sustained maneuver. They need to stay in orbit for several years and replacing them with new ones as soon as they run out of fuel is not an option, Purdy said. It would take several years to secure funding and acquire new satellites, “and it would have been a lot faster if I just had a refueler up there to refuel it,” he said. “The refueler could absolutely be contractor owned, contractor operated, and I’ll buy refueling as a service.”

Purdy noted that the use of commercial services for space maneuver and logistics is part of the Space Force’s long-term commercial strategy and the RG-XX program would help accelerate this. “So that’s a subject of active debate that we’re working on right now.”

In a First, Space Force to Require Refueling Capability for Next-Gen Neighborhood Watch Sats

Theresa Hitchens | 24 September 2025

Source: [Breaking Defense](https://breakingdefense.com/2025/09/in-shift-space-force-to-require-refueling-capability-for-next-gen-neighborhood-watch-sats/) | <https://breakingdefense.com/2025/09/in-shift-space-force-to-require-refueling-capability-for-next-gen-neighborhood-watch-sats/>



Astroscale US is building a prototype satellite for refueling other satellites on orbit under a Space Force contract worth \$25.5M. (Graphic: Astroscale US)

AFA 2025 — The Space Force’s next-generation space domain awareness satellites will be equipped with a capability to be refueled on orbit — the first time the service has put such a requirement in an official acquisition program.

“I mandated that, and was very militant about that,” Maj. Gen. Stephen Purdy, acting Air Force assistant secretary for acquisition and integration, said today.

Space Systems Command is gearing up a draft request for proposal for the RG-XX program to replace the current Geosynchronous Space Situational Awareness Program (GSSAP) constellation, in hopes of issuing it by the end of the year. While the plan is for there to be multiple providers, the Space Force intends to own and operate the

new satellites.

While the GSSAP birds have some capability to maneuver, they are constrained in how far and how fast they can move by the fact that they carry a limited amount of fuel. Being equipped to allow refueling will give the Space Force more freedom to undertake what is known as rendezvous and proximity operations to keep tabs on adversary satellites.

“To be blunt, US Space Command has been very open about that desire [for] on-orbit servicing and mobility. Given our funding situation, it’s been difficult to stand up an ... actual program. So, we’re looking at this one to kind of get our foot in the door,” Purdy told reporters during the annual Air and Space Forces Association conference in National Harbor, Maryland.

He noted that one complication is that the Space Force intends to make multiple contract awards for the RG-XX constellation, there is a strong likelihood that satellites from different vendors will use different fuels.

“And so now we’re thinking through that, okay, what does that mean? Well, I might ask them to bring their own refueler,” Purdy said. On the other hand, he said, the Space Force could simply buy services from “contractor-owned, contractor-operated” re-fueling spacecraft.

The Space Force currently has two contractors working to demonstrate re-fueling capabilities: Northrop Grumman and Astroscale US.

In addition, the Pentagon’s Defense Innovation Unit is funding Orbit Fab to place a fuel depot in orbit. Under the Space Force’s Tetra 5 demonstration project slated for launch in 2026, a small satellite will be equipped with Orbit Fab’s fuel port, called the Rapidly Attachable Fluid Transfer Interface, to dock with the DIU funded depot.

In addition, Orbit Fab is a subcontractor to Astroscale, providing refueling hardware for that company’s Space Force mission (also as part of Tetra 5).

“So that’s a subject of rapid, active debate that we’re working on right now,” Purdy said.

Israel Successfully Launches Ofek 19 Spy Satellite, an ‘Eye on our Enemies’

Stav Levaton | 03 September 2025

Source: Times of Israel | <https://www.timesofisrael.com/israel-successfully-launches-ofek-19-spy-satellite-an-eye-on-our-enemies/>



The launch of the Ofek 19 spy satellite from Palmachim air base, September 2, 2025. (Defense Ministry)

The “Ofek 19” satellite successfully launched into space late Tuesday, and initial tests showed it was performing as planned, the Defense Ministry, in collaboration with the Israel Defense Forces and Israel Aerospace Industries, announced.

The satellite, which will be used for military reconnaissance, was launched at 10:30 p.m. from Palmachim airbase in central Israel.

In an update Wednesday morning, the Defense Ministry said the spacecraft successfully entered orbit, began transmitting data, and passed a series of initial tests.

Defense Minister Israel Katz said that the successful launch served not only as a technological milestone but also as a warning to Israel’s adversaries.

“The launch of the ‘Ofek-19’ satellite yesterday is an achievement of the highest global standard... it is also a message to all our enemies, wherever they may be — we are watching you at all times and in all circumstances,” he wrote on X.

Katz also extended an invitation to regional powers to cooperate with Israel in harnessing such capabilities “for a better shared future for us all,” while stressing that Israel will continue to invest heavily in space and satellite programs to strengthen its security edge.

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The launch of the Ofek 19 spy satellite from Palmachim air base, September 2, 2025. (Defense Ministry)

The launch reportedly caused brief panic in Tel Aviv and central Israel, where residents mistook the satellite for an interceptor missile. In videos posted online, passersby could be heard wondering what the rocket launch was.

Over the past two years, amid the ongoing Gaza war, Iran-backed terror groups throughout the region have fired hundreds of ballistic missiles and rockets at Israel, most of which have been intercepted by air defense systems.

The Defense Ministry said a “Shavit” launcher lofted the satellite into space, where it entered the planned orbit.

“Ofek-19” is a synthetic aperture radar observation satellite with advanced capabilities, designed to provide high-resolution imaging for intelligence and surveillance purposes.

Engineers from the Defense Ministry's Space Department and IAI's Space Division were continuing a series of pre-planned checks before the satellite enters full operational service in the near future. Responsibility for operating it will then be transferred to the IDF's Unit 9900, which specializes in VISINT, or visual intelligence.

The launch, carried out in cooperation with the IDF and Israel Aerospace Industries (IAI), was attended by Katz, President Isaac Herzog, Defense Ministry Director General Amir Baram, head of Defense Research & Development at the Defense Ministry Danny Gold, and IAI CEO Boaz Levy.

Herzog hailed the launch as proof of Israel's innovation: "We are not only a Start-Up Nation, we are a Space Nation. Israel must be in space — that is where the future of humanity lies, and it holds the most important strategic capabilities... This is yet another proof that we are a unique and exceptional people — there is no country like Israel."

Katz called the launch "a moment of immense national pride," saying that the "Ofek-19" represents "another layer of Israel's strength even in the third circle [long-range threats], and expresses the advanced capabilities of the Ministry of Defense, the IDF, and IAI... Israel continues to soar, to lead, and to ensure our security with pride and strength."

Baram said the "Ofek-19" would serve as a "significant force multiplier" for the defense establishment, noting that "modern warfare

also takes place in space" and that Israel plans to invest billions of shekels over the next decade into building a "constellation of satellites."

Levy emphasized the satellite's day-and-night radar imaging capabilities, saying these were "more essential today, particularly following Operation Rising Lion, which highlighted... that advanced observation abilities in our region are critical for achieving both air and ground superiority," he said, referring to the brief war between Israel and Iran in June.

Earlier, Levy told Channel 13 that the satellite "will give Israel important eyes in space" and explained that it can photograph objects smaller than 50 centimeters across, day or night.

The project was developed by IAI, with contributions from its Systems, Missiles, and Space Group, the ELTA Group, and IAI's MLM Division. The rocket engines were produced in collaboration with Tomer Ltd. and Rafael Advanced Defense Systems.

The launch is part of an ongoing program led by the Defense Ministry's Defense Research and Development Directorate, in cooperation with the IDF, including Unit 9900 of the Intelligence Directorate and the Israeli Air Force.

"Ofek-19" follows "Ofek-13," which was launched in March 2023, continuing Israel's efforts to maintain advanced space-based observation capabilities, the ministry noted.

Aerospace Industry

Why the European Airports Cyber Incident is a Wake-Up Call

25 September 2025

Source: Weforum | <https://www.weforum.org/stories/2025/09/european-airports-cyber-incident-critical-infrastructure/>



An urgent wake-up call on the need to build cyber resilience across all critical infrastructure.

Travellers across Europe faced a weekend of disruption on Friday, 19 September, after airports including London Heathrow, Berlin Brandenburg and Brussels were hit by flight delays and cancellations following a cyber-attack.

The attack, believed to be a ransomware strike on aviation IT provider Collins Aerospace, targeted its widely used check-in technology. The failure forced several airports to revert to manual systems, leaving thousands of passengers stranded, resulting in queues and backlogs. While travel has largely returned to normal, the incident underlines the importance of building cyber resilience into our critical infrastructure.

Airports, in particular, pose significant cyber risks due to their complexity and highly digitized processes. As a critical part of a nation's infrastructure, the approach to securing them must reflect the reality that no system is entirely secure – a point acknowledged in the World Economic Forum's report, The Cyber Resilience Compass. This means that the focus cannot solely be on preventing attacks. It is equally vital to build resilience to ensure that when attacks do happen, their impact is minimized and critical services are maintained. This dual approach is crucial for safeguarding passenger safety, maintaining public trust and enabling long-term growth.

Unique Challenges for Critical Infrastructure

For malicious actors, critical infrastructure like airports offers a wide surface attack area. There are multiple sources of interconnected IT and operational technology, alongside the Internet of Things, controlling everything from passenger processing to air traffic control to baggage handling.

A large number of niche but critical players need to function in harmony, potentially creating very fragile systems. Often there is limited visibility into suppliers, and uneven capabilities across them can create ecosystem-wide resilience challenges.

As demonstrated by this most recent attack, single points of failure in shared systems can disrupt physical airport operations for days. The Forum's Global Cybersecurity Outlook 2025 finds that 54% of large organizations believe such supply-chain challenges are one of the

biggest hurdles in achieving cyber resilience.

“The recent cyberattack on airport check-in and boarding systems across Europe is a stark reminder that cyber resilience is a shared responsibility across the entire aviation ecosystem – including airlines, service providers, technology partners and regulators. Strengthening collaboration and preparedness at every level is essential to safeguard public trust and ensure operational continuity,” says Head of the World Economic Forum's Centre for Cybersecurity, Akshay Joshi.

This interconnectivity and dependence on third parties also means that cyber incidents can cascade across multiple systems, and affect multiple stakeholders, amplifying the effect of the initial attack. Cyber resilience relies on identifying ahead of time what the priority assets and functions are, and allocating resources accordingly.

Building Greater Resilience

Threat actors are increasingly targeting critical infrastructure in sophisticated and well-resourced ways. The threat is constant and varied; Poland, for example, reports that its critical infrastructure is hit by 20 to 50 cyberattacks per day. Furthermore, the nature of these threats is evolving beyond purely digital attacks. Recent hybrid threats in places like Denmark have involved unauthorized drone activity near key energy sites, blending physical intrusion with cyber risks. The NotPetya attack in 2017, which affected Maersk, shows how rapidly and profoundly such events can disrupt operations, costing the shipping and logistics

giant \$300 million in lost revenue and affecting 76 ports and terminals.

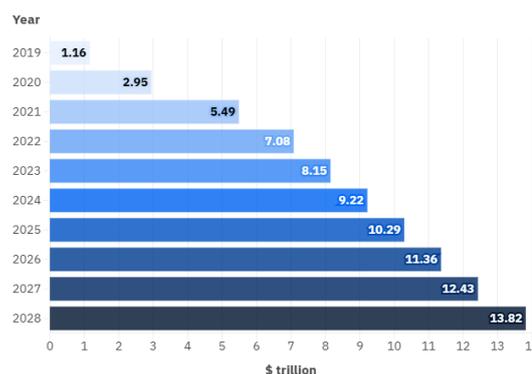
Alongside this, transport systems, particularly aviation, are rapidly adopting technology and automation, which creates increasing vulnerabilities and novel exposures.

With airports moving time-critical passengers and cargo, even short delays and disruptions have material, operational, economic and reputational impacts. To avoid safety incidents and large economic shocks, there are three key principles we need to embed end-to-end in our aviation systems to build resilience.

1. Develop a Better Understanding of Systemic Points of Failure

All stakeholders must map data flows and dependency chains, including the role that niche players have on the wider infrastructure. Real-world scenarios need to be tested for points of weakness, and any manual fallbacks – such as manual check-in systems used in the case of the most recent attack – need to be rigorously stress-tested.

Estimated Annual Cost Of Cybercrime Worldwide



Source: Statista

*A Flourish chart

2. Raise Executive Awareness and Demand for Security

Leadership at the highest level must recognize the risks posed by third-party suppliers across the supply chain. Prioritizing transparency and implementing continuous control monitoring are two essential requirements for protecting stakeholder interests.

Organizations shouldn't simply take partners at their word that their services are secure. They must insist on evidence that systems, software and services have been evaluated for security and reliability. This might include sharing a Software Bill of Materials – a detailed inventory of all of the components inside a piece of software – or penetration test summaries, which detail vulnerabilities and security issues identified during simulated system break-ins.

3. Build Collaborative Ecosystems that Bridge Cyber Inequity

Major airline operators, airports and manufacturers need to work in partnership, co-investing in security. This should include establishing baselines for critical vendors based on shared knowledge and expertise, playbooks, joint incident exercises, and secure-by-design requirements.

By collaborating in this way, organizations can help reduce the risk of cascading outages and build a defensive ecosystem that is stronger than the sum of its parts.

Amid rising geopolitical uncertainty, uneven cybersecurity across supply chains and a rapidly evolving technological landscape, building and maintaining cyber resilience has become increasingly challenging. To address these pressures, the Forum's Centre for Cybersecurity, through its Cyber Resilience in Industries initiative, is developing forward-looking solutions and promoting effective practices to strengthen the cyber defences of businesses across industries.

ISRO Inks Pact with HAL for Transfer of Small Satellite Launch Vehicle Technology

10 September 2025

Source: *The Hindu* | <https://www.thehindu.com/sci-tech/science/isro-inks-pact-with-hal-for-transfer-of-small-satellite-launch-vehicle-technology/article70034256.ece>



ISRO Chairman V. Narayanan during the signing of an agreement between NewSpace India Limited, ISRO, IN-SPACe and Hindustan Aeronautics Limited for the transfer of the Small Satellite Launch Vehicle technology. | Photo: X/@isro via PTI

This Marks a Significant Step in Industry Participation in the Space Sector

ISRO signed a formal agreement with Hindustan Aeronautics Limited (HAL) on Wednesday (September 10, 2025) for the transfer of technology for the production of Small Satellite Launch Vehicles (SSLV), marking a significant step in industry participation in the space sector.

The agreement, the 100th transfer of technology agreement facilitated by space sector promoter INSPACe, was inked in Bengaluru by the Indian Space Research Organisation (ISRO), NewSpace India Limited (NSIL) and INSPACe with Hindustan Aeronautics Limited (HAL), which outbid a

consortium led by Adani Group-backed Alpha Design Technologies.

The aim is to complete the entire technology transfer process within 24 months from the date of signing the agreement, a statement from the Indian National Space Promotion and Authorisation Centre (INSPACe) said.

During this period, ISRO will provide necessary training and technical support to HAL for acquiring the knowhow of the SSLV, it added.

“With India’s liberalisation of the commercial space sector, opportunities are certainly growing. At ISRO, we have a dynamic technology transfer mechanism to realise shared goals,” ISRO chairman V. Narayanan said.

He said ISRO would guide the HAL team on the preparedness-to-flight tangent of SSLVs that would define the next phase of deep-tech collaboration in space in India.

“ISRO, HAL, NSIL and INSPACe coming together for the SSLV technology transfer signals a vital leap towards this endeavour. It reflects the Government of India’s vision to empower the space industry and establish India as a global hub for affordable and reliable launch services,” INSPACe chairman Pawan Kumar Goenka said.

He said the agreement would allow HAL to independently take up the realisation of SSLV and cater to both domestic and international markets.

“We are honoured to be in this league to scale India’s next big frontiers with the SSLV technology by partnering with ISRO, NSIL and IN-SPACe to operationalise it,” D.K. Sunil, Chairman and Managing Director of HAL, said.

Mr. Sunil said HAL would apply its engineering and manufacturing strength to build SSLVs, train the required workforce and progress towards building a self-reliant ecosystem so that India could offer regular, cost-competitive small-satellite launches to domestic and global customers.

Rajnath Singh launches Indian company's defence unit near Casablanca

24 September 2025

Source: Times of India | <https://timesofindia.indiatimes.com/india/rajnath-singh-launches-indian-companys-defence-unit-near-casablanca/articleshow/124080891.cms>



Rajnath Singh & Moroccan trade minister Ryad Mezzour in Rabat

NEW DELHI: A modern defence manufacturing facility for armoured vehicles near Casablanca in Morocco, the first such Indian private sector plant in Africa, was inaugurated by Union defence minister Rajnath Singh and his counterpart Abdelatif Loudyi Tuesday.

The facility, set up by Tata Advanced Systems Limited, will produce wheeled armoured platforms (WhAP 8x8), which it has jointly designed with DRDO. Equipped with advanced mobility, protection and mission adaptability, the WhAP can be configured as an infantry fighting vehicle; armoured personnel carrier; reconnaissance, command post, mortar carrier; and even an ambulance. NEW DELHI: A modern defence manufacturing facility for armoured vehicles near Casablanca in Morocco, the first such Indian private sector plant in Africa, was inaugurated by Union defence minister Rajnath Singh and his counterpart Abdelatif Loudyi Tuesday.

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Singh said India's vision of 'Atmanirbhar Bharat' is not just to manufacture defence platforms and tech for its own needs, but to develop capabilities that allow the country to become a credible source of advanced technology and high-quality products for the world.

"For India, self-reliance does not mean isolation. Rather, we aim to develop strategic autonomy. We want to develop capabilities that allow us to defend our nation independently, while maintaining engagement with global partners. Along with 'Make in India', we are pursuing 'Make with Friends' & 'Make for World'," he added.

Describing the occasion as "a historic moment" in the evolving bilateral strategic partnership, Singh said Morocco's strategic location as a gateway to Africa and Europe makes the TASL facility an important hub for exports and collaboration.

Spread over 20,000 square metres, the facility will begin delivering WhAP 8x8 vehicles to Royal Moroccan Army from next month.

L&T, BEL in Strategic Partnership to Support Air Force's Advanced Medium Combat Aircraft Programme

24 September 2025

Source: ANI News | <https://www.aninews.in/news/national/general-news/lampt-bel-in-strategic-partnership-to-support-air-forces-advanced-medium-combat-aircraft-programme20250924112634/>



Larsen & Toubro signs a strategic partnership deal with Bharat Electronics Ltd (Photo/@larsentourbo)

Mumbai (Maharashtra) [India], September 24 (ANI): Larsen & Toubro (L&T) has formed a strategic partnership with Bharat Electronics Limited (BEL) to support the Advanced Medium Combat Aircraft (AMCA) programme of the Indian Air Force, a press release said.

The consortium will participate in the Expression of Interest notice issued by the Central Government's Aeronautical Development Agency by submitting a response in the coming weeks.

According to the press release by L&T, the partnership will leverage the firm's expertise in developing strategic defence and aerospace platforms, along with BEL's experience in defence electronics and systems, to jointly contribute to India's 5th-generation fighter aircraft.

The collaboration aims at advancing

India's defence capabilities in line with the government's vision for an 'Atmanirbhar Bharat' (self-reliant India).

In the past, L&T and BEL have played a pivotal role in India's indigenous Light Combat Aircraft programme by supplying major aero-structure modules and developing mission-critical avionics and electronic systems, the press release stated.

Building on this legacy, the consortium will bring proven expertise and commitment to the timely delivery of world-class defence and aerospace platforms for the Indian Air Force.

Commenting on the development, SN Subrahmanyam, Chairman and Managing Director of L&T, said, "The collaboration with BEL marks a significant leap in our commitment to the modernisation of India's defence capabilities. We are honoured to be

working with BEL to deliver next-generation technologies for the Indian Air Force. Both the organisations are leaders in our respective domains, and our combined efforts will play a crucial role in bolstering national security and advancing self-reliance in defence technologies".

Manoj Jain, Chairman and Managing Director of Bharat Electronics Limited, said: "The AMCA project represents India's growing capabilities in defence technology. Our collaboration with L&T is a crucial step in realising this vision. With L&T's engineering and systems integration capabilities and BEL's expertise in defence electronics, we are confident of delivering a world-class solution that will serve the Indian Air Force for decades to come". (ANI)

“Airpower both supports and is supported by land power and sea power (and space power and cyber power).”

- 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).

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