



**CENTRE FOR AIR POWER STUDIES (CAPS)**

Forum for National Security Studies (FNSS)

# AEROSPACE NEWSLETTER



Image Courtesy: OrbitsHub.com

*The Indian Air Force marked a significant milestone with the successful conclusion of the first phase of 'Tarang Shakti,' India's largest multinational air exercise.*

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*“Exercise Tarang-Shakti tests coordination among diverse aircraft formations. Key challenges include managing data links and ensuring seamless communication, with the goal of enhancing operational efficiency.”*

*- Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC*

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## Opinions and Analysis

### IAF's Heft Shows in West's Keeness on Joint Exercises

*Air Vice Marshal Anil Golani (Retd)*

*Director General, Centre for Air Power Studies |  
03 September 2024*

*Source: Hindustan Times | <https://www.hindustantimes.com/opinion/iafs-heft-shows-in-west-s-keenness-on-joint-exercises-101725376736208.html>*



*Jodhpur: Indian Air Force (IAF) personnel during a group photo at the inauguration ceremony of Tarang Shakti 2024, at the Jodhpur Air Force Station, in Jodhpur, Friday, Aug. 30, 2024. (PTI Photo)*

*(PTI08\_30\_2024\_000251B) (PTI)*

The recently concluded first phase of the Tarang Shakti exercise was the first-ever multilateral air force exercise conducted by the Indian Air Force (IAF) after more than six decades. The last such exercise, Shiksha, was conducted in 1963, after the 1962 Indo-China conflict — with the American, British, and Australian air forces participating in it. With the French Air and Space Force, the German Air Force, the Royal Air Force of the UK, and the Spanish Air and Space Force taking part this time, it marked a new beginning for the IAF. The chiefs of the German, Spanish, and French air forces participated in the exercise.

In July 2004, six Jaguar aircraft of the IAF

flew across the Atlantic to participate in Cope Thunder, a multilateral exercise organised by the US's Pacific Air Force. The IAF has come a long way since. Having taken part in numerous exercises across the globe and having conducted bilateral exercises with the air forces of the UK, the US, Russia, the UAE, Egypt, Australia, Saudi Arabia, Israel, and many others, the IAF is much sought after as a participating force for joint exercises. Air forces the world over understand that they would be the first responders in any conflict, natural calamity, or disaster — due to the inherent attributes of speed, agility, stealth, and precision. Multilateral exercises with friendly foreign countries not only ensure interoperability but also enhance bonhomie amongst participants of different nations, lead to a better understanding of each other's capabilities and limitations, and enhance operational synergy.

Carrying out large force engagement (LFE) exercises, refuelling mid-air from each other's tankers, and operating under the airborne warning and control systems (AWACS) of different air forces with their mission commanders gives a great deal of confidence to the participating crew of different nationalities apart from enhancing air situational awareness under dynamic conditions. Exercises such as these are rare opportunities that test the planning, preparation, operational readiness, and response of air forces in a spirit of healthy competition, preparing them for unforeseen contingencies should the need arise.

Tarang Shakti's second phase commenced on August 30, with the participation of forces from the US, Australia, Greece, Singapore, Japan, Sri Lanka, and the UAE, apart from

observers from many other friendly foreign countries. Bangladesh, which was scheduled to participate in the second phase, has withdrawn due to political uncertainty and turmoil in the country. With seven nations participating with their air assets in this exercise, the IAF is going to field its indigenous Tejas LCA apart from Rafale, Su 30, Jaguar, Mirage 2000, and Mig 29 aircraft along with its AWACS, including the indigenous Netra AEW & C aircraft. F-16s from the Hellenic Air Force and the USAF, F-18s from the Royal Australian Air Force, Mitsubishi F-2 fighter aircraft from the Japan Air & Self Defence Force (JASDF), and A-10s of the USAF are going to participate in this phase, which will also witness live firing by IAF aircraft. The exercise is going to witness several LFE missions, including some that will be long (through the night). This is going to be the first time that Greece's air force will participate in a military exercise in India, after IAF's participation in the Iniochos exercise hosted by Greece in April 2023.

The exercise is going to test the mettle, skill, and professionalism of all participating nations while honing their ability to operate in a multinational environment with large forces. While the western air forces are used to operating together on a regular basis in an airborne networked environment with common and interoperable communication links and operating bases, the IAF needs to fast-track operationalisation of its airborne network-centric capability and secure communication links, including software-defined radios (SDR). The increasing demand of foreign air forces to exercise with the IAF bears testimony to the professionalism of its air warriors and the

growing stature of India in the emerging world order. Multilateral exercises such as Tarang Shakti serve as a beacon of hope and resolve for participating friendly foreign forces and send a strong strategic signal of deterrence to inimical forces and hegemonies that do not wish to abide by a rules-based world order.

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## The Rising Wave of Air Power -Exercise Tarang Shakti

*Air Marshal (Dr) Diptendu Choudhury (Retd)*  
*PVSM, AVSM, VM, VSM | 25 August 2024*

*Source: Chanakyaforum | <https://chanakyaforum.com/the-rising-wave-of-air-power-exercise-tarang-shakti/>*



The largest-ever International Air Exercise that mainland Asia has seen in over six decades is underway as the Indian Air Force hosts friendly foreign Air Forces from thirty nations, ten as active participants, and the rest as observers. Exercise Tarang (Wave) Shakti completed its extremely successful first phase from August 6 to August 16 in the azure, blue skies over Sullur airbase situated in Tamil Nadu in the south, where France, Spain, Germany and the UK flew together with the IAF. The intervening break in the exercise has been factored to enable the second set of countries taking part, which include the USA, Australia, Japan, Singapore, Bangladesh, UAE and Greece, along with the

large number of observer nations, to position and prepare for the second phase from August 29 to September 14, in Jodhpur airbase in Rajasthan. The large participation of nations despite the wars and conflicts underway in the world, underscores the international acknowledgement of the current and future salience of air power in national security.

Interestingly, the last time an air exercise of this scale was held in India was over six decades ago after the 1962 war with China, when the national leadership eschewed from committing IAF's offensive air power in the debacle. It remains an unforgivable strategic mistake paid for in blood and continues to haunt us even today. Consequent to Prime Minister Nehru's appeal to the US for assistance in bolstering India's air defence, Air Forces from the USA, UK, and Australia came together for Exercise Shiksha way back in November 1963, in a world divided by the Cold War. Though the exercise was kept politically low key, it was a stark reminder of the disastrous consequences of not committing the combat proven air power of a nation in its defence. It also highlighted the vital necessity of a strong Air Force in India's continental security, an enduring lesson that is increasingly relevant in today's tenuous regional dynamics. However, unlike the past when the leading Air Forces of the time had brought their assets and personnel to train, exercise, and augment the nation's air defence capability, this time the narrative is different. The number of Air Forces bringing in their latest air power assets to exercise with the IAF is a recognition and acceptance of India's growing power trajectory and of its military capability.

This has not happened overnight, as the experience gained by the IAF's participation in 91 bilateral and multilateral exercises over two decades, with almost all the leading Air Forces in the world, has paid enormous dividends. The Service earned a formidable reputation way back in 2004 in Exercise Cope India with the US, where the professional skills and innovative tactical agility of our aircrew flying legacy platforms, surprised the most powerful Air Force in the world. Since then, from Alaska in the US, France, the UK, and Greece in Europe, to Russia, Japan, Australia, the Middle East, and Southeast Asia, the IAF has notched up many friends in places. These engagements over the years have not only created unique 'air bridges of friendship' to strengthen our foreign policy and diplomatic initiatives, but they have also created opportunities for the exchange of contemporary and future relevant air power employment concepts and operational solutions, through the sharing of best practices. The international exposure has gone a long way to ensure the IAF's contemporary operational capabilities remains honed, and that its doctrine and strategy remain agile and future relevant.

India's geography and the complex political and security dynamics of the sub-continent present a unique threat paradigm, where the nation is faced with two nuclear-armed adversaries with strong Air Forces. The criticality of the asymmetric air power advantage which the vertical dimension provides in a nation's conventional deterrence capability, that was amply evident in the Doklam and Galwan border standoffs against China, serves as a much needed refresher in India's future continental security outlook. Cognisant of this, the PLA Air Force has stepped up its

infrastructure and capacity development in Tibet, to neutralize India's current operational air power advantage in the high altitudes. The PLAAF which last saw combat in the Korean War in the fifties, had very little exposure to how other Air Forces train and fight, and has sought to increase its participation in exercises internationally. It participated first in Exercise Peace Mission with Russia under the aegis of the Shanghai Cooperation Organisation in 2007 and has since expanded its role in foreign military exchanges by attending international air shows and competitions since 2013. It has engaged with Pakistan, Turkey, Malaysia, and Thailand to widen its professional exposure, and conducts regular bi-laterals with Pakistan and Thailand. The tenth iteration of the bilateral Exercise Shaheen with Pakistan in 2023, and the very recently concluded fifth bilateral Exercise Falcon Strike with Thailand, have served to enhance the PLAAF's operational ability.

Today there is a wide-spread recognition of the future relevance which the aerial dimension and the multi-domain air power capabilities bring to the table of comprehensive national power, not just as a military instrument, but also as a political and diplomatic one. The large participation in Tarang Shakti thus underscores the acceptance of India's growing power in a world where China's rapid military growth, great power ambition, and coercive foreign policy actions, have created serious concerns worldwide. Multi-lateral air exercises allow nations the choice of participating in varied operational training scenarios, ranging from large-scale complex combat employment missions, to combat support roles, or simply as observers. They also provide a multitude of

cooperative options in the soft power spectrum like humanitarian assistance, disaster relief, mass evacuation, medical and logistic support, etc. Prior to the actual exercise, mission planning teams from different Air Forces rub shoulders to create realistic set-ups catering to the various platform types, as well as formulate mutually acceptable rules of engagement that balance mission objectives and mission safety. Blue and Red teams simulating friendly and opposition forces, carry out missions in near realistic conditions with and against different platform types and combat systems, weapon capabilities, and employment concepts, under the close and watchful eye of the White Force, who act as umpires to oversee the conduct and ensure key lessons and outcomes emerge.

Tarang Shakti opens the possibility of a much-needed air power employment in the maritime domain, to create a game-altering collective deterrence strategy in the regional security matrix among the nations affected by China's military coercion. Considering the number of regional and extra-regional Air Forces, and the IAF's engagement and relations with most of them, leveraging air power to bolster the net security of the region is a strategic opportunity to India's advantage. It can play a significant out-of-the-box strategic role regionally by exploiting its AF to AF connects towards building a deterrent cooperative air power capability, by enhancing and exploiting air power interoperability and inter-usability with these nations. From conducting training and exercises, capacity building, export opportunities for our aeronautical and defence industrial base, to potential joint tasks and missions in the future, the exercise provides

many options for enhancing India's regional engagement. The demonstrated excellent performance of the Tejas fighter, which more than held its own among some of the best current fighters in the realistic operational scenarios, has validated the potential of the nation's aviation industry.

As the first phase of the exercise drew to a close in Sullur, the never-before four-aircraft formation flypast flown by the Air Chiefs of France, Germany, Spain, and led by the IAF Chief, stood testimony to India's rising power stature. The second phase will commence shortly with a different and larger set of players and platforms, to engage in a more intense and complex set of mission profiles over the two-week duration. From a strategic perspective, this major exercise provides a framework for nations vested in enhancing the regional stability and security. Unlike the continental threat which is India-exclusive, the maritime security of the Indian Ocean region and the Indo-Pacific construct include a large number of nations with common interests toward countervailing the Chinese domination of the Asian waters. Inclusion of the significant land-based air power capabilities of the regional and other friendly Air Forces to collectively leverage the vertical dimension, will infuse a much-needed multi-domain multi-nation approach to strengthen India's Security and Growth for all in the Region (SAGAR) strategy. As participating Air Forces fly together in the inaugural biennial Exercise Tarang Shakti, the most invaluable outcome will be the building and strengthening of mutual trust, respect, and friendship, which furthers India's standing as a major power committed to the stability and security of the region.

## Air Power

### India's Multi-National Air Exercise 'Tarang Shakti 2024' begins in Coimbatore

06 August 2024

*Source: The Hindu* | <https://www.thehindu.com/news/cities/Coimbatore/indias-multi-national-air-exercise-tarang-shakti-2024-begins-in-coimbatore/article68493291.ece>



*German Air Force Chief Lt. Gen. Ingo Gerhartz arrived at the Sullur Air Base in Coimbatore on Tuesday, flying a Eurofighter Typhoon. | Photo Credit: SPECIAL*

#### ARRANGEMENT

'Tarang Shakti 2024', an international air exercise, began at the Sullur Air Base in Coimbatore district on Tuesday, August 6, 2024.

The exercise kick-started with a welcome formation by four Tejas aircraft that intercepted and escorted the German Air Chief, Lieutenant General Ingo Gerhartz, who flew alone five hours straight to the base.

Speaking to the media, Air Chief Marshal V. R. Chaudhari said, "The exercise tests coordination among diverse aircraft formations. Key challenges include managing data links and ensuring seamless communication, with the goal of enhancing operational efficiency."

The Sular Air Base is a unique environment to test these capabilities, he added.

He also highlighted the growing opportunities for the defence sector in India, with the exercise potentially opening avenues for co-production internationally. “Upcoming international defence expos are planned to display defence equipment from other nations to foster business ventures,” he highlighted.

Regarding Germany’s first participation in large-scale aerial exercises globally, Mr. Gerhartz explained that this marks its fifth exercise in 2024 and the largest deployment of German air assets in an exercise. “India’s capability and commitment to global defence cooperation makes it an attractive partner for multinational exercises,” he said.

Indian air assets and fighter jets including Su-30MKI, Tejas, Rafale, Mirage, and MiG-29K will take part in the exercise that will go on till August 13. Thirty countries, including the U.S., Germany, France, Australia, UAE, and Singapore, will showcase their fighter jets.

The second phase of the exercise will be held from August 29 to September 14 at the Rajasthan Air Base.

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## Bangladesh Opts out of Multinational Air Exercise Tarang Shakti, Sri Lanka Steps in

Shivani Sharma | 30 August 2024

Source: [India Today](https://www.indiatoday.in/india/story/bangladesh-opts-out-of-multinational-air-exercise-tarang-shakti-sri-lanka-steps-in-2590859-2024-08-30) | <https://www.indiatoday.in/india/story/bangladesh-opts-out-of-multinational-air-exercise-tarang-shakti-sri-lanka-steps-in-2590859-2024-08-30>



*The second phase of Tarang Shakti, the largest multinational air exercise hosted by India, will be held from August 30 to September 14.*

In a last-minute decision, Bangladesh has opted not to deploy its C-130 aircraft for the second phase of the multinational air exercise, Tarang Shakti, which begins today in Jodhpur. The decision marks a significant change in Bangladesh's participation, as the country was initially slated to bring its C-130 aircraft to the exercise. However, officials from the Bangladesh Air Force will be a part of the Exercise as observers.

Filling the gap left by Bangladesh, Sri Lanka has stepped in to participate with its own C-130 aircraft, marking its involvement in this phase of the exercise.

The second phase of Tarang Shakti, the largest multinational air exercise hosted by India, will be held from August 30 to September 14, with the daredevil stunts of fighter jets from

Australia, US, Greece, Bangladesh, Singapore, and the UAE highlighting the event.

The air exercise marks Greece's first-ever participation in a military exercise in India, following the strengthening of military relations between the two countries in April 2023.

India will be showcasing a range of its advanced military assets, including the LCA Tejas, Su-30 MKIs, and Rafales, during the exercise. With over 18 nations participating and around 67 fighter jets involved, Tarang Shakti 2024 highlights India's growing role as a key player in fostering multinational defence cooperation and enhancing interoperability among the participating air forces.

Air Forces from 10 countries are participating with their assets while others are a part of Tarang Shakti as observers. Australia's F-18, Sri Lanka's C-130, Greece's F-16, and the USA's A-10 and F-16 will be showcasing their capabilities in Indian skies close to the western border.

The Indian Air Force will participate with Rafale, Sukhoi, Mirage, Jaguar, Tejas, MiG-29, Prachand and Rudra attack helicopters, ALH Dhruv, C-130, IL-78, and AWACS assets.

The Air Force Chiefs of the participating countries will also be present during the exercise. The first phase of Tarang Shakti was conducted in Tamil Nadu's Sullur during August 6 to 14 with France, Germany, Spain, and UK participating in the air exercise.

This phase of Tarang Shakti, hosted by the Indian Air Force, will focus on enhancing interoperability and strengthening defence ties

among the participating nations, with operations scheduled to take place near India's western border. The exercise remains a crucial platform for fostering multinational cooperation in the region.

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## India Debuts New 'Swadeshi' Kamikaze Drones with 1,000 km Range; Cutting-Edge Answer to Modern Warfare

14 August 2024

Source: *The Economic Times* | [https://economictimes.indiatimes.com/news/defence/india-debuts-new-swadeshi-kamikaze-drones-with-1000-km-range-cutting-edge-answer-to-modern-warfare/articleshow/112526356.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/defence/india-debuts-new-swadeshi-kamikaze-drones-with-1000-km-range-cutting-edge-answer-to-modern-warfare/articleshow/112526356.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)



'Swadeshi' Kamikaze drones

As India gears up to celebrate its 78th Independence Day, the National Aerospace Laboratories (NAL) has announced a groundbreaking development in the country's defence arsenal: fully indigenous kamikaze drones. These "do-and-die" unmanned aerial vehicles (UAVs) are designed with the capability to strike enemy targets with precision and are seen as a significant advancement in India's defence technology.

### Design and Capabilities: Engineered for Precision

The Indian kamikaze drones, each

approximately 2.8 meters in length with a wingspan of 3.5 meters, weigh around 120 kilograms. These drones are powered by a 30-horsepower Wankel Engine, a creation of NAL, enabling them to reach speeds of up to 180 kilometers per hour. With a range of up to 1,000 kilometers, these UAVs are equipped to carry an explosive payload of 25 kilograms, making them formidable in any combat scenario.

### **Loitering Munitions: A Modern Warfare Tool**

Kamikaze drones, also known as loitering munitions, have gained prominence in contemporary conflicts, including the ongoing Russia-Ukraine war and the Israel-Hamas conflict in Gaza. These drones have been extensively used by Ukrainian forces to target Russian infantry and armored vehicles. They are designed to loiter over an area of interest for extended periods, carrying explosives and awaiting commands from human controllers to strike specific targets. These drones can also be deployed in swarms, overwhelming enemy defences and radars.

### **Project and National Security: A Collaborative Effort**

The development of these indigenous drones is part of a broader initiative led by the Council of Scientific and Industrial Research (CSIR), which has given in-principle approval for the project. CSIR-NAL serves as the nodal laboratory, with participation from major engineering labs across the country. The goal is to address India's national security needs by developing a robust and reliable defence technology that can be deployed in various

combat scenarios.

### **Enhanced Features: GPS-Denied Operations**

One of the key features of these drones is their ability to operate in GPS-denied environments. Equipped with the Indian NAViC system, these UAVs can navigate and acquire targets even in areas where GPS signals are jammed or unavailable. This capability significantly enhances the drones' operational flexibility, making them suitable for a wide range of combat situations.

### **Expert Opinion: A Game-Changing Technology**

Dr. Abhay Pashilkar, Director of NAL and the leading force behind the research, emphasized the significance of these drones in modern warfare. "India is developing these fully indigenous kamikaze drones; they are a game-changing 21st-century new-age war machine," he told NDTV. He further explained that the Indian loitering munition would have an endurance of about nine hours, allowing it to continuously hover in the area of interest. "Such drones deployed by other nations have shown great potential in the modern ongoing wars elsewhere," Dr. Pashilkar added.

### **The Kamikaze Legacy**

The concept of kamikaze missions is not new; it dates back to World War II when Japanese pilots would ram their planes into Allied forces, sacrificing themselves to inflict maximum damage. The modern kamikaze drones, however, are unmanned and remotely controlled, allowing for precise strikes without

risking the lives of pilots.

## A New Era in India's defence

The unveiling of these indigenous kamikaze drones marks a significant milestone in India's defence capabilities. As the nation celebrates its Independence Day, the development of these advanced UAVs reflects India's commitment to strengthening its national security and enhancing its technological prowess. With the potential to redefine modern warfare, these drones are set to play a crucial role in the country's defence strategy, ensuring that India remains at the forefront of global defence technology.

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## UK to Build F-35-Sized 'Silent Hangar' to Test Jamming, Electronic War

Rudy Ruitenberg | 21 August 2024

[Source: Defence News | https://www.defensenews.com/global/europe/2024/08/21/uk-to-build-f-35-sized-silent-hangar-to-test-jamming-electronic-war/?utm\\_source=sailthru&utm\\_medium=email&utm\\_campaign=c4-overmatch](https://www.defensenews.com/global/europe/2024/08/21/uk-to-build-f-35-sized-silent-hangar-to-test-jamming-electronic-war/?utm_source=sailthru&utm_medium=email&utm_campaign=c4-overmatch)



A U.S. HH-60W helicopter hangs in an anechoic chamber at Eglin Air Force Base, Fla., in 2020. The British Ministry of Defence announced plans in August 2024 to build a similar, aircraft-sized facility to test systems' defenses against electronic warfare. (U.S. Air Force photo by Samuel King Jr.)

PARIS — Britain's Ministry of Defence

plans to build a hangar-sized isolated chamber big enough for F-35 jets and Chinook transport helicopters to test its military assets against GPS jamming and other types of electronic warfare.

U.K. firm QinetiQ will build the "silent hangar" at the ministry's Boscombe Down site in south-west England under a £20-million (US\$ 26 million) contract, the ministry said in a statement Wednesday. The anechoic hangar is due to open in 2026 and will be one of the biggest in Europe, far bigger than existing facilities in Britain, the ministry said.

Electronic warfare has become a near-constant feature of the war in Ukraine, where Russia jams GPS frequencies to disrupt the accuracy of Western-supplied guided missiles, and both sides use jamming to down drones. Meanwhile, Russian jamming of GPS signals around the Baltic Sea has been a regular source of disruption for civilian aviation there.

"Hostile threats jamming GPS to disorientate military equipment has become increasingly common," Minister for Defence Procurement and Industry Maria Eagle said in the statement. "This cutting-edge test facility will help us eliminate vulnerabilities from our platforms."

The hangar will be used to test the integrity of U.K. military equipment without the testing affecting other users such as emergency services and air-traffic control, the ministry said.

The chamber will be big enough to fit equipment including the F-35 jet, Chinook helicopter and the MQ-9B Protector drones

operated by the U.K., according to the ministry. The F-35 has a length of 15.7 meters, the Protector has a 24m wingspan, while the Chinook stands 5.68m tall.

“Not only will this be one of the largest such chambers in Europe, but it will also be one of the most up-to-date and high-tech in the world, where hostile environments can be safely recreated to put military equipment, such as fighter jets and drones, through testing,” said Richard Bloomfield, the head of Electronic Warfare Space at the UK’s Defence Equipment and Support.

The isolated hangar will reduce reflections and the escape of radio-frequency waves, while GPS simulators and threat emulators in the chamber will be able to create various hostile environments to test how well equipment can withstand jamming and other threats, the ministry said.

With GPS jamming “well documented,” the new facility will be vital to help keep U.K. armed forces safe, Broomfield said.

The war in Ukraine and China’s military modernization have renewed interest in high-end electronic warfare, and there is catching up to do, International Institute for Strategic Studies editor Robert Wall wrote in August last year. The U.S. Army has said observations from the Russia-Ukraine war are driving its development of jammers, and the service is again prioritizing electronic warfare after decades of neglect.

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## Ukraine F-16 Destroyed During Russian Attack

Ruth Comerford and Nick Beake | 29 August 2024

Source: [BBC](https://www.bbc.com/news/articles/cd0532n9pdko) | <https://www.bbc.com/news/articles/cd0532n9pdko>



*President Volodymyr Zelenskiy speaks to the media in front of an F-16*

One of the F-16 fighter jets sent from NATO allies to Ukraine has been destroyed, a Ukrainian military source has told the BBC.

The aircraft went down amid a barrage of Russian missiles on Monday, killing pilot Oleksiy Mes, Ukraine's military said. It marks the first loss of its kind since the planes were delivered earlier this month.

The cause of the crash was not a direct result of an enemy missile strike, the Ukrainian military claims.

It said the pilot destroyed three cruise missiles and one drone in Russia's largest aerial attack to date.

### Ukraine Receives First F-16 Fighter Jets

"Oleksiy saved Ukrainians from deadly Russian missiles," the Ukrainian Air Force wrote in a statement on social media.

"Unfortunately, at the cost of his own life."

The statement did not specify the type of plane involved, but a military source told the BBC the pilot was flying an F-16.

Ukrainian President Volodymyr Zelensky officially confirmed on Tuesday the US-made F-16s were being deployed to shoot down Russian drones and missiles.

This week, he asked allies to allow Ukraine to use long-range missiles to hit targets further into Russia.

Dutch Chief of Defence Gen Onno Eichelsheim confirmed the Netherlands will provide Ukraine with 24 of the jets, in addition to more weapons.

There will be no restrictions on their usage apart from complying with humanitarian law, he told a conference in Washington on Wednesday - meaning Kyiv could launch deeper strikes into Russian territory.

Around 65 F-16s have been pledged by NATO countries since US President Joe Biden first authorised willing European allies to send them to Ukraine in August 2023.

Ukraine's F-16s work alongside a limited number of Western-supplied surface-to-air missile systems such as Patriot and NASAMS which are already on the ground.

They also help defend against Russian glide bombs - dumb munitions fitted with pop-out wing kits and guidance modules to deliver precision strike stand-off capabilities, similar to the JDAM munitions from the United States.

The destruction of the aircraft is a blow to President Zelensky, who said he will deliver a "victory plan" to US President Joe Biden next month.

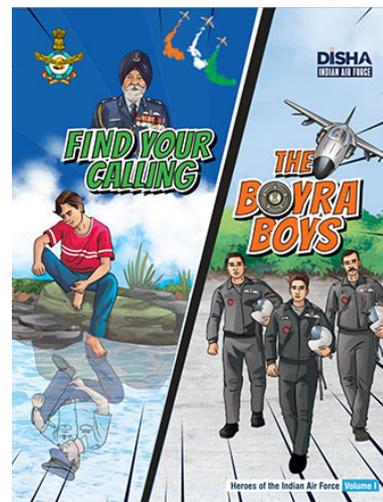
He also revealed Ukraine had recently carried out the first successful test of a domestically-produced ballistic missile, but declined to share any more details.

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## Air Chief Marshal VR Chaudhari Launches the First Comic Book in the Series "Heroes of the Indian Air Force"

28 August 2024

Source: ANI News | <https://www.aninews.in/news/national/general-news/air-chief-marshal-vr-chaudhari-launches-first-comic-book-in-series-heroes-of-the-indian-air-force20240828231511/>



Air Chief Marshal VR Chaudhari launches first Comic Book in series "Heroes of the Indian Air Force"

Read more At:

New Delhi [India], August 28 (ANI): Air Chief Marshal VR Chaudhari, Chief of the Air Staff, Indian Air Force launched the first Comic book in the series "Heroes of the Indian Air Force" on Wednesday.

Anubhav Khanduri General Manager of

National Film Development Corporation of India and his team played a key role in the development and design of the book.

The officials said that it was the vision of the Chief of the Air Staff that heroic narratives of the Air Force's role in the war and the annals of national history be depicted through the medium of comic books.

This may foster a sense of duty and aspiration. Driven by the values and stories narrated, young readers may envision themselves as future Air Force officers.

The combination of visuals and narrative helps simplify complex historical events, making them more accessible to children. The engaging format improves retention and understanding, as visual elements enhance memory and comprehension. Most importantly, comics spark an emotional connection with the content. By presenting historical figures and events through relatable characters and thrilling stories, children are more likely to feel inspired and motivated. The depiction of real-life heroes and significant events in an entertaining format helps children see the human side of history and understand its relevance.

The task of developing the comic book was achieved through the National Film Development Corporation of India. The creatives and storyline were developed by Rogue Communications, an agency empanelled under the same. This is a 32-page book, narrating two stories.

The first story, 'Find your Calling' is about the Life of the Marshal of the Air Force Arjan

Singh Distinguished Flying Cross, one of the most compelling figures in the history of the Indian Air Force. Not only did he hold the highest rank an IAF officer can achieve, but his life was also characterised by bravery, leadership, and vision.

As per the officials, the story begins with his early days, illustrating his journey from a young cadet to becoming The Marshal of the Air Force. The narrative highlights key events such as his role in crucial operations in the North Western Frontier Province, the Burma Campaign of World War II, and the 1965 Indo-Pak War. The story celebrates his heroism, leadership qualities, and dedication to the Air Force and the nation. His journey from a cadet to a Marshal of the Air Force serves as an inspiration of how commitment, hard work, and a life based on strong values and principles can lead to extra ordinary achievements.

By presenting the life story of the Marshal of the Air Force Arjan Singh, children can better appreciate the values of leadership, courage, and perseverance, and be motivated to walk in his footsteps.

The second story is titled The 'Boyra Boys'. It is a narration of an epic air battle in Indian Air Force war history, the Battle of Boyra, during the 1971 Indo-Pak War. This air combat engagement was a significant demonstration of the fighting prowess and valour of young pilots of the No. 22 Squadron 'Swifts', which earned the squadron the moniker 'Sabre Slayers'.

The story contains adrenaline-pumping action sequences as seen through the pilots' eyes, allowing the readers to experience the

events first hand. This not only educates young readers about a critical historical event but also emphasizes the heroism associated with air combat. It depicts all that is patriotic, brave, professional, and what embodies the spirit of 'youth'. For the youngsters, it is a direct call to action.

The book also gives out information about career choices in the Indian Air Force and the associated eligibility criteria.

The comic book is for free circulation to the target audience of young children. The distribution will be achieved through Command HQs and AF Stns, as a part of publicity interactions, and through the IPEV drives. A PDF version of the comic book will also be available for free sharing on Digital Media.

The comic book will educate the youth of the nation about the glorious history of the IAF, and encourage them to be a part of this proud organisation. The copies of the book were presented to the principals of The Air Force School, Air Force Golden Jubilee Institute and Air Force Bal Bharti School. (ANI)

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## Space

### U.S. Military Space Domain Awareness Lags Behind Expectations

Sandra Erwin | 26 August 2024

Source: *Space News* | <https://spacenews.com/u-s-military-space-domain-awareness-lags-behind-expectations/>



*Illustration of Earth orbit. Credit: EUSST*

WASHINGTON — Despite the creation of the U.S. Space Force and increased attention on space as a critical domain for national security, the U.S. military is struggling to innovate in the crucial area of space domain awareness (SDA), experts said Aug. 26.

SDA, which encompasses the monitoring, tracking, and identification of objects in Earth orbit, remains largely confined to basic cataloging functions, falling short of the predictive and analytical capabilities needed in an increasingly congested and contested space environment, said retired U.S. Space Force general John Shaw, a former deputy commander of U.S. Space Command.

Speaking at a SpaceNews webinar titled “Space: The Next Frontier of Strategic Competition,” Shaw lamented a lack of significant progress in SDA techniques.

“We still have a capability lag,” Shaw stated, noting that despite five years of discussion about improving SDA since the establishment of new military space organizations, “the capability that’s being delivered to Space Command today isn’t significantly different from what existed five to seven years ago.”

Shaw likened current SDA efforts to “searching for our keys under a streetlight,” suggesting that the military is focusing on easily accessible data rather than tackling the more challenging aspects of space monitoring. He emphasized the need to move beyond simple cataloging to “dynamic tracking of hard to detect and track targets in non-standard orbits.”

At the same time, Space Force leaders have stressed the critical nature of SDA for national security. As space becomes more crowded with both active satellites and debris, and as potential adversaries develop anti-satellite capabilities, the ability to accurately track and predict the behavior of objects in orbit becomes increasingly vital, officials said.

Brian Weeden, systems director at the Aerospace Center for Space Policy and Strategy, provided historical context for the current challenges. He noted that over the past decade, there have been multiple attempts to shift focus from simple “space surveillance” to a more comprehensive “space situational awareness” and now “space domain awareness.” However, these nomenclature changes have not resulted in the desired cultural and capability shifts.

“Here we are 10 years later and there’s been another name change from space situational awareness to space domain awareness, getting at

the same exact question: How do we get beyond just tracking things in space?” Weeden remarked.

He pointed out that fundamental challenges in catalog maintenance and orbital tracking persist, even as the military faces new demands to monitor an expanding sphere of operations, including cislunar space.

The root of the problem may lie in a combination of technical challenges and cultural inertia, Weeden suggested. Despite two directed nomenclature changes aimed at shifting the military’s approach to space monitoring, neither has resulted in the hoped-for cultural transformation or capability leap.

### **Slow shift to Commerce**

Complicating the U.S. military’s SDA challenges is an ongoing transition of responsibilities mandated by a 2018 presidential directive. This directive requires the Department of Defense to transfer the task of maintaining the authoritative catalog of space objects to the Department of Commerce’s Office of Space Commerce.

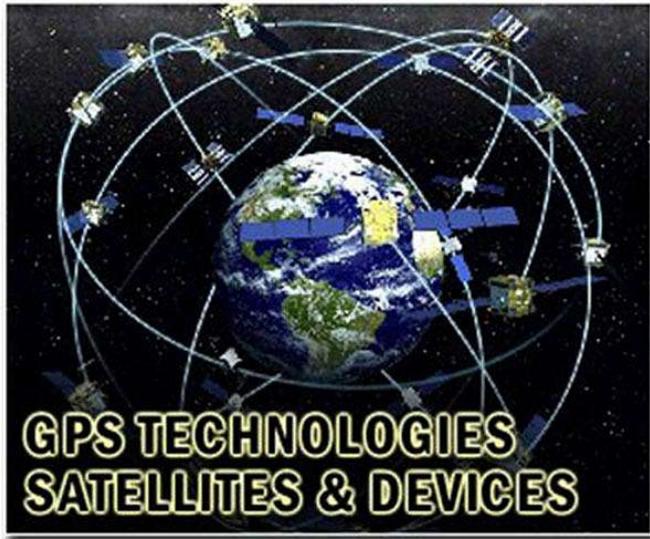
The transition, aimed at freeing up military resources and fostering innovation through civilian management, has progressed more slowly than initially anticipated.

The Office of Space Commerce, while preparing to take on this crucial role, faces its own set of challenges. These include developing the necessary technical infrastructure, and establishing the regulatory framework needed to manage an increasingly complex space environment.

## LEO Satellites Enhance GPS Accuracy through Ground Station Integration

27 August 2024

[Source: Space Daily | https://www.spacedaily.com/reports/LEO\\_satellites\\_enhance\\_GPS\\_accuracy\\_through\\_ground\\_station\\_integration\\_999.html](https://www.spacedaily.com/reports/LEO_satellites_enhance_GPS_accuracy_through_ground_station_integration_999.html)



*illustration only*

Ensuring precise Global Navigation Satellite System (GNSS) orbit and clock data is vital for various critical applications. A new method that integrates data from regional ground stations with measurements from Low Earth Orbit (LEO) satellites has been shown to significantly improve the accuracy of GNSS orbits, advancing precision from meters to centimeters. This development is particularly beneficial for regional networks such as BDS, which have traditionally struggled with accuracy due to limited global coverage.

The accuracy of GNSS is essential for applications requiring precision, but regional networks often encounter challenges in maintaining this accuracy. By combining LEO satellite data with ground station measurements, a promising solution to these challenges has been identified. This approach highlights the need to explore more effective methods for GNSS orbit

determination.

Researchers from the Shanghai Astronomical Observatory, Chinese Academy of Sciences, published a study on August 12, 2024, in 'Satellite Navigation' (DOI: 10.1186/s43020-024-00147-4). The study details how the integration of regional ground station data with LEO satellite measurements can significantly enhance GPS orbit determination. Data from January 20 to 26, 2019, involving 13 LEO satellites and six International GNSS Service stations across China, were analyzed. The findings suggest that this method can achieve centimeter-level accuracy in GPS orbit and clock products, which is essential for high-precision GNSS applications.

The study, conducted by the Shanghai Astronomical Observatory, focused on integrating measurements from 13 LEO satellites with data from six GNSS stations around China. The satellites involved included those from missions such as GRACE Follow-On, SWARM, Sentinel, Jason, and various Chinese meteorological satellites.

The results showed significant improvements in GPS orbit accuracy, with average errors reduced to 2.27 cm in the radial direction, 3.45 cm along-track, and 3.08 cm cross-track. Clock accuracy was also enhanced, with errors less than 0.15 nanoseconds. The LEO satellites themselves demonstrated high precision, with most errors within 4 cm. This approach underscores the potential of LEO satellites to boost GNSS accuracy, especially in regions where ground station coverage is limited, offering a reliable solution for achieving high-precision GPS orbit and clock products necessary for a variety of applications.

Dr. Chengpan Tang, the lead researcher from the Shanghai Astronomical Observatory, emphasized the importance of this study: "Integrating LEO satellite data with regional ground stations provides a practical solution to the challenges of high-precision orbit determination in GNSS. Our findings suggest that this approach can deliver reliable orbit and clock products, which are vital for a broad range of applications, from navigation to Earth observation."

The integration of LEO satellites with regional ground stations represents a major advancement in GNSS technology. This method not only improves GPS orbit determination accuracy but also opens up new opportunities for high-precision applications, particularly in areas with limited ground station coverage. As LEO satellite constellations continue to grow, this method could become a standard practice, ensuring more reliable and accurate GNSS services worldwide.

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## Starlink Now Being Deployed on US Navy Warships

Joseph Trevithick | 22 August 2024

Source: [TWZ](https://www.twz.com/sea/starlink-now-being-deployed-on-u-s-navy-warships) | <https://www.twz.com/sea/starlink-now-being-deployed-on-u-s-navy-warships>



*A Kymeta satellite antenna being installed aboard the USS Abraham Lincoln for use with the Sailor Edge Afloat and Ashore (SEA2) system, which also utilizes Starlink.*

The U.S. Navy says it is on the verge of having improved persistent, reliable, and secure high-speed internet connections across its fleets thanks to a project leveraging commercial satellite constellations like SpaceX's Starlink. This is a sorely needed upgrade in connectivity that offers important operational and morale-boosting benefits for the crews of Navy ships wherever they might be sailing.

What is formally known as Sailor Edge Afloat and Ashore (SEA2) originally began as an ad-hoc effort aboard the Nimitz class aircraft carrier USS Abraham Lincoln. Now it "is on the cusp of being available on every Navy ship and more shore sites," according to a recent news item from the Naval Information Warfare Systems Command (NAVWAR).

"Before SEA2, ship communications have relied upon Department of Defense (DOD) satellites for the past 30 years," the NAVWAR

piece explains. “These six satellites were roughly 22,300 miles away in geostationary orbit and provided a footprint on Earth the size of a hemisphere, resulting in slow data rates as the signal traveled up to the satellite and back down to its final destination.”

Navy ships have also made use of other largely ad-hoc commercial internet links over the years, including with local networks ashore during port visits. However, the service’s top information warfare command says these “previous internet solutions had no full authority to operate and were only tolerated.”

“The need for increased connectivity was exacerbated by the COVID-19 pandemic shutdown in March 2020 when ships were unable to perform port calls due to country restrictions, thus severing their connection to the rest of the world,” the recent Navy news story notes. “Better and more reliable Internet access would mitigate the issues that arise from less frequent interactions with external sources.”

“Technological developments with low-orbit satellites like Starlink and [Eutelsat] OneWeb have made them a more viable and accessible option” for use with architectures like systems like SEA2, according to NAVWAR. “Sitting between 375 to 750 miles above Earth and numbering around 7,000 currently in orbit, they could provide a much faster and more reliable connection if appropriately utilized.”

Distributed satellite constellations have the added benefit of being more resilient against various kinds of attacks, including electronic warfare jamming and even the physical loss of individual nodes.

Per NAVWAR, “in order to utilize low-orbit satellites for a naval ship’s needs, three key objectives needed to be achieved: laser crosslink capability so satellites could communicate with each other, a downlink for shore sites to connect to the Internet and a mobility code so a ship’s terminal could remain connected to a satellite even as it traverses an ocean.”

As part of SEA2’s development, NAVWAR’s “Program Executive Office Command, Control, Communications, Computers and Intelligence (PEO C4I) was tasked to develop the capabilities to overcome those three obstacles through its PMW 170 Communications and Global Positioning System Navigation program office. The connection established by PMW 170 is known as STtNG, or Satellite Terminal (transportable) Non-Geostationary, which allows ships’ tactical feeds to gain secure access to low-orbit satellites,” according to the recent news item from the command. “It provides a midline level of throughput, about 30 to 50 megabits per second. From there, the bandwidth was scaled up by connecting multiple Starlink antennas to achieve the objective of one gigabit per second.”

As already noted, SEA2 also leverages OneWeb, and commercial antennas from Kymeta have been used to link to that network. The architecture is designed to be network agnostic and can also make use of military satellite communications constellations.

From an operational perspective, there are clear benefits to having constant high-bandwidth internet access available across all Navy ships, as well as sites ashore. This includes just being able to communicate more reliably using the internet, including via video call, helping to streamline

day-to-day operations. SEA2 presents a clear avenue to a broader resilient beyond-line-of-sight communications capability, as well.

In addition, many “tactical” computer applications, even certain ones designed to handle encrypted classified data, “are already designed to work with commercial internet,” according to another Navy news story on SEA2 published earlier this year. That piece centered on an interview with Cmdr. Kevin White, a Combat Systems Officer aboard Abraham Lincoln, who is credited as being the driving force behind SEA2’s development.

“The fact that we’re not making use of that opportunity with modern technology to allow classified tactical applications to ride the commercial internet is where we are missing out, so we built Sailor Edge Afloat and Ashore to be able to do that in the future,” White, a Combat Systems Officer aboard Abraham Lincoln, said. “We’re close to demonstrating a couple of those applications, and I am fully confident it will be game changing.”

Other applications have already been demonstrated together with SEA2, including one called Flank Speed Edge, which the Navy describes as “a cloud system capable of transferring terabytes of data from the cloud to users aboard a ship.” The Navy has also previously said that the new internet connectivity has made it easier for the crew of Abraham Lincoln, specifically, to put in orders for things like spare parts and fuel, as well as manage maintenance data.

“Right now our logs are showing that we’re able to pass between 3 and 5 terabytes of data per day, which is absolutely massive. And what

we’re able to do with software defined networks is scale exactly how that data is used,” Cmdr. White told Federal News Network earlier this year. “Right now we’re demonstrating pushing applications like air wing maintenance apps that live in the cloud, and all of our pay and personnel apps. And that’s just scratching the surface.”

White also told that outlet that SEA2 coupled with Flank Speed Edge had provided more general computing benefits for his ship by allowing them to keep their systems more up to date on a regular basis.

“While we’re out at sea right now, with this P-LEO [proliferated low Earth orbit; also abbreviated pLEO] capability, a cloud connected node and all the right elements in place, we’re able to scale new capabilities as they become available and rapidly deploy them while they’re monitored from the shore side,” White explained. “One of the big challenges we have is the cycle of Windows updates and the cycle of patches, and with that high-speed capability, we can have those update services enabled.”

All this being said, SEA2 still looks to be in a fledging state and has had limitations, at least in the past. As of June, the Navy had not authorized it for use with classified data, according to the Federal News Network. The service has since said that SEA2 has received a first-of-its-kind cybersecurity certification, but it is unclear if this means it can now be used to send and receive classified information. Commercial links also wouldn’t be used in certain operational circumstances, such as when “emissions control” tactics or heightened cyber-hardening is required.

Even if SEA2 remains limited to handling transfers of unclassified information, that is a still major boon for ships like the Abraham Lincoln. Many routine, but still critical day-to-day military logistics and other activities happen in the unclassified realm.

Constant high-bandwidth internet offers important morale-boosting benefits, too, especially for personnel on ships far out to sea for months at a time. SEA2 is in use now to provide improved connectivity for personal voice-over-IP and video calls between sailors and their families back home and recreational television and internet use. Sailors on Abraham Lincoln watched this year's Super Bowl back in February via a livestream thanks to the new network architecture. Satellite television has been available on Navy warships since the late 1990s, but it is still relatively limited in its offerings with just four channels today.

This all has the knock-on effect of reducing the burden on the ship's other networks, something the Navy has highlighted in its use of other ad-hoc commercial internet links on other ships in the past.

There is a broader trend toward ever-greater internet access for personnel on ships at sea, especially for morale-boosting reasons, among navies the world over. In June, the Japan Maritime Self-Defense Forces began trialing Starlink on two ships to improve internet access for personal use. SpaceX's satellite internet service has very rapidly become a dominant force in the maritime realm more generally, as well.

As already noted, distributed constellations like Starlink offer extremely valuable resiliency

against attacks and, by extension, architecture like SEA2 that can tap into them could offer an important alternative option, at least for certain purposes, if other networks are rendered unusable. Growing concerns about the vulnerability of U.S. government space-based assets to a host of different threats in recent years has already prompted increased interest within America's armed forces in the use of commercial satellite constellations for communications and other functions.

Use of Starlink, specifically, by the U.S. military has already been growing steadily for years and is not limited to the maritime domain. This has included tests utilizing the space-based internet network for tactical applications. SpaceX now has an entire government-focused business unit called Starshield, which, among other things, supplied more military-tailored versions of Starlink to America's armed forces.

"I don't think you could take 10 steps without tripping over a Starshield terminal," Mark Kitz, head of the Army's Program Executive Office Command Control Communications-Tactical (PEO C3T), said at the TechNet Augusta 2024 conference just this week, according to Defense News. "I would say the Army is very committed to pLEO and Starshield."

Similar to what the Navy has been doing with SEA2, "we want to get out of bringing a new antenna every time we want to change providers," Kitz added. "If a unit deploys and they want to leverage a Ka-band Kuiper [antenna for the satellite network from Amazon], they have that RF front end. If they want to be leveraging Starshield, we swap modems and we go."

There are clear signs that interest in expanding use of commercial satellite internet services, and Starlink specifically, is only set to grow among other armed forces globally, and with an eye toward potential tactical applications.

There are potential operational security and other concerns that come from increased usage of commercial networks. For instance, in June, the U.S. Army began blocking the use of commercial internet services to access certain Email accounts and other online applications for cybersecurity reasons.

SpaceX, and more specifically its CEO Elon Musk, has also notably faced criticism over how Starlink has and hasn't been allowed to be used in the course of the conflict in Ukraine.

The U.S. military has been working with SpaceX and others to develop and field new distributed communications and intelligence-gathering satellite constellations that will be fully under its control, as you can read more about here.

Regardless, the new SEA2 architecture pioneered aboard the USS Abraham Lincoln presents an important step forward for Navy internet access at sea that opens a new door to other important future networking developments for the service warships.

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## US Army Gears up for Space Warfare, Drawing Lessons from Ukraine

Sandra Erwin | 07 August 2024

[Source: Space News | https://spacenews.com/u-s-army-gears-up-for-space-warfare-drawing-lessons-from-ukraine/](https://spacenews.com/u-s-army-gears-up-for-space-warfare-drawing-lessons-from-ukraine/)



*Col. Princeton Wright, Army capability manager for space and high altitude at the Army's Space and Missile Defense Command (center), speaks Aug. 6 at the Space and Missile Defense Conference in Huntsville, Alabama. Credit: SMDC*

WASHINGTON — The U.S. Army is taking cues from the ongoing conflict in Ukraine to prepare for a new era of space-based warfare.

“The war in Ukraine has given us a stark warning: the character of war is changing,” said Col. Princeton Wright, capability manager for space and high altitude at the Army’s Space and Missile Defense Command (SMDC).

Wright spoke during a panel discussion Aug. 6 at the Space and Missile Defense Conference in Huntsville, Alabama.

The conflict in Ukraine has served as a stark demonstration of modern electronic warfare capabilities, with Russia’s deployment of jamming systems and other disruptive technologies offering a sobering preview of

future combat scenarios. U.S. military planners now anticipate that rival powers will adopt similar tactics in future conflicts, potentially leaving American forces in electronically contested environments where reliable satellite communications and navigation are no longer guaranteed.

The U.S. military also is interested in advanced technologies like tactical lasers to disrupt enemy imaging satellites, a capability that could prove crucial in denying adversaries the benefits of space-based reconnaissance.

“The brutal and complex nature of this conflict has demonstrated that traditional modes of warfare are being supplemented — and in some cases, supplanted — by new technologies and strategies,” said Wright.

### **Dual-Pronged Strategy**

As the largest consumer of satellite services within the U.S. military, the Army relies heavily on space-based assets for critical functions including communications, navigation, weather forecasting, and early missile launch detection. This dependence has led to a dual-pronged approach in the Army’s space strategy.

On one hand, the service plans to work with the other branches of the military to develop tactics and technologies to safeguard U.S. satellite signals from potential disruptions, ensuring continued access to these vital resources during conflicts. On the other hand, the Army is also exploring offensive capabilities that could potentially deny adversaries access to their own satellite networks in times of war.

Wright pointed at the Army’s recent guidance on the role of space in land warfare which focuses on two primary objectives: integrating space capabilities into ground forces’ operations and developing ways to interdict adversary space assets.

The Army is also looking at concepts such as using high-altitude platforms — drones or balloons — equipped with jammers to disrupt adversary navigation satellite signals.

The idea of using high-altitude balloons or airships for military purposes isn’t new, but it has recently gained renewed interest following the establishment of the U.S. Space Force and subsequent realignment of satellite ownership and operations. With the Space Force now responsible for satellite acquisitions, the Army is exploring more cost-effective alternatives like airships to deploy sensors or jamming equipment.

### **Seeking Industry Help**

Wright emphasized the need for collaboration with industry and academia on a number of space-focused technologies identified by SMDC’s Center of Excellence. This includes developing systems that can operate effectively in various theaters, from Europe to the Indo-Pacific and even the Arctic.

In its “Space Vision” document published earlier this year, the Army for the first time has explicitly expressed interest in developing offensive capabilities that could potentially deny adversaries access to their surveillance satellites during conflicts. This stance appears to be influenced by the Army’s Pacific Command,

which has been a driving force behind the organization of “multi-domain” task forces. These experimental units are designed to be equipped with asymmetric or unconventional weapons and tactics, aimed at countering an opposing force’s advantages in warfare.

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## Chinese Rocket Stage Breaks up into a Cloud of More than 700 Pieces of Space Debris

Andrew Jones | 09 August 2024

Source: [Spce News | https://spacenews.com/chinese-rocket-stage-breaks-up-into-cloud-of-more-than-700-pieces-of-space-debris/](https://spacenews.com/chinese-rocket-stage-breaks-up-into-cloud-of-more-than-700-pieces-of-space-debris/)



A Long March 6A rocket lifts off from Taiyuan spaceport, Aug. 6, 2024, carrying the first 18 Qianfan (“Thousand Sails”) satellites. Credit: Ourspace

HELSINKI — A Chinese Long March 6A rocket’s upper stage has fragmented into a cloud of over 700 pieces of space debris, adding to concerns about long-term orbital safety.

China launched the Long March 6A rocket Aug. 6 from Taiyuan spaceport carrying a first batch of 18 flat panel Qianfan (“Thousand Sails”) satellites to 800-kilometer-altitude polar orbit.

The rocket’s upper stage, having been modified for restarts to deploy multiple satellites,

was then noted to have created a field of at least 50 pieces of debris on Aug 07 by Slingshot Aerospace, a space-tracking and data analytics firm.

It was initially unclear if this was a recurrent issue related to passivation or insulation of the Long March 6A stage, or a breakup of the rocket body.

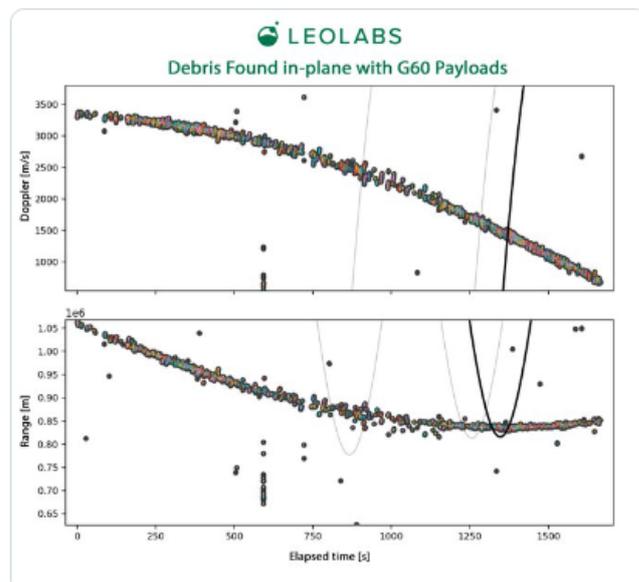
U.S. Space Command (USSPACECOM) confirmed Aug. 8 the incident to be a rocket breakup event. USSPACECOM said it was tracking over 300 pieces from this breakup event.

LeoLabs, a company which monitors low Earth orbit with a global network of radars, stated later Aug. 8 that its radar data indicates “at least 700 debris fragments and potentially more than 900.” The debris cloud is in-plane with the 18 deployed satellites.

 LeoLabs ✕  
@LeoLabs\_Space · Follow

 We’re actively monitoring and analyzing the breakup event in #LEO involving a Chinese rocket body, CZ-6A. Our radar data indicates this event occurred on 6 August at ~20:10 UTC at ~810 km.

It resulted in at least 700 debris fragments and potentially more than 900.



Space debris at such altitudes, where there is very little atmospheric drag, can remain in orbit for decades, depending on the size and density of the fragments and other variables.

The European Space Agency's Space Debris Office estimates there have been more than 640 break-ups, explosions, collisions, or anomalous events resulting in fragmentation. It is also estimated there are 40,500 space debris objects greater than 10 cm, 1,100,000 from greater than 1 cm to 10 cm, and 130 million space debris objects from greater than 1 mm to 1 cm.

### **Long March 6A Debris Issues and Rocket Disposal**

The Long March 6A was developed by the state-owned Shanghai Academy of Spaceflight Technology (SAST). It uses kerosene-liquid oxygen core stages with solid rocket boosters. The launcher can carry 4,500 kg to a 700-km sun-synchronous orbit.

The dry mass of the upper stage is approximately 5800 kilograms, according to NASA. The rocket has flown seven times in total, with its debut launch taking place in March 2022.

Neither SAST nor its parent company, the China Aerospace Science and Technology Corporation (CASC), nor the China National Space Administration (CNSA) have commented on the breakup of the rocket stage.

This is the second time the rocket's upper stage has broken up in orbit. The first incident, in November 2022, saw the 18th Space Defense Squadron (18 SDS) identify and catalog 533 fragments by the end of January 2023. Other

Long March 6A stages have created clouds of debris without breaking up.

The Shanghai Institute of Aerospace Systems Engineering in 2023 drafted "Detailed requirements for launch vehicle orbital stage disposal." The guidelines intend, among other things, to reduce the chances of creating debris and avoid collisions. Standards include deorbiting spent stages where possible, guidelines to how long these remain in orbit, and passivation to avoid explosions. The standards were to be implemented Jan. 1, 2024.

The Aug. 6 launch was the first for a planned low Earth orbit communications megaconstellation known as G60, or Qianfan ("Thousand Sails"). Shanghai Spacecom Satellite Technology (SSST), the company behind the Qianfan constellation, plans to launch over 14,000 satellites. It remains uncertain how significant a role the Long March 6A will play in this project.

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## SpaceX Flights Grounded by FAA after Falcon 9 Booster Mishap

Ibadan | 29 August 2024

[Source: Space Watch | https://spacewatch.global/2024/08/spacex-flights-grounded-by-faa-after-falcon-9-booster-mishap/?utm\\_source=rss&utm\\_medium=rss&utm\\_campaign=spacex-flights-grounded-by-faa-after-falcon-9-booster-mishap&mc\\_cid=582bb8424d&mc\\_eid=5410314afa](https://spacewatch.global/2024/08/spacex-flights-grounded-by-faa-after-falcon-9-booster-mishap/?utm_source=rss&utm_medium=rss&utm_campaign=spacex-flights-grounded-by-faa-after-falcon-9-booster-mishap&mc_cid=582bb8424d&mc_eid=5410314afa)



The Federal Aviation Administration has grounded SpaceX launches after a Falcon 9 booster anomaly on Wednesday, 28th of August. The booster was part of a Falcon 9 mission to place Starlink satellites in orbit from Cape Canaveral Air Force Station. However, after the stage separation, the booster, intending to land on an uncrewed drone ship, suffered an anomaly and ended up tipping into the Atlantic Ocean.

As a result, the FAA ordered an investigation into the anomaly, subsequently grounding upcoming SpaceX launches, until the launch company completes the probe and the FAA approves corrective actions.

“A return to flight of the Falcon 9 booster rocket is based on the FAA determining that any system, process or procedure related to the anomaly does not affect public safety. In

addition, SpaceX may need to request and receive approval from the FAA to modify its license that incorporates any corrective actions and meet all other licensing requirements,” said the Administration in a statement.

Due to the grounding, the impending Polaris Dawn mission may experience further delays, after SpaceX postponed its Wednesday launch till Friday as a result of unfavorable weather conditions. The mission is a private flight funded by Jared Isaacman, and it aimed to conduct the world’s first commercial spacewalk and achieve “the highest Earth orbit ever flown”. The astronauts on the mission would also be testing Starlink’s laser-based communication system in space.

The ill-fated mission was the first of a back-to-back Starlink satellite launch for SpaceX. However, the booster anomaly from the first mission resulted in SpaceX calling off the second flight. SpaceX is also due to launch two astronauts to the International Space Station for NASA late next month, with two seats set aside for Astronauts Butch Wilmore and Suni Williams.

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## Global Aerospace Industry

### Serbia Signs \$3 Billion Deal for 12 Rafales as it Moves Away from Russia

Dhruv Yadav | 30 August 2024

Source: *Bharat Shakti* | <https://bharatshakti.in/serbia-signs-3-billion-deal-for-12-rafales-as-it-moves-away-from-russia/>



Serbia has signed a landmark agreement with France's Dassault Aviation for the purchase of 12 new Rafale fighter jets for \$2.99 billion. The agreement, signed by Serbia's Defence Minister Bratislav Gasic and Dassault Aviation CEO Eric Trappier, also includes a complete auxiliary logistics package, spare engines and parts, Serbia's President Aleksandar Vucic told a news conference.

"A dozen of brand new aircraft will be owned by Serbia ... this will contribute to a significant increase in the operational capabilities of our army," Vucic said. "We are happy to become a part of the Rafale club."

The acquisition, made during French President Emmanuel Macron's visit to Belgrade, signals a major shift in Serbia's security and political stance, moving away from Russia, its traditional ally and weapons supplier.

Macron said Europe needs a strong and democratic Serbia, while Belgrade needs a "strong and sovereign EU."

"Choice of Rafale jets by Serbia is in this context a clear choice of long-term alliance between our two countries," Macron said.

The purchase of Rafales is the single biggest weapons deal since Serbia became independent from its state union with Montenegro in 2006.

Vucic said Serbia would pay two tranches of 421 million euros each in 2024 and 2025 for the planes.

He did not specify when Serbia would receive its first Rafales, but said they would be delivered with MICA air-to-air medium-range missiles manufactured by France's MBDA, instead of more sophisticated Meteor missiles which have longer range.

Belgrade curtailed military cooperation with Moscow after Russia invaded Ukraine and it has condemned the invasion, but unlike the EU, which it wants to join, and other Western countries, it has not imposed sanctions on Moscow.

Serbia's military and air force are loosely based on Soviet technology, but it has also purchased helicopters and transport planes from Airbus, radars from Thales and France's Mistral surface-to-air missiles.

Vucic also sought to assure that Serbia will not share Rafales technology with Moscow.

"We are not Russian spies to transfer

technology, we paid for this with Serbian citizens' money," Vucic said.

Serbia also operates Chinese missiles and drones. Its defence budget amounts to around 2% of gross domestic product (GDP).

This is Macron's second meeting with Vucic this year and follows the visit of Chinese President Xi Jinping to Belgrade in May, highlighting Serbia's strategic position on the edge of the EU, with ties to the east and west.

The EU remains Serbia's single biggest investor and hundreds of thousands of Serbs work in Western-owned companies.

But Belgrade, which seeks to diversify its gas supplies, is also dependent on Russian gas and has the Kremlin's support in its opposition to the 2008 independence of Kosovo.

Before it joins the European Union, Serbia would have to strengthen democracy, the rule of law and judiciary. Besides the nation will also have to root out corruption and organised crime. It must also align its foreign policies with those of Brussels, including the introduction of sanctions against Russia.

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## UAE Cancels \$20 billion Rafale Deal with France Despite Telegram CEO's Release

29 August 2024

Source: *Financial Express* | <https://www.financialexpress.com/business/defence-uae-cancels-20-billion-rafale-deal-with-france-despite-telegram-ceos-release-3595771/>



 With Restricted Direct Messages, teens on Instagram can only receive messages from people they follow or are connected to.

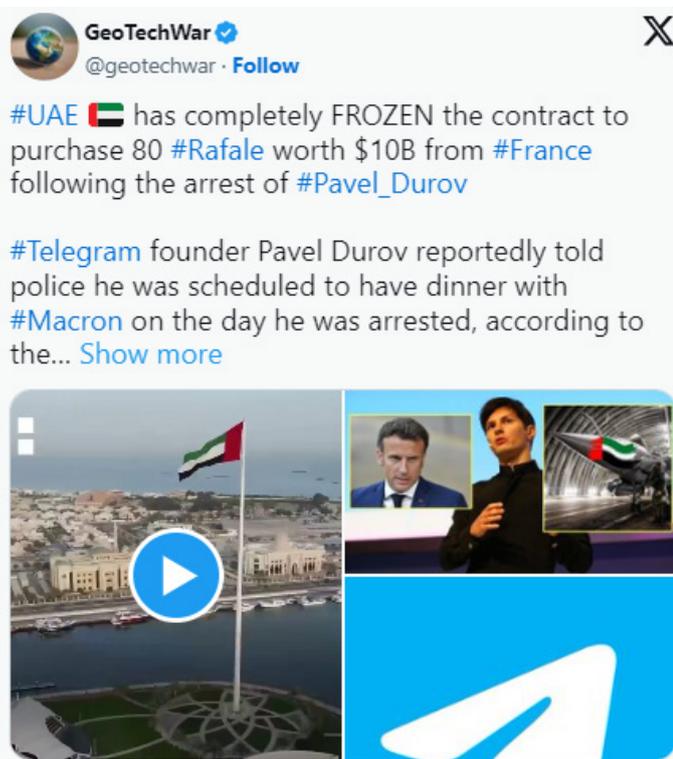
*Durov, who holds UAE citizenship alongside several other nationalities, was arrested on Saturday at a Paris airport after arriving from Azerbaijan (Photo source: Dassault Aviation)*

The diplomatic fallout from the arrest of Telegram CEO Pavel Durov continues to escalate, as the United Arab Emirates (UAE) has decided to cancel its US\$20 billion deal with France for 80 Rafale fighter jets. The decision comes in the wake of Durov's brief detention by French authorities, a move that has strained relations between the UAE and France, despite Durov's release on bail.

Durov, who holds UAE citizenship alongside several other nationalities, was arrested on Saturday at a Paris airport after arriving from Azerbaijan. The arrest was reportedly linked to accusations from French authorities, including allegations of financial crimes, cyber offenses,

drug trafficking, and child exploitation on the Telegram platform. While Durov has consistently denied these allegations, claiming they are politically motivated due to his refusal to grant Western governments' backdoor access to Telegram, the arrest has nonetheless triggered significant diplomatic repercussions.

According to reports in the public domain, the UAE, a close ally of Durov, has expressed its anger over the arrest, viewing it as an affront to its sovereignty and a violation of diplomatic norms. Durov's connections in the UAE, particularly his relationship with the Emir's son, Zayed Al Nahyan, have only intensified the situation.



The UAE government's decision to halt the Rafale deal, which was signed with French aerospace company Dassault in 2021, is seen as a direct response to Durov's treatment.

The deal, which was valued at US\$20 billion, was one of the largest defense contracts signed by the UAE in recent years. It included the delivery of 80 Rafale fighter jets, with the first batch expected

to arrive in 2027. The cancellation of this deal not only represents a significant economic loss for France but also marks a sharp deterioration in UAE-France relations, which had been strong and cooperative until this incident.

French President Emmanuel Macron has attempted to mitigate the situation, stating that Durov's arrest was not politically motivated and was unrelated to the Russia-Ukraine conflict. However, these assurances have done little to appease the UAE. The timing of the arrest, coupled with previous reports that France had unsuccessfully courted Durov to relocate Telegram's operations to French soil in 2018, has fueled speculation that deeper geopolitical motives may be at play.

Despite his release on a US\$5.56 million bond, Durov's legal troubles are far from over. He remains barred from leaving France, and the charges against him could lead to a lengthy legal battle. Meanwhile, the UAE's decision to stand by Durov underscores the complex web of international relations and the significant impact that the arrest of a high-profile individual can have on global diplomacy.

The future of the Rafale deal now hangs in the balance, with analysts suggesting that it could be renegotiated or permanently shelved, depending on how the situation unfolds. For now, the cancellation serves as a stark reminder of the unpredictable nature of international politics, where a single arrest can derail multi-billion-dollar agreements and alter the course of diplomatic relations.

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## Slovakia to Acquire Six Israeli Air Defence Systems in \$616 Million Deal

Abdullahi Jimoh | 29 August 24

[Source: News Central | https://newscentral.africa/slovakia-to-acquire-six-israeli-air-defence-systems-in-616-million-deal/](https://newscentral.africa/slovakia-to-acquire-six-israeli-air-defence-systems-in-616-million-deal/)



Slovakia's government has approved a major deal to acquire six mobile air defence systems from Israel, with a total value of €554.3 million (\$616.88 million), as part of its efforts to bolster its airspace protection.

In addition to the air defence systems, the government sanctioned the purchase of over 1,300 heavy terrain vehicles in collaboration with the Czech Republic, with an anticipated cost of €708.3 million. These new 6×6 and 8×8 vehicles will replace the country's aging truck fleet.

Slovakia, which shares a border with Ukraine, has been actively seeking to enhance its air defence capabilities amidst the ongoing Russian invasion of Ukraine since 2022. As a NATO member, Slovakia has been involved in strengthening the alliance's eastern front. Defence Minister Robert Kalinak emphasised the importance of advancing defence capabilities, particularly in air defence. Last month, Slovakia received the first two of fourteen new F-16 fighter jets.

The specific air defence system to be acquired from Israel was not disclosed in the government's announcement. Slovakia currently operates the medium-range 2K12 KUB system, which is nearing the end of its operational life cycle, according to a defence ministry document released on Wednesday.

Previously, under a different administration, Slovakia donated its outdated S-300 air defence system to Ukraine—a move that has faced criticism from the current government for diminishing Slovakia's own air defence capabilities.

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## India's Acquisition of Russian Ka-31 Helicopters on Hold Due to Ukraine Conflict

Andrew Salerno-Garthwaite | 28 June 2024

[Source: Pune News | https://pune.news/defence/indias-acquisition-of-russian-ka-31-helicopters-on-hold-due-to-ukraine-conflict-220817/#google\\_vignette](https://pune.news/defence/indias-acquisition-of-russian-ka-31-helicopters-on-hold-due-to-ukraine-conflict-220817/#google_vignette)



India's plans to acquire ten Kamov Ka-31 airborne early warning (AEW) helicopters from Russia have been put on hold. This decision, influenced by the ongoing conflict in Ukraine, casts uncertainty over the \$520 million (Rs 4,354 crore) deal. The Indian Navy, which had been in negotiations for this acquisition, is now exploring alternative options or considering indigenous development in collaboration with

Hindustan Aeronautics Limited (HAL).

## Current Situation

The suspension of the Ka-31 helicopter deal is a response to the following challenges:

1. **Reliability Concerns:** The ongoing conflict in Ukraine has raised doubts about the reliability of arms supplies from Russia. The imposition of Western sanctions has further complicated the situation, leading to a reassessment of defense procurement strategies.

2. **Strategic Needs:** The Indian Navy has expressed a pressing need for additional Ka-31 helicopters to enhance its airborne early warning capabilities. These helicopters play a crucial role in detecting and tracking airborne threats, vital for maritime security.

## Exploring Alternatives

In light of the suspended deal, the Indian Navy is considering several alternative approaches:

1. **International Options:** The Navy is exploring potential acquisitions from other countries that can meet its AEW requirements. This may involve negotiating with other defense suppliers to procure comparable systems.

2. **Indigenous Development:** Accelerating development efforts with HAL could provide a strategic advantage. Collaborating with HAL, a prominent Indian aerospace manufacturer, could facilitate the development of indigenous AEW solutions, reducing dependence on foreign suppliers and enhancing self-reliance in defense technology.

## Implications for India's Maritime Capabilities

The suspension of the Ka-31 deal represents a significant set back for India's efforts to strengthen its maritime capabilities. However, the Indian Navy's proactive stance in seeking alternative solutions underscores its commitment to maintaining robust defense and operational readiness. The shift towards indigenous development and exploring other international options highlights a strategic approach to overcoming procurement challenges and ensuring national security.

## Future Prospects

As India navigates the complexities of defense procurement amid geopolitical uncertainties, the focus remains on ensuring that the Indian Navy's requirements for advanced AEW systems are met. The decision to suspend the Ka-31 deal emphasizes the need for adaptive strategies in defense acquisitions and the pursuit of self-reliance in critical technology areas.

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## Indian Aerospace Industry

### India's First Kamikaze Drone Developed; 5,000 Units Can Be Made In 2-3 Years

Sanjib Kr Baruah | 08 May 2024

Source: *The Week* | <https://www.theweek.in/news/india/2024/05/08/indias-first-kamikaze-drone-developed-5000-units-can-be-made-in-2-3-yrs.html>



‘Suicide’ or ‘kamikaze’ drones or loitering aerial munitions (LAM) are assuming a larger than life image in the ongoing Russia-Ukraine war and the Israel-Hamas conflict underlining its tremendous potential to be the veritable game-changer in modern day warfare.

What makes this weapon a sure killer is the capability to patiently loiter over a target area for a long period of time until the target is located. The major advantage is that it has precision-targeting capability and also to change targets mid-flight or even abort the mission.

Spurred by a flourishing military production ecosystem that has come up in India, a 13-year-old Indian defence systems manufacturing company—Kadet Defence Systems (P) in collaboration with the Defence Research Development Organisation (DRDO)—has developed the country first Loitering Aerial

Munitions (LAM) for the armed forces.

Multiple versions of the indigenously designed, developed and India-manufactured LAM systems are being developed to meet different operational requirements with its weight varying from 15 kg to 120 kg with explosives payload of 2 to 40 kg.

The biggest version of the drone can loiter for about 12 hours.

These systems have been made adaptable to various terrains, including deserts, plains, and high-altitude environments, with a remarkable launch altitude capability exceeding 5,000 meters.

They can be shoulder launched or vehicle launched while future plans are to develop the air-launched version.

A Kadet official told THE WEEK: “The range of the LAM extends from 150 km to 300 km with a rocket-assisted canister launch and a runway independent hybrid vertical take-off and landing (VTOL) system.”

What is really significant is the sheer capability of the product.

A Kadet release said: “The LAM systems encompass a diverse array of cutting-edge technologies, including Canister Aerial Loitering Munition (CALM), Combat UAVs with stand-off capabilities for munition release, Tactical VTOL UAVs, and a versatile mix of systems capable of swarming and manned-unmanned teaming operations.”

While the company has already inked a

contract for the delivery of over 50 such systems in 2024, it can scale up production to deliver an estimated 5,000 within the next 2-3 years.

The market size of LAMs in India is estimated to be around Rs 15,000 crore.

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## Technical, Price Bids Submitted in Fighter Jet Engine Deal with the US

Manu Pubby | 10 August 2024

*Source: The Economic Times | [https://economictimes.indiatimes.com/news/defence/technical-price-bids-submitted-in-fighter-jet-engine-deal-with-us/articleshow/112411614.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/defence/technical-price-bids-submitted-in-fighter-jet-engine-deal-with-us/articleshow/112411614.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)*



Bengaluru-. India is preparing to sign a landmark deal with the US for fighter jet engine technology within the next six months, with General Electric Co. submitting techno-commercial bids, which would be followed by detailed discussions on technology transfer.

People aware of the developments said the manufacturing licence agreement for producing GE414-INS6 engines in India under a technology transfer pact is in the final stages of getting approved by the Indian government

and that the bid submitted by GE is currently being examined. The estimated \$1 billion deal will lead to 80% technology transfer for the engines, which will include coating for the hot end of the engine as well as crystal blades and laser drilling technology. The next stage of discussions with GE is crucial as they will determine the size and scope of the technology transfer, the people said.

The Hindustan Aeronautics Ltd, chosen for the deal, has already identified land in Bengaluru for building the new engine factory. Environmental and pollution clearances for the project are currently being processed and the plan is to have the facility operational within two years of signing of the contract.

As part of the deal, 99 engines will be manufactured in India, which will power the Mk2 variant of the Light Combat Aircraft. The air force has projected a demand for 120-130 of the Tejas Mk2 fighters, which if accepted is likely to grow the order size beyond 99 engines.

India is also developing twin engine deck-based fighters for the navy that are likely to be powered by the F414. The first two squadrons of the futuristic Advanced Multirole Combat Aircraft (AMCA) will also be powered by the same engine.

It is also learnt that negotiations have also been initiated with GE for supplying more GE404 engines to support an upcoming order for 97 LCA Mk1A aircraft.

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## India to Reveal 5.5-Generation AMCA Fighter Jet Prototype by 2028

29 August 2024

Source: TFI Post | <https://tfipost.com/2024/08/india-to-reveal-5-5-generation-amca-fighter-jet-prototype-by-2028/>



India is poised to make a significant leap in its defense capabilities with the upcoming Advanced Medium Combat Aircraft (AMCA), a 5.5-generation fighter jet slated for prototype unveiling by 2028. This ambitious initiative highlights the Indian Air Force's (IAF) commitment to advancing domestic military technology.

The AMCA, with a weight of 27 tons, will be India's first stealth fighter, incorporating advanced avionics, stealth features, and enhanced combat systems. The Defence Research and Development Organisation (DRDO) is leading this pioneering project, which aims to place India at the forefront of next-generation fighter aircraft development.

DRDO is actively seeking partners for development and production to collaborate on this high-profile venture. The project's progress has been reviewed in a high-level meeting between the IAF and DRDO, focusing on the AMCA and other aircraft development programs.

The AMCA is part of a comprehensive strategy

to enhance India's air combat capabilities, with the aircraft expected to enter production by 2035. This timeline reflects India's long-term vision for defense modernization and technological advancement.

Meanwhile, India's indigenous fighter aircraft projects are advancing as planned. The TEJAS MK-2, an upgraded version of the existing TEJAS fighter, is scheduled for its maiden flight in March 2026. Developed by the Aeronautical Development Agency (ADA) and Hindustan Aeronautics Limited (HAL), the TEJAS MK-2 will feature improved weaponry and sensors. Mass production of this enhanced variant is projected to begin by mid-2029.

Additionally, the TEJAS MK-1A is set for deployment at the Nal airbase in Bikaner, Rajasthan, a strategic location near the Pakistan border. The first squadron of these aircraft will be stationed there, bolstering defense capabilities along India's western frontier. With 83 units already ordered and a total of 180 planned, the TEJAS MK-1A represents a significant step in strengthening India's defense posture.

India's focus on advancing its air force with these state-of-the-art aircraft underscores a commitment to self-reliance and national security, ushering in a new era of indigenous defense technology.

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## Fifth Generation Advanced Medium Combat Fighter to have Two Production Lines; First Prototype Further Delayed to 2028

Ujjwal Shrotryia | 29 August 2024

Source: Swaraj Yamag | <https://swarajyamag.com/defence/fifth-generation-advanced-medium-combat-fighter-to-have-two-production-lines-first-prototype-further-delayed-to-2028>



*A Model of the Advanced Medium Combat Aircraft.*

The Ministry of Defence (MoD) wants to create two production lines for India's first fifth-generation stealth fighter jet, the Advanced Medium Combat Aircraft (AMCA).

According to a report by ANI, in a recent review meeting held by the Indian Air Force (IAF) and Defence Research and Development Organisation (DRDO) officials, a decision was made to have two development-cum-production partners (DcPPs) — one public (most likely HAL) and one private for the project.

DRDO will transfer all technologies developed for AMCA to these partners, and they will most likely manufacture the jet in separate production lines.

The AMCA project, however, has now seen its timeline slip further by almost three to four

years, with the prototype now expected to take its first flight only in 2028, from the earlier anticipated timeline of 2024-25.

Reportedly, these delays are due to difficulties in deciding the production partners for the jet and the pending negotiations with American jet engine maker General Electric (GE) to manufacture its GE F-414 engine in India.

The GE F-414 jet engine will power the initial 40-odd AMCA Mk-1 jets, with an entirely new high-thrust engine powering the latest and more advanced jet variant — AMCA Mk-2.'

Initially, it was said that a special purpose vehicle (SPV) would manage the production of the jet with a private company in charge of the project. However, this plan has run into problems.

According to former IAF Chief ACM RKS Bhadauria, discussions with the private sector regarding the SPV did not go well, causing the plan to stall. As a result, the MoD began exploring alternative options, leading to the creation of the DcPP arrangement.

The jet's weight will increase from 25 to 27 tonnes, allowing it to carry a greater number and weight of conventional weapons in its internal weapons bay.

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## IAF Considers Boosting C-295 Fleet to Modernize Transport Capabilities

Shyam Nandan Upadhyay | 25 June 2024

Source: Pune News | [https://pune.news/defence/iaf-considers-boosting-c-295-fleet-to-modernize-transport-capabilities-222080/#google\\_vignette](https://pune.news/defence/iaf-considers-boosting-c-295-fleet-to-modernize-transport-capabilities-222080/#google_vignette)



The Indian Air Force (IAF) is reportedly considering expanding its fleet of C-295 medium tactical transport aircraft to replace its aging Soviet-era AN-32 turboprop transport aircraft. This move comes as the IAF looks to modernize its fleet and enhance its operational capabilities in response to evolving needs.

### Rationale Behind the Shift

The C-295 aircraft, known for its 5-10-tonne payload capacity, offers a similar capability to the AN-32, which has been a reliable workhorse for the IAF for decades. However, with the AN-32 fleet approaching the end of its service life, the IAF plans to gradually retire these aircraft starting in 2030. The C-295, with its robust design and modern features, is seen as a suitable replacement, especially given its continued production line, which is expected to run until around 2032.

### Current and Future Acquisitions

The IAF has already committed to acquiring 56 C-295 aircraft, with 16 to be manufactured

in Spain by Airbus and the remaining 40 to be produced in India. This move not only strengthens India's defense capabilities but also aligns with the "Make in India" initiative, which aims to bolster domestic defense manufacturing.

Additionally, the Indian Coast Guard is expected to acquire six C-295 Multi-Mission Maritime Aircraft (MMMA) variants, further expanding the use of this versatile aircraft within India's defense forces. There is also the potential for follow-on orders from paramilitary organizations, such as the Border Security Force (BSF), which could benefit from the aircraft's capabilities.

### Important Points

- **Replacement of AN-32 Fleet:** The IAF plans to retire its aging AN-32 aircraft starting in 2030, with the C-295 identified as a suitable replacement due to its similar payload capacity and modern features.
- **C-295 Acquisition Plans:** The IAF has ordered 56 C-295 aircraft, with production split between Spain and India. This aligns with India's broader defense manufacturing goals.
- **Additional Orders:** The Indian Coast Guard is likely to acquire six C-295 MMMA variants, and there may be follow-on orders from paramilitary organizations like the BSF.
- **Modernization Efforts:** The move to acquire additional C-295s reflects the IAF's commitment to modernizing its fleet and enhancing its operational readiness.

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## Tech Mahindra, Marshall Partner to Drive Advancement in Aerospace, Defence

29 August 2024

*Source: Business Standard | [https://www.business-standard.com/companies/news/tech-mahindra-marshall-partner-to-drive-advancement-in-aerospace-defense-124082900673\\_1.html](https://www.business-standard.com/companies/news/tech-mahindra-marshall-partner-to-drive-advancement-in-aerospace-defense-124082900673_1.html)*



*Shares of Tech Mahindra were trading 0.67 per cent higher at Rs 1,638.30 apiece in intra-day trade on the BSE on Thursday. | Photo: Shutterstock*

IT major Tech Mahindra on Thursday said it has inked a pact with UK-based engineering service provider Marshall Group to combine their digital solutions and engineering capabilities to spur advancements in aerospace and the defence industry.

Tech Mahindra in a statement said it will assist Marshall's engineering programmes in aircraft design and manufacture, special mission platforms, and the development of digital maintenance, repair, and overhaul (MRO) technologies.

Marshall will also make use of Tech Mahindra's suite of data analytics and intelligent field support technologies to enhance its infrastructure solutions' operational efficiency and reliability.

"Combining Tech Mahindra's global engineering and technology capabilities with Marshall's rich heritage and specialised knowledge, we are poised to create a powerful collaboration to drive innovation, deliver exceptional customer value, and enable the industry to scale at speed," Narasimham R V, President, Engineering Services, Tech Mahindra, said.

Tech Mahindra will also engage in developing future hydrogen fuel systems, aiming to replace fossil fuels and promote sustainability in aviation, the statement said.

Shares of Tech Mahindra were trading 0.67 per cent higher at Rs 1,638.30 apiece in intra-day trade on the BSE on Thursday.

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## Innovation

### Tamil Nadu Startup Soars with India's First Reusable Hybrid Rocket Launch

Aayushi Dubey | 25 August 2024

*Source: The Vocalnews | <https://thevocalnews.com/business/startups/tamil-nadu-startup-soars-with-india%E2%80%99s-first-reusable-hybrid/cid15218256.htm>*



Reusable rocket technology has long been dominated by Elon Musk's SpaceX, which has set the global standard for reusing rockets and

reducing the cost of space travel. Until now, this advanced technology had largely been out of reach for other space-faring nations, particularly on a smaller scale

As the world watches the rapidly advancing space race, a lesser-known but increasingly significant player has emerged from Tamil Nadu, India. Space Zone India, a Tamil Nadu-based startup, recently made headlines with the successful launch of India's first reusable hybrid rocket, Mission RHUMI-2024. This landmark achievement, which took place just a day after the country celebrated its first National Space Day, represents more than just a technical milestone—it signals a profound shift in the future of space exploration in India and beyond.

### **Breaking Ground in Reusable Rocket Technology**

Reusable rocket technology has long been dominated by Elon Musk's SpaceX, which has set the global standard for reusing rockets and reducing the cost of space travel. Until now, this advanced technology had largely been out of reach for other space-faring nations, particularly on a smaller scale. Space Zone India's successful launch of the RHUMI-1 rocket marks a significant step forward in democratizing this technology.

Unlike traditional rockets, which are used once and then discarded, the RHUMI-1 is designed with an innovative, cost-effective, and eco-friendly descent mechanism that allows for the recovery and reuse of rocket components. This breakthrough is particularly important for a country like India, where cost-effective solutions are critical to advancing its space ambitions.

### **The Importance of Hybrid Propulsion Systems**

One of the most remarkable aspects of the RHUMI-1 rocket is its hybrid propulsion system, which combines both liquid and solid fuel propellant systems. This design not only enhances the rocket's efficiency but also significantly reduces operational costs—an essential factor for space missions in developing countries. Furthermore, the hybrid system is 100% free of pyrotechnics and TNT, making it a safer and more environmentally friendly option for space exploration.

This emphasis on safety and sustainability reflects a broader trend in the aerospace industry, where the environmental impact of space missions is increasingly coming under scrutiny. By adopting hybrid propulsion, Space Zone India is positioning itself at the forefront of this movement, offering a model for other space companies worldwide.

### **A Strategic Focus on the Small Satellite Market**

Another strategic move by Space Zone India is its focus on capturing the burgeoning small satellite market. The demand for small satellites in Low Earth Orbit (LEO) is growing rapidly, particularly in India, where these satellites are used for a wide range of applications, from environmental monitoring to telecommunications. By developing rockets like the RHUMI-1, which are specifically designed to deploy small satellites, Space Zone India is tapping into a lucrative and expanding market.

The RHUMI-1 rocket's recent launch successfully placed three Cube satellites and 50

PICO satellites into a suborbital trajectory. These satellites will collect valuable data for research on global warming and climate change—issues of critical importance both in India and globally. This capability not only underscores the technological prowess of Space Zone India but also highlights the practical benefits of their innovations in addressing some of the world's most pressing challenges.

### **A Visionary Leadership and Collaborative Approach**

The success of Space Zone India is not just a testament to its technological innovations but also to its visionary leadership and collaborative approach. Founded by Anand Megalingam, the company has rapidly established itself as a key player in India's space sector. Megalingam's focus on cost-effectiveness and sustainability has driven the company to develop rockets that are not only technologically advanced but also economically viable.

Space Zone India's collaboration with Martin Group, which provides crucial funding, has been instrumental in bringing these innovations to life. This partnership illustrates the importance of collaboration between startups and established firms in advancing technological breakthroughs. Moreover, the mentorship of Mylswamy Annadurai, the former project director of ISRO's Chandrayaan-1 mission, has provided invaluable guidance, helping to steer the company's strategic direction and ensuring the success of its ambitious projects.

### **Setting a New Benchmark in Indian Aerospace**

The launch of the RHUMI-1 rocket through

Space Zone India's hydraulic mobile launchpad is a first-of-its-kind initiative that sets a new benchmark in aerospace technology. This innovative system is designed to provide unparalleled flexibility and efficiency, allowing the company to adapt to various launch scenarios with ease. The development of portable launch systems that can be moved from one location to another is yet another example of the company's commitment to innovation and adaptability.

In February 2023, Space Zone India made history by launching India's first hybrid rocket, RHUMI-1, from the Atomic Research Centre in Kalpakkam. Since then, the company has continued to push the boundaries of what is possible, developing a range of rockets tailored for altitudes ranging from 1 km to 500 km.

### **Pioneering a New Era in Space Exploration**

Space Zone India's achievements represent more than just technological milestones—they herald the beginning of a new era in space exploration, where sustainability, cost-effectiveness, and innovation are key drivers. As the company continues to develop new technologies and expand its capabilities, it is poised to play a crucial role in shaping the future of space exploration, not just in India, but globally.

With its focus on hybrid propulsion systems, reusable technology, and the small satellite market, Space Zone India is setting a new standard for what is possible in space exploration. As more companies and countries look to the stars, Space Zone India's innovations will undoubtedly serve as a guiding light for the future of the industry.

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## An Indian Air Force Su-30MKI Successfully Launched the New Locally-Made GAURAV Glide Bomb

25 August 2024

Source: Zona Militar | [https://www.zona-militar.com/en/2024/08/25/an-indian-air-force-su-30mki-successfully-launched-the-new-locally-made-gaurav-glide-bomb/#google\\_vignette](https://www.zona-militar.com/en/2024/08/25/an-indian-air-force-su-30mki-successfully-launched-the-new-locally-made-gaurav-glide-bomb/#google_vignette)



Through various research and development organizations, India continues to advance the production of new, sophisticated weaponry to equip its armed forces. One of the latest developments from the Indian industrial and scientific complex is the new long-range GAURAV glide bomb, which recently completed launch tests using an Indian Air Force Su-30MKI fighter jet.

Named GAURAV and developed by the Defence Research and Development Organisation (DRDO), this long-range glide bomb is designed to provide enhanced ground attack capabilities to Indian Air Force fighters. Weighing 1,000 kilograms, it employs a hybrid navigation system combining inertial and GPS guidance, with an operational range of 100 kilometers, according to Indian officials.

Although still in the development and testing phase, the launch recorded off the coast of Odisha marks a significant milestone for the project, with one of the Indian Air Force's Su-30MKI fighters serving as the launch platform.

In its official statement on August 13, DRDO noted: *"During the flight test, the glide bomb struck the target with millimeter precision. Complete flight data during the test launch was captured by telemetry and electro-optical tracking systems deployed by the Integrated Test Range along the coast. The flight was monitored by senior DRDO scientists. Adani Defence and Bharat Forge, the development and production partners, also participated in the flight test."*

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*"The term 'Aerospace' was introduced in 1958 by the USAF Chief of Staff, General Thomas D White, as a new construct that depicted air and space as a seamless continuum stretching from the Earth's surface to infinity."*



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