



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

Forum for National Security Studies (FNSS)

# AEROSPACE NEWSLETTER



Image Courtesy: the statesman.com

**Ex-Red Flag 2024:** An Indian Air Force (IAF) contingent participated in Exercise Red Flag 2024 conducted at Eielson Air Force Base, Alaska of the United States Air Force, from 04 Jun to 14 Jun 24.

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## Ex-Red Flag 2024

- This was the second edition of **Ex Red Flag 2024**, which is an advanced aerial combat training exercise, held four times a year by the US Air Force.
- Participation of the **Indian Air Force** along with the Republic of Singapore Air Force (**RSAF**), Royal Air Force (**RAF**) of the United Kingdom, Royal Netherlands Air Force (**RNLAF**), German Luftwaffe, and the US Air Force (**USAF**).
- Red Flag is an **air combat exercise** featuring **realistic combat scenarios**. Forces are divided into **Red Force** (simulating Air Defence, primarily with USAF Aggressor Squadron's F-16 and F-15 aircraft) and **Blue Force** (simulating Offensive Composite elements).
- This year marked the **debut of the Indian Air Force's Rafale aircraft** in the exercise, operating alongside RSAF and USAF F-16s, F-15s, and A-10s.
- The missions included **Beyond Visual Range combat exercises** in Large Force Engagements, focusing on Offensive Counter Air and Air Defence roles.

*“The dynamic environment of modern warfare demands that military leaders not only be adept at combat but also possess strategic thinking ability and grasp of the evolving geo-political landscape.”<sup>1</sup>*

*- Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC  
at the Capstone seminar, June 25, 2024.*

<sup>1</sup> <https://www.freepressjournal.in/corporate-gallery/iaf-concludes-3rd-warfare-aerospace-strategy-program-wasp-with-a-capstone-seminar>

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## Opinions and Analysis

### Why New Delhi Needs a National Security Strategy

*Air Vice Marshal Manmohan Bahadur (Retd) | 25 June 2024*

*Source: [Hindustan Times](https://www.hindustantimes.com/opinion/why-new-delhi-needs-a-national-security-strategy-101719329903327.html#google_vignette) | [https://www.hindustantimes.com/opinion/why-new-delhi-needs-a-national-security-strategy-101719329903327.html#google\\_vignette](https://www.hindustantimes.com/opinion/why-new-delhi-needs-a-national-security-strategy-101719329903327.html#google_vignette)*



*National security is just not about defence but is a whole-of-government approach that needs orchestration by the political executive head, not by the defence minister. (Photo by Rakesh BAKSHI / AFP) (AFP)*

Every organisation of repute has a macro plan to guide and synchronise the activities of its sub-elements to achieve organisational goals. There are two parts to this endeavour — the determination of the organisational aim and guidance for each sub-group to work in unison to achieve it. This becomes an inescapable imperative when considering something as vital as a nation’s security, with each element of national power — economy, industry, commerce, taxation, justice, foreign policy, internal security, and defence — working in unison for ensuring an inviolate security cocoon. To ensure the required unison from each element, a National Security Strategy (NSS) is necessary to guide policy- and strategy-making. Unfortunately, India lacks one and a

recent statement of the chief of defence staff suggests that New Delhi doesn’t require one. The new government needs to urgently address this issue.

How do nations that wield power of consequence plan their security? The American NSS states that, “We will... galvanise collective action on global challenges, and shape the rules of the road for technology, cybersecurity, and trade and economics.... Our approach encompasses all elements of national power — diplomacy, development cooperation, industrial strategy, economic statecraft, intelligence, and defence”. The road map is, thus, clearly spelt out for all arms of the government.

The French NSS lists out 10 priority areas that include Euro-Atlantic relationship and capacity to defend and act in hybrid fields. The NSS of the United Kingdom states that, “the stability and resilience of our economy and society is a precondition of our security... we must preserve the huge benefits that stem from our openness while ensuring that we are protected from the worst effects of global disruption, transnational challenges, or to hostile interference. That means improving our economic, health and energy security” The Russian NSS, similarly, reinforces the common theme of every NSS that, “the strategy is founded on the inseparable interconnection and mutual dependence of the national security of the Russian Federation and the socio-economic development of the country.”

All NSSs are signed by the executive heads of government, ensuring that all arms of the government are, by law, on the same page on national security. The rationale behind the

endorsement at the highest level is pertinent: National security is just not about defence but is a whole-of-government approach that needs orchestration by the political executive head, not by the defence minister.

### What has been happening in India?

“The defence minister’s op directive conveys the government’s intention, and that suffices”, goes a refrain. “We have won four wars without a written NSS, so what’s the need for one,” goes another. One has lately heard that “Israel doesn’t have one, despite its challenging security environment,” missing the point that Israeli society and institutions are militarised whereas all Indian institutions, other than the armed forces, are civilianised.

A decade ago, I was looking after procurement plans in HQ Integrated Defence Staff. The 15-year tri-services long-term integrated perspective plan (LTIPP) for the acquisition of capital equipment, duly passed by the Defence Acquisition Council (headed by the defence minister), was forwarded to the finance ministry; it also carried an estimated costing, and hence the budgeting that was required. The LTIPP, however, lacked a macro-level government policy statement to support it and hence was just a defence ministry wish list flying on hope. One wonders whether this has changed for the better with some surety of the defence acquisition plan having “government” acceptance. However, the despatch of empowered teams abroad for emergency armament purchases after recent border crises makes one wonder whether a duly published NSS would have avoided the haphazard costly purchases — as the output

of other relevant government arms would have been synchronised with the duties of the defence ministry.

So, while there is a huge furore about the delay in establishing theatre commands, the Agnipath scheme and whether the Navy needs another aircraft carrier, what’s holding New Delhi back from promulgating an NSS that would streamline such decision-making and help its *aatmanirbharta* campaign in defence? Is it that, being a formal written commitment of resources and political will to national security, the executive would be held accountable? It is time the new government grabs the proverbial bull by the horns and promulgates its NSS.

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## Air Power

### IAF Contingent Completes Successful Participation In Exercise Red Flag 2024

16 June 2024

Source: PIB | <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2025644>



An Indian Air Force (IAF) contingent participated in the Exercise Red Flag 2024 conducted at Eielson Air Force Base, Alaska of the United States Air Force, from 04 Jun to 14 Jun 24. This was the second edition of Ex Red Flag 2024, which is an advanced aerial combat training exercise, held four times in a year by the US Air Force. The exercise witnessed participation of the

Indian Air Force along with Republic of Singapore Air Force (RSAF), Royal Air Force (RAF) of the United Kingdom, Royal Netherlands Air Force (RNLAf), German Luftwaffe, and the US Air Force (USAF).

The IAF contingent participated with the Rafale aircraft and personnel comprising of aircrew, technicians, engineers, controllers and subject matter experts. The transatlantic ferry of Rafale fighter aircraft was enabled by the IL-78 Air to Air Refuellers (AAR), while the transportation of personnel and equipment was undertaken by the C-17 Globemaster aircraft. The contingent landed at Eielson, USAF base in Alaska on 29 May 24.

Red Flag is an air combat exercise conducted with multiple scenarios designed to provide realistic combat settings. A demarcation of forces is done for simulating the desired environment, with the Red Force simulating Air Defence elements, and the Blue Force simulating the Offensive Composite elements. During this Exercise (Ex), the Red Force was mainly constituted by the USAF Aggressor Sqn flying the F-16 and the F-15 aircraft.

This was the first time the IAF Rafale aircraft participated in Ex Red Flag, wherein, they operated alongside the RSAF and USAF F-16 and F-15s, and the USAF A-10 aircraft. The missions included Beyond Visual Range (BVR) combat exercises as a part of Large Force Engagements (LFE), in Offensive Counter Air and Air Defence roles. The IAF crew were actively involved in mission planning and also assumed the role of Mission Leaders for designated missions during the exercise.

In spite of the challenging weather and almost sub-zero temperatures, the IAF maintenance crew worked diligently to ensure serviceability of all the aircraft throughout the duration of the exercise and all assigned missions could be undertaken with more than 100 sorties being flown during the exercise.

Key takeaways from the exercise included insight on interoperability with international partners and a collaborative understanding of employment philosophy in a multinational environment. Experience of ferrying long distances, while undertaking Air to Air refuelling enroute, was both an enriching and thrilling takeaway, especially for the younger crew.

Undertaking their return journey, the contingent is planned to split enroute along with their mutual support elements and participate in exercise with Air Force elements of Greece and Egypt, before landing back in India on 24 Jun 24. Enriched with the Red Flag exercise experience, the IAF keenly looks forward to hosting the participating contingents from other countries during Ex-Tarang Shakti-2024, which is the first ever Indian multinational air exercise to be held later this year.

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## Indian Air Force completes third Warfare & Aerospace Strategy Program

27 June 2024

Source: *The Print* | <https://theprint.in/india/indian-air-force-completes-third-warfare-aerospace-strategy-program/2150279/>



File photo of Indian Air Force soldiers | representational image | ANI

New Delhi: The third edition of the Warfare & Aerospace Strategy Program (WASP) has been completed by the Indian Air Force. The 15-week-long programme has been conducted to bring critical thinkers and strategic thinkers together to create policy-driving ideas at the strategic level, a PIB press release stated.

This edition of the WASP saw participation from 14 officers from the Indian Air Force, two officers from the Indian Navy, one officer from the Indian Army, and one research scholar. The participants were provided with intensive training in a range of areas, including strategy, military history, civil-military relations, higher defence organisation, aerospace power, information warfare, technology, and hybrid warfare.

The program was guided by an external faculty of accomplished practitioner-scholars with extensive teaching and research experience.

The graduates of the programme were awarded a PG diploma in Strategic Studies by Rashtriya Raksha University. The Chief of the Air Force, Air Chief Marshal VR Chaudhari, delivered the keynote address of the seminar, which was attended by other dignitaries. He highlighted that the rapidly changing nature of modern warfare demands that military leaders not only be able to fight and win battles, but also be able to think critically and adapt to the evolving geo-political landscape.

The CAS congratulated the participants on successfully completing the rigorous programme and urged them to continue with the same zeal in the forthcoming editions of the WASP.

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## IAF Relocates MiG-21s to Nal Base as it Prepares to Replace the Fleet

Rahul Singh | 28 June 2024

Source: *Hindustan Times* | <https://www.hindustantimes.com/india-news/iaf-relocates-mig-21s-to-nal-base-as-it-prepares-to-replace-the-fleet-101719515430591.html>



Squadron Leader Mohana Singh in a MiG-21 Bison at the Nal airbase near Bikaner. (HT file)

Some of the Indian Air Force's last Mikoyan-Gurevich MiG-21 fighter jets have silently bid adieu to their home base at Suratgarh in

Rajasthan and been relocated by IAF to the sprawling Nal desert fighter base near Bikaner, where the only other remaining Indian MiG-21s are based, as the world's fourth largest air force prepares the ground to pull these iconic planes out of service and begins raising its new Tejas light combat aircraft (LCA Mk-1A) fleet in July, senior officials aware of the matter said on Thursday.

IAF has completed the relocation of the Suratgarh-based No 23 Squadron, better known as "Panthers", to Nal, which is home to the MiG-21s belonging to the No 3 Squadron or "Cobras", and the last of the air force's MiG-21s are now operating from the same airbase, said one of the officials cited above on the condition of anonymity.

Both squadrons operate the MiG-21 Bison, the last variant of the single-engine workhorse. A fighter squadron usually consists of 16 to 18 fighter jets.

"The MiG-21 Bisons have been moved from Suratgarh to Nal as IAF wants to optimise their maintenance, service and spares to keep the fleet flying till the conversion of the two squadrons to LCA Mk-1A is completed during 2024-25," said a second official who also asked not to be named.

The conversion of the first of the two MiG-21 squadrons to the locally made LCA Mk-1A will begin after the state-run plane maker Hindustan Aeronautics Limited (HAL) delivers the first aircraft to IAF, he said. The air force is likely to get delivery of the first LCA Mk-1A in July 2024. It ordered 83 Mk-1As for ₹48,000 crore in February 2021.

The first Mk-1A was to be delivered to IAF by March 31, 2024, but HAL missed the deadline as key certifications were still pending. It made its maiden sortie from an HAL facility in Bengaluru on March 28.

HAL now plans to deliver 16 of these fighters to IAF in the financial year 2024-25. It has set up a new production line in Nashik for LCA Mk-1As to meet IAF's growing requirements. It can build 16 LCA Mk-1As every year in Bengaluru, and the Nashik line will help HAL ramp up production to 24 jets.

The delivery of the 87 jets on order is expected to be completed by 2028.

The induction of the MiG-21, India's first supersonic fighter, began in 1963. IAF has operated a raft of MiG-21 variants over the last six decades --- Type 74 or MiG 21F, Type 76 or MiG 21PF, Type 77 or MiG 21FL, Type 96 or MiG 21M, Type 75 or MiG 21 Bis (upgraded Type 96) and the MiG-21 Bison.

The MiG-21's 60-year history in IAF has been punctuated by accidents that have put the Soviet-origin aircraft's safety record under running scrutiny and led to an understandable chorus of concern and calls for its early replacement. With upgrades, IAF has managed to keep them flying for so long.

In April, the defence ministry issued a tender to HAL for the proposed acquisition of 97 more LCA Mk-1As to strengthen the air force's capabilities at a time it is grappling with a shortage of fighter squadrons. The new fighter planes are expected to cost around ₹67,000 crore.

LCA Mk-1A is an advanced variant of the LCA Mk-1, which is already in active service. LCA is set to emerge as the cornerstone of IAF's combat power in the coming decade and beyond as it is expected to operate around 350 LCAs (a mix of Mk-1, Mk-1A and Mk-2 versions).

Forty Mk-1 jets operated by IAF are in the initial operational clearance (IOC) and the more advanced final operational clearance (FOC) configurations --- the first variants of LCA.

More than 400 MiG-21s have been involved in accidents that have killed around 200 pilots, earning the fighter jets unfortunate epithets such as "Flying Coffin" and "Widow Maker". To be sure, more MiG-21s have crashed than any other fighter because they formed the bulk of the aircraft in IAF for the longest time.

In the 1980s and 1990s, these planes accounted for more than 60% of the air force's fighting strength. The maiden batch of six MiG-21Fs entered service in March-April 1963 and IAF progressively inducted 874 MiG-21s.

IAF will deploy the Mk-1As at forward air bases in the western sector to bolster its combat readiness against Pakistan and fill voids left by the gradual phasing out of the MiG-21s. It phased out the MiG-21 Bisons belonging to the No 4 Squadron ("Oorials") based at Uttarlai in Rajasthan and the Srinagar-based No 51 Squadron, which is also known as "Sword Arms," during 2022-23.

The LCA project was sanctioned in 1983 as a replacement for MiG-21s. IAF raised its first LCA Mk-1 squadron in Suler with two aircraft in July 2016. While the existing Mk-1 and Mk-

1A variants will replace MiG-21 fighters, the Mk-2 aircraft is planned as a replacement for the MiG-29s, Mirage-2000s and Jaguar fighters that will start retiring in the coming decade.

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## India, Qatar Hold Talks on Sale of 12 Used Mirage-2000 Fighter Jets

Nisha Anand | 22 June 2024

Source: *Business Insider* | [https://www.business-standard.com/external-affairs-defence-security/news/india-qatar-hold-talks-on-sale-of-12-used-mirage-2000-fighter-jets-124062200261\\_1.html](https://www.business-standard.com/external-affairs-defence-security/news/india-qatar-hold-talks-on-sale-of-12-used-mirage-2000-fighter-jets-124062200261_1.html)



*A Mirage 2000 Fighter Jet With Indigenous Payload.*

*(Photo: X/@IAF)*

India and Qatar on Friday held key discussions in New Delhi on the proposal to buy 12 second-hand Qatari Mirage-2000-5 fighter jets for the Indian Air Force (IAF).

A presentation was made to the Indian officials on the current state of the fighter jets, news agency ANI reported, citing defence sources.

The report added that the aircraft are in very "good condition" and have a lot of life left in them, officials said.

The Indian authorities are evaluating the proposal, while considering the compatibility of the offered Mirage-2000-5 jets with India's

existing fleet of Mirage-2000 aircraft, which are more advanced.

According to the report, it would be easier for India to maintain the two sets of aircrafts as they have the same engines.

However, the price of the jets still remains a key discussion point in the talks. While the Qatari side has offered a deal worth Rs 5,000 crore for the 12 aircrafts, India is seeking a more reasonable price.

The Qatari aircraft would come with missiles and additional engines for flying operations.

If the deal goes through, the aircrafts would be used for flying operations, the officials said, noting that they would not be meant for spare and maintenance requirements.

The IAF already has a significant amount of spare and equipment, bought from a French vendor during the Covid-19 pandemic. In 2021, IAF signed a deal with a French company to purchase phased-out Mirage 2000 aircraft to be used as spares. The deal worth Rs 300 crore was sealed on August 31.

If the deal with Qatar takes place, the IAF's fleet of Mirage aircraft will rise to 60.

The fleet has been a part of several key operations of the IAF, including the Kargil war, and Balakot air strikes.

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## Key Role of the Indian Air Force in the 2024 General Elections

12 June 2024

*Source: [Financial Express](https://www.financialexpress.com/business/defence-key-role-of-the-indian-air-force-in-the-2024-general-elections-3522811/) | <https://www.financialexpress.com/business/defence-key-role-of-the-indian-air-force-in-the-2024-general-elections-3522811/>*



*The IAF's commitment to this task was demonstrated by its performance in five of the seven election phases, where it flew over 1,000 hours in more than 1,750 sorties (Photo: Indian Air Force)*

The Indian Air Force (IAF) played a crucial role in the General Elections of 2024, undertaking a variety of tasks to ensure the smooth conduct of the electoral process. The IAF's transport and helicopter fleets were engaged in both peacetime and wartime duties, and for the elections, their role was pivotal in nation-building activities.

The IAF's medium lift helicopters (Mi-17 variants), light utility helicopters (Chetaks), and indigenously manufactured Advanced Light Helicopters (ALH) Dhruv were heavily utilized. These aircrafts were instrumental in airlifting electronic voting machines and deploying Election Commission of India (ECI) personnel to remote and inaccessible areas. The IAF's involvement was critical in extending the reach of the ECI to the farthest corners of the country, particularly to areas where road

movement was impractical or unsafe.

The time-bound nature of the elections required precise coordination. Polling officers needed to be positioned at remote polling stations two days before the election and de-inducted on the day of polling. The IAF's commitment to this task was demonstrated by its performance in five of the seven election phases, where it flew over 1,000 hours in more than 1,750 sorties.

Achieving this required close coordination with the ECI and the Chief Election Commissioners (CECs) of various states. Nodal officers were appointed to optimize the utilization of assets, considering factors like security, weather, and road connectivity. Additionally, helicopter assets from the Indian Army (IA) and the Border Security Force (BSF) were integrated into the overall plan, ensuring the smooth conduct of the General Elections-2024.

The IAF's efforts in supporting the electoral process underscore its role in not just national defence but also in nation-building and aiding civil power during crucial times.

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## Sikkim Govt Seeks Indian Air Force's Assistance to Airlift 1,400 Stranded Tourists in Northern Part of State.

*Bikash Singh | 15 June 2024*

*Source: [Economics Times](https://economictimes.indiatimes.com/news/india/sikkim-govt-seeks-indian-air-forces-assistance-to-airlift-1400-stranded-tourists-in-northern-part-of-state/articleshow/111024311.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst) | [https://economictimes.indiatimes.com/news/india/sikkim-govt-seeks-indian-air-forces-assistance-to-airlift-1400-stranded-tourists-in-northern-part-of-state/articleshow/111024311.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/india/sikkim-govt-seeks-indian-air-forces-assistance-to-airlift-1400-stranded-tourists-in-northern-part-of-state/articleshow/111024311.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)*



Guwahati: The Sikkim government has sought the Indian Air Force's assistance to airlift at least 1,400 tourists stranded in the northern part of the state which is landslide prone owing to incessant rainfall.

Heavy rainfall and landslides in the Mangan District of Sikkim have left approximately 1,215 tourists stranded, including 15 foreign nationals from Thailand, Nepal, and Bangladesh.

The office of the Chief Secretary, Government of Sikkim, is in talks with the relevant Ministry of the Government of India to arrange for the airlifting of tourists, subject to favourable weather conditions.

Authorities have clarified that only Lachung village is cut off.

Around nine people have died as excessive rainfall triggered massive landslides across North Sikkim.

The toll in the state from the recent spate of rainfall and landslides is now nine, with three deaths reported on Monday.

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## Space

### Chang'e-6 Delivers First Lunar far side Samples to Earth after 53-day Mission

Andrew Jones | 25 June 2024

Source: [Space News](https://spacenews.com/change-6-delivers-first-lunar-far-side-samples-to-earth-after-53-day-mission/) | <https://spacenews.com/change-6-delivers-first-lunar-far-side-samples-to-earth-after-53-day-mission/>



The Chang'e-6 reentry module back on Earth and recovered, 53 days after launch. Credit: CCTV/framegrab

HELSINKI — The Chang'e-6 return capsule reentered Earth's atmosphere early Tuesday, safely delivering unique lunar material expected to provide unique insights into the evolution of the moon.

The roughly 300-kilogram Chang'e-6 reentry capsule separated from the mission service module 5,000 kilometers away from Earth. The

capsule then skipped off the atmosphere over the Atlantic Ocean at 1:41 a.m. Eastern (0541 UTC) June 25 to decelerate, before making a final descent.

The reentry capsule—containing around 2 kilograms of lunar material drilled and scooped from Apollo crater on the far side of the moon—landed in the grasslands of Siziwang Banner, Inner Mongolia at around 2:07 a.m. Teams recovered the capsule shortly after.

The event was the final act of a five-spacecraft, 53-day effort to collect the first samples ever collected from the lunar far side and delivered them to Earth.

Retrieval of the samples will allow extensive research into the composition and evolution of the far side of the moon. The collected material could provide insight into why the near and far sides are so different, and clues about the history of the early solar system.

“Chang'e 6 is the first mission in human history to return samples from the far side of the moon, which is a cause for celebration for all humanity,” Long Xiao, a Planetary geoscientist for China University of Geosciences in Wuhan, told SpaceNews.

“I am excited about the future research scientists will conduct on these samples, which will provide valuable insights for addressing many significant lunar science questions. This is a major event for scientists worldwide.”

The mission was supported by the Queqiao-2 lunar relay satellite launched in March. Chang'e-6 then launched on a Long March 5

rocket from Wenchang spaceport May 3. The four-spacecraft stack entered lunar orbit just under five days later.

Its lander-ascent vehicle combination landed at 41.6385°S, 206.0148°E in Apollo crater within the vast and scientifically intriguing South Pole-Aitken (SPA) basin June 1.

“The Moon’s geological features are highly uneven. The far side of the moon differs significantly from the near side,” says Long. “The far side, affected by the South Pole-Aitken basin impact and lacking extensive maria regions, suggests that its geological evolution process is different from that of the near side.”

The SPA basin is a gigantic impact crater covering a vast portion of the far side of the moon. The impact which caused the basin is thought to have excavated material from the moon’s interior.

“Obtaining samples from the far side with a determined geological context is crucial for revealing the moon’s geological history,” Long states.

Meanwhile, the Chang’e-6 service module is expected to have fired its engines following separation of the return capsule to avoid reentering the atmosphere. The spacecraft could potentially be sent on an extended mission, as with the 2020 Chang’e-5 lunar nearside sample return mission.

China has already planned its next lunar missions. These will be the multi-spacecraft Chang’e-7 in 2026, with the Chang’e-8 in-situ resource utilization and technology test mission

to follow around 2028.

These are described as precursor missions to the China-led International Lunar Research Station (ILRS). Super heavy-lift launches in the early 2030s will construct ILRS.

Before this, China aims to send a pair of astronauts to the lunar surface before 2030. A number of countries and organizations have signed up to the ILRS project.

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## Why Indian-Origin Astronaut Sunita Williams is Stuck in Space

28 June 2024

*Source: Indian Express | <https://indianexpress.com/article/explained/explained-sci-tech/starliner-spacecraft-sunita-williams-nasa-9419165/>*



*A satellite image shows an overview of the International Space Station with the Boeing Starliner spacecraft (in the centre, bottom portion) on June 7, 2024. (Maxar Technologies/Handout via REUTERS/File Photo)*

The return of the Starliner spacecraft, which took NASA astronauts Sunita Williams and Butch Wilmore to the International Space Station (ISS) earlier this month, has been postponed. Following lift-off on June 5, the Boeing-built spacecraft docked at the ISS and was scheduled to begin its return journey towards Earth on June

26.

Steve Stich, manager of NASA's Commercial Crew Program, said on June 21 that they were managing the "small helium system leaks and thruster performance" on the aircraft. "We are taking our time and following our standard mission management team process," he added.

The mission is seen as a landmark for the entry of another private player in the American space sector. Before Boeing, Elon Musk's company SpaceX was the only one to successfully take US astronauts to space.

What is the mission, what caused the delay, and what happens to the astronauts now? We explain.

### **What is the Starliner Crew Flight Test spacecraft?**

The Boeing website describes the CST-100 Starliner as a "space capsule that will take people to and from low-Earth orbit." LEO refers to Earth-centered orbits with an altitude of 2,000 km or less. According to NASA, this is considered near enough to Earth for convenient transportation, communication, observation, and resupply.

Starliner's spacecraft was developed in collaboration with NASA's Commercial Crew Program. It can accommodate up to seven passengers or a mix of crew and cargo for LEO missions. It is also reusable up to 10 times with a six-month turnaround time.

Its significance also lies in the fact that NASA stopped its Space Shuttle Program in 2011 and

needed private players to step in. Back in 2012, SpaceX's Dragon spacecraft became the first commercial spacecraft to deliver cargo to and from the ISS. In 2020, it became the first to take humans to space and bring them back.

However, Starliner's launch has been beset by several problems. The current mission was also postponed multiple times. "A May 6 countdown was halted just two hours before launch time over a faulty pressure valve on the Atlas V upper stage, followed by weeks of further delays caused by other engineering problems..." a Reuters report said.

It was supposed to reach the ISS and dock and stay latched onto it for eight days. This would allow the astronauts to work on the ISS, where multiple countries' astronauts carry out research and experiments. Then, it would un-dock and fly the astronauts back to Earth. The mission was mainly aimed at proving the spacecraft's ability to take the crew and bring them back.

### **Why is the Starliner spacecraft still in space?**

There were several issues detected in some key mechanisms that need to work well for a safe flight.

According to a report from The Telegraph, the delay in launch was linked to issues detected in a spacecraft valve responsible for regulating the flow of oxidisers. On spacecraft, oxidisers are chemicals that help rockets during lift-off and in changing the rocket's path by aiding combustion. A large amount of energy is required to propel it forward.

Before the launch, the valve was "creating

an audible buzzing sound”, according to The Telegraph’s report.

Further, NASA said at one point that delaying the launch would allow teams to “further assess a small helium leak in the Boeing Starliner spacecraft’s service module traced to a flange on a single reaction control system thruster”. Helium is also essential as it pressurises the rockets, helps maintain their structural integrity, and helps manoeuvre the spacecraft.

The initial issue seemed small-scale. However, “Since its June 5 liftoff, the capsule has had five helium leaks, five maneuvering thrusters go dead and a propellant valve fail to close completely, prompting the crew in space and mission managers in Houston to spend more time than expected pursuing fixes mid-mission,” according to Reuters.

### **What happens now to Sunita Williams and Butch Wilmore?**

The spacecraft can remain docked for up to 45 days. Beyond that, the ISS has supplies and other materials that can last for several months. Therefore, there is no immediate danger to the two astronauts.

If safety concerns remain, they may have to come back to Earth on SpaceX’s Dragon spacecraft, which is also currently attached to the ISS, according to a report in The Guardian.

Further, the spacecraft can be brought to Earth in case of an emergency, but the space agency is looking to understand the nature of the problem first in the interest of the next such mission. Crucially, as a BBC report states, a part

of the service module will burn up upon re-entry, “meaning the loss of some information on what went wrong.”

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## **Russian Satellite Breaks Up, Creating Debris in Low Earth Orbit**

*Jeff Foust | 27 June 2024*

*Source: [Space News](https://spacenews.com/russian-satellite-breaks-up-creating-debris-in-low-earth-orbit/) | <https://spacenews.com/russian-satellite-breaks-up-creating-debris-in-low-earth-orbit/>*



*A model of the Resurs-P spacecraft like the one that suffered a breakup event in low Earth orbit June 26.*

*Credit: Vitaly V. Kuzmin CC BY-SA 4.0*

WASHINGTON — A Russian satellite in low Earth orbit broke up June 26, creating more than 100 pieces of trackable debris and briefly causing the International Space Station crew to take shelter.

The satellite, Resurs P1, suffered some kind of event at around 12 p.m. Eastern June 26, U.S Space Command (USSPACECOM) said in a June 27 statement, creating more than 100 pieces of debris. The statement did not indicate any potential cause for the breakup.

“USSPACECOM has observed no immediate threats and is continuing to conduct routine conjunction assessments to support the safety

and sustainability of the space domain,” it stated.

LeoLabs, the company that monitors low Earth orbit with a global network of radars, reported the event on social media late June 26, estimating the time of the breakup to be between 9:05 a.m. and 8:51 p.m. Eastern.

A LeoLabs spokesperson said June 27 that the company was now tracking at least 180 objects from the event, a number that could increase. The spokesperson added that it was still too early to determine what caused the breakup.

The event appears to have caused the ISS crew to temporarily take shelter in spacecraft docked to the station. “Beginning around 8:45 p.m. EDT on Wednesday, June 26 NASA instructed crews aboard the space station to shelter in their respective spacecraft as a standard precautionary measure after it was informed of a satellite break-up at an altitude near the station’s earlier Wednesday,” NASA said in a statement. Mission control gave an all-clear to the crew about an hour later.

Resurs P1 is a defunct Russian Earth observation satellite weighing about 6,000 kilograms. Launched in 2013 into a sun-synchronous orbit, the spacecraft was decommissioned in late 2021 and its orbit was decaying. At the time of the incident, its altitude had decreased to about 355 kilometers, and the spacecraft was likely to reenter before the end of the year.

What caused the spacecraft to break up is not clear. The leading explanation is the spacecraft itself broke apart because it was not properly passivated at the end of its mission. Passivation

involves removing sources of energy, such as draining batteries and venting tanks, that have been linked to past satellite breakups.

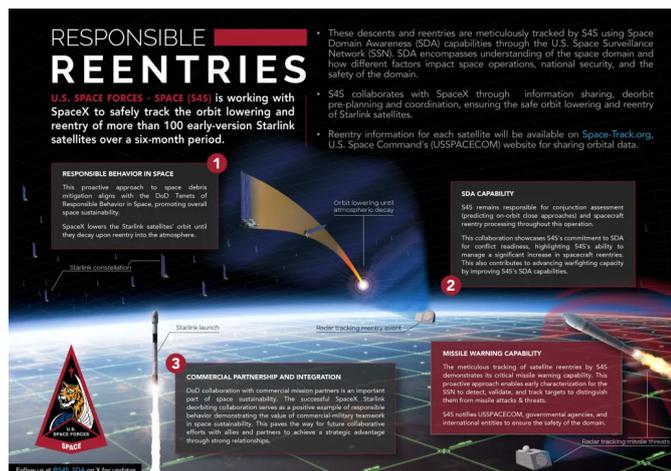
The spacecraft could have been hit by an untracked piece of debris. There has also been speculation that the spacecraft was hit by a Russian anti-satellite (ASAT) weapon in a test like that in November 2021, when a direct-ascent ASAT struck Cosmos 1408, creating nearly 1,800 pieces of tracked debris. However, there have been no statements by either the Defense Department or Russian Ministry of Defense about such a test, which likely would have been observed by American assets, and Russia did not file airspace restrictions associated with any potential launch site for an ASAT test at the time Resurs P1 broke up.

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## Military Space Trackers to keep Public Informed on Starlink Satellite Reentries

Sandra Erwin | 28 June 2024

Source: [Space News](https://spacenews.com/military-space-trackers-to-keep-public-informed-on-starlink-satellite-reentries/) | <https://spacenews.com/military-space-trackers-to-keep-public-informed-on-starlink-satellite-reentries/>



Infographic by U.S. Space Command

WASHINGTON — U.S. Space Command on June 28 sent out a reminder that it will closely monitor the controlled deorbiting of approximately 100 Starlink satellites, an operation that SpaceX announced in February.

The decision to deorbit these early version 1 Starlink satellites came after SpaceX identified a potential issue that could increase the risk of future failures. The operation, projected to last several months, involves a controlled descent of satellites from low Earth orbit.

With a massive constellation of about 6,000 satellites and counting, SpaceX routinely deorbits spacecraft at the end of their operational life. However, the deorbiting of 100 satellites at once is a larger-than-usual operation.

To keep the public informed, U.S. Space Command said that reentry information for each satellite will be available on Space-Track.org, a public catalog used to track orbital objects and prevent potential collisions.

Space Force units under U.S. Space Command are working with SpaceX to “safely track the orbit lowering and reentry of Starlink satellites,” the command said in a news release.

### Satellites Designed to Burn up on Reentry

This tracking effort comes against a backdrop of increasing worry about the risks posed by the rapid expansion of satellite constellations in low Earth orbit. A controversial Federal Aviation Administration (FAA) report to Congress last year warned that by 2035, falling debris from U.S.-licensed constellations in low Earth orbit could potentially injure or kill someone every two years if deployments continue as planned.

SpaceX strongly contested these findings, calling the FAA report a “deeply flawed analysis” based on outdated studies and questionable assumptions. The company maintains that its satellites are designed to completely burn up upon reentry, posing minimal risk to people on the ground.

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## Robotic Version of Indian Space Station By 2028

Pallava Bagla | 29 June 2024

Source: [NDTV](https://www.ndtv.com/india-news/robotic-version-of-indian-space-station-by-2028-isro-chief-to-ndtv-5997277) | <https://www.ndtv.com/india-news/robotic-version-of-indian-space-station-by-2028-isro-chief-to-ndtv-5997277>



*India is now eyeing the opportunity to build its own space station. (Representational)*

New Delhi: From being a rocket and satellite maker, India is now eyeing the opportunity to build its own space station.

Prime Minister Narendra Modi announced earlier this year that India will have its space station by 2035. Sharing the progress of this ambitious goal, Indian Space Research Organisation (ISRO) Chairman S Somanath told NDTV that the first phase of the space station will be built by 2028.

"We are currently designing it. The space station's first phase has to be built by 2028. We have completed or rather engineered the detailed design, which is capable of being launched by the LVM3 (Launch Vehicle Mark-3). So, in 2028, we will start launching the first module," he said.

The ISRO chief also informed that his team has made the full project report and cost estimate for government approval.

The space station will initially be developed and designed to handle robotic activity.

"It will only be robotics to start with because the process has to succeed and we have to build the capability for human spaceflight. A lot of confidence has to be built to operate for a long period. So, that will only happen in 2035. Until then, the space station will be developed and designed to handle robotic activity with an external robot mechanism," he said.

Mr Somanath also mentioned that India might not participate in a global effort to replace the International Space Station if it is decommissioned.

"We are limited by our resources and efforts required. We have to be on equal footing to talk about it," he said.

The Indian space agency chief also asserted that it's not easy to decommission the ISS: "ISS decommissioning is something we have heard many times, but it never happens because it's a huge infrastructure with a lot of value; it's not easy to decommission at any point. However, if it deteriorates, it creates problems for operation. Maybe we will decide at an appropriate time."

"Its life has been extended till 2030. And before that, we are going to have our first

module of the space station. So we would like to focus on the independent space activity for the time being because we would like to have Gaganyaan connected to it," he added.

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## ISRO Completes its RLV Technology Demonstrations through LEX Trio

23 June 2024

Source: ISRO | [https://www.isro.gov.in/ISRO\\_Completes\\_RLV\\_Technology\\_Demonstrations\\_RLV-LEX3.html](https://www.isro.gov.in/ISRO_Completes_RLV_Technology_Demonstrations_RLV-LEX3.html)



RLV-LEX3

WASHINGTON The Indian Space Research Organisation (ISRO) has proudly achieved a third consecutive success in the Reusable Launch Vehicle (RLV) Landing EXperiment (LEX) on June 23, 2024. The third and final test in the series of LEX (03) was conducted at 07:10 IST at the Aeronautical Test Range (ATR) in Chitradurga, Karnataka.

Following the success of the RLV LEX-01 and LEX-02 missions, RLV LEX-03 re-demonstrated the autonomous landing capability of the RLV under more challenging release conditions (cross range of 500 m against 150 m for LEX-02) and more severe wind conditions. The winged vehicle, named 'Pushpak', was released from an Indian Air Force Chinook

Helicopter at an altitude of 4.5 km. From a release point 4.5 km away from the runway, Pushpak autonomously executed cross-range correction manoeuvres, approached the runway and performed a precise horizontal landing at the runway centreline. Due to this vehicle's low lift-to-drag ratio aerodynamic configuration, the landing velocity exceeded 320 kmph, compared to 260 kmph for a commercial aircraft and 280 kmph for a typical fighter aircraft. After touchdown, the vehicle velocity was reduced to nearly 100 kmph using its brake parachute, after which the landing gear brakes were employed for deceleration and stop on the runway. During this ground roll phase, Pushpak utilises its rudder and nose wheel steering system to autonomously maintain a stable and precise ground roll along the runway.

This mission simulated the approach and landing interface and high-speed landing conditions for a vehicle returning from space, reaffirming ISRO's expertise in acquiring the most critical technologies required for the development of a Reusable Launch Vehicle (RLV). Through this mission, the advanced guidance algorithm catering to longitudinal and lateral plane error corrections, which is essential for the future Orbital Re-entry Mission has been validated. The RLV-LEX uses multisensor fusion including sensors like Inertial sensor, Radar altimeter, Flush air data system, Pseudolite system and NavIC. Notably, the RLV-LEX-03 mission reused the winged body and flight systems as such without any modification, from the LEX-02 mission, demonstrating the robustness of ISRO's capability of design to reuse flight systems for multiple missions.

This mission simulates the approach & landing

interface and high-speed landing conditions for a vehicle returning from space, which will reaffirm ISRO's expertise in acquiring the most critical technologies required for the development of a Reusable Launch Vehicle (RLV).

The mission, led by VSSC, was a collaborative effort involving multiple ISRO centres SAC, ISTRAC, SDSC-SHAR and IISU, with significant support from the Indian Air Force (IAF), Aeronautical Development Establishment (ADE), Aerial Delivery Research and Development Establishment (ADRDE), Regional Centre for Military Airworthiness (RCMA) under Centre for Military Airworthiness and Certification (CEMILAC), National Aerospace Laboratories (NAL), Indian Institute of Technology, Kanpur, Indian aerospace industrial partners, Indian Oil Corporation of India and Airport Authority of India.

Shri. S Somanath, Chairman, ISRO/Secretary, Department of Space, congratulated the team for their efforts in maintaining the success streak in such complex missions. Dr. S Unnikrishnan Nair, Director of VSSC, emphasised that this consistent success boosts ISRO's confidence in the critical technologies essential for future orbital re-entry missions.

Shri. J Muthupandian is the Mission Director and Shri. B Karthik is the Vehicle Director for this successful mission.

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## Global Aerospace Industry

### Europe Nears First Single-Pilot Airliner Certification: Unions Raise Safety Concerns

*Nathan Racine | 10 June 2024*

*Source: Aero Crew News | <https://aerocrewnews.com/aviation-news/aviator-bulletins/europes-largest-pilot-union-raises-alarm-single-pilot-cruise-operations-are-coming/>*

The aviation industry stands on the ridge of a significant transformation with the impending introduction of Extended Minimum Crew Operations (eMCO), touted by Airbus as the future of single-pilot cruise operations. Scheduled for debut in 2027, single-pilot cruise operations represent a seismic departure from traditional multi-pilot crews, relying heavily on automation. Yet, amidst Airbus' push for eMCO's implementation, grave concerns arise, particularly as the European Aviation Safety Agency (EASA) lags in completing a comprehensive safety study.

At the heart of the apprehension surrounding single-pilot cruise operations lies the alarming prospect of entrusting sole responsibility to automated systems in the cockpit. Despite technological advances, automation remains fallible, prone to malfunctions and errors that a lone pilot would grapple with during in-flight emergencies. While Airbus races to assert dominance in the face of Boeing's challenges, the accelerated rollout of eMCO raises troubling questions about prioritizing profit over safety.

Human factors, including fatigue and cognitive limitations, compound the inherent risks of single-pilot operations. Operating an

aircraft demands unwavering attention and rapid decision making, qualities that may be compromised when a lone pilot shoulders all safety responsibilities. With eMCO set to debut in cruise operations by 2027, the strain on pilots during critical phases of flight cannot be overstated.

In the pursuit of innovation, Europe's largest pilot union, the European Cockpit Association (ECA), says safety must remain paramount. Airbus and industry stakeholders must heed the warnings of pilot unions and safety advocates, ensuring that implementation is not rushed at the expense of safety. While technological advancement may be enticing, the skies must remain a sanctuary of safety. It remains unclear how eMCO will impact air safety despite its rollout planned for 2027.

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## Airbus A321XLR Arrival could Disrupt Long-Haul Networks

Jens Flottau | 21 June 2024

[Source: Aviatin Week Network | https://aviationweek.com/air-transport/aircraft-propulsion/airbus-a321xlr-arrival-could-disrupt-long-haul-networks](https://aviationweek.com/air-transport/aircraft-propulsion/airbus-a321xlr-arrival-could-disrupt-long-haul-networks)



*The A321XLR can fly ranges of nearly 4,700 nm  
Credit: Airbus.*

The service entry of an aircraft derivative is not normally something that shakes up the commercial airline industry. New aircraft variants

usually introduce incremental improvements, less fuel burn or updated cabins. However, the arrival of the Airbus A321XLR could be different: The narrowbody has the potential to change the structure of long-haul networks.

Launched in 2019, the latest version of the A321neo is on the verge of flying its first scheduled route. Airbus expects to deliver the first aircraft in the third quarter to Iberia, which plans to introduce the XLR on the Madrid-Boston route.

Airbus is hoping that the aircraft will be certified ahead of the July 22-26 Farnborough International Airshow. The OEM had planned to reach that milestone by the end of June, but it says the sheer volume of paperwork has slowed down the process somewhat. The XLR, which recently flew at the ILA Berlin Airshow, also will be displayed at this year's largest aerospace event.

The A321XLR is reviving a niche created decades ago by the Boeing 757, currently the only narrowbody capable of flying true long-haul services. Airbus asserts that the XLR will feature about 30% lower fuel burn than its predecessor, creating economic viability for thinner routes and new business models for long-haul travel. The A321XLR also could eat into some hub-and-spoke traffic as it enables competing airlines to fly direct to smaller markets beyond the hubs and poach transfer passengers—making it operationally cheaper for the carrier and more convenient for passengers to avoid connections at large, often-congested airports.

The limit lies in the number of markets with sufficient demand for nonstop routes. A

much smaller cargo capacity compared with widebodies makes the XLR less attractive for airlines on routes with strong cargo demand.

Commercially, the A321XLR is already a success. Airbus has collected more than 500 firm orders for the aircraft, according to Aviation Week Network's Fleet Discovery database. IndiGo is the largest customer with a commitment for 70 aircraft, followed by American Airlines with 54, United Airlines with 50 and Wizz Air with 47. The lineup shows that the aircraft has generated interest from both legacy and low-cost airlines. At American and United, the XLR will fill the role of the aging 757; elsewhere, the XLR will allow carriers to reach into new strategic spheres.

Although the aircraft is a version of the highly popular A321neo, the XLR is substantially different. The key difference is the XLR's fuel capacity: The new rear center tank (RCT) has a capacity of slightly less than 13,000 liters (3,400 gal.), enabling the aircraft to fly routes of nearly 4,700 nm. Because the tank is integrated into the fuselage frame rather than sitting on a cargo floor structure, "we can put the equivalent volume of four tanks in the space of two," says Gary O'Donnell, head of the A321XLR program. Airlines also have the option to add a second tank to the front cargo hold of the aircraft. For comparison, the 4,000-nm-range A321LR has three tanks in the back and one in the front fuselage.

Whether airlines will install the forward tank depends largely on their cabin choices and required ranges. For instance, carriers that install heavy premium business class seats and want to fly from Europe to the U.S. but farther than the East Coast, the added tank might be necessary,

though it would reduce space for cargo and baggage. "Not all full-service carriers would have the additional center tank," O'Donnell says. "Some would want the forward capacity."

While the RCT extends to the bottom of the fuselage skin, it does leave space for the escape rafts on each side below the exit doors, and channels on the upper sides provide room for electrical wiring and air conditioning. The fuel system has been adapted accordingly.

Because of the extra fuel capacity, Airbus raised the maximum takeoff weight to 101 tons from 97. "We have completely changed the main landing gear and simplified the mechanism," O'Donnell says. The nose landing gear has been reinforced, and the tires, wheels and brakes have been updated.

Airbus also has "reinforced 80% of the airframe," O'Donnell says. "Most of the parts are similar but stronger because of the extra weight."

In addition, engineers have simplified the mechanism of the inboard flaps. On the A321neo, a double mechanism extends twice, but on the XLR only once. The landing gear has also been changed, from double pistons to single.

Airbus engineers took advantage of an opportunity to bring the A320neo family closer to the technological standard of the A330neo and A350 by changing an important flight control element that still had a mechanical layout. Because of the RCT's location, the traditional rudder controls have been replaced by what Airbus calls the eRudder. The technology is planned to be integrated into the baseline

A321neo within the next three years.

The flaps, landing gear and electronic rudder control all help with weight reduction, which became a rather significant challenge after the European Union Aviation Safety Agency (EASA) and later the FAA insisted on special conditions to ensure better fire protection and crashworthiness of the RCT. Airbus had to make several modifications. First, the OEM changed the lower skin of the aircraft to a fiber metal laminate, a material used on the upper skin of the A380 that is more fire-resistant than traditional aluminum alloys. That measure is supposed to help against so-called pooled fires from the outside.

Engineers also designed an extended belly fairing with a gap between it and the fuselage skin so that heat would not transfer inside as easily, O’Donnell explains. Airbus also had to demonstrate to airworthiness authorities that the aircraft could sustain a hard landing on the belly and absorb a large amount of the energy. For this improvement, Airbus added extra structure inside the belly fairing and a rubber liner on the RCT floor, the same material it uses on the A340-500. The material is supposed to prevent fuel from leaking in the event of a crash. “We have an extremely robust proposal, which is now being discussed with EASA and the FAA,” O’Donnell says. “It meets what they need. We now need to process through the documentation to get certification before the summer.”

### Airbus A321XLR Orders

Operator	On Order
Aer Lingus	6
Air Arabia	20
AirAsia X	20
Air Canada	30
American Airlines	50
Cebu Pacific Air	10
Flynas	10
Frontier Airlines	18
Iberia	13
IndiGo	70
JetBlue Airways	13
JetSMART Airlines	14
Jetstar Airways	36
Middle East Airlines	4
Saudia	15
Sky Airline	10
United Airlines	50
VietJet Air	20
Wizz Air Hungary	47

Sources: Aviation Week Network Fleet Discovery and Airbus

O’Donnell notes that EASA “has a large workload. . . . We have submitted all our documents apart from two or three. EASA is processing them.” The final few documents are summaries that need to be signed. O’Donnell concedes that the “certification workload has grown.”

Because of the various weight additions and reductions required to comply with certification,

the aircraft is slightly heavier than planned. “We still have the ability to meet everything that we have sold for 90% of city pairs,” O’Donnell says. “For [the remaining] 10%, we have 50-70 nm that we are looking to recover. We have a couple of ideas of how to get there over the next two years. We believe we will get half of that back, at least.”

The first four aircraft are either in final assembly or have left the line for completion. Airbus initially will build the XLR in Hamburg, its main single-aisle production site. One of the four final assembly lines there will be dedicated to the long-range variant plus some of the more complex versions and cabin layouts of the standard A321neo. Airbus has not revealed its choice among the four Hamburg facilities; the OEM introduced the fourth, more modern and automated assembly line in 2018 in a building originally dedicated to A380 completion.

All final assembly lines in the Airbus system—Hamburg; Mobile, Alabama; Tianjin, China; and Toulouse—are being updated to be A321-capable, so they could also assemble the XLR. “We want to get to maturity in Hamburg, and then we can decide as a business where we want to put production,” O’Donnell says. “What I’m trying to build most is flexibility. We cannot have so many single points of failure.”

To derisk XLR production, Airbus tries to “push complexity to the left as much as possible,” he notes. Complicated components, such as the RCT, are built in their own factories (Premium Aerotec in Augsburg, Germany, in this case) so that elements of substantial change are isolated and dealt with before the parts enter the final assembly line. Airbus hopes the sequence

of moving aircraft from one assembly station to another can be maintained with few disruptions. Since the A321XLR will add to the growing number of complex layouts for the A321neo, that goal is particularly pertinent.

Airbus has not revealed detailed XLR production ramp-up plans. According to Fleet Discovery, seven aircraft are scheduled to be delivered this year, 51 next year, 120 in 2026 and a peak of 142 in 2027. If Airbus reaches its target rate of 75 per month for the A320neo family, 15-20% of production capacity could be allocated to the XLR. That snapshot view might change depending on future orders for the type and other A321neo variants. Fleet Discovery forecasts that XLR deliveries will fall steeply after 2029 based on current orders. The final eight XLRs from the current orderbook are scheduled to be handed over in 2033.

International Airlines Group (IAG) confirmed in May that Iberia, rather than sister carrier Aer Lingus, will receive the group’s first XLR once deliveries start “by the end of the summer.” IAG placed a firm order for 14 of the type at the 2019 Paris Air Show; eight are designated for Iberia and six for Aer Lingus. After a pilot pay dispute at Aer Lingus was not resolved in time, IAG decided to switch to Iberia as the launch operator.

Iberia’s A321XLRs will feature 182 seats in a two-cabin configuration, including 14 in its business cabin featuring fully flat seats that convert into beds and offer direct aisle access. “One of the great innovations offered by the A321XLR is its ability, as a single-aisle aircraft, to make long-haul flights while also providing a premium service at the same level as that enjoyed

in widebody models, like the A330s and A350s in Iberia's fleet," the airline stated.

The XLR could enable the Spanish flag carrier to serve U.S. cities such as Atlanta; Charleston, South Carolina; Houston; Orlando, Florida; and Philadelphia.

Possibly the most interesting case study will be how IndiGo uses the XLR to expand its long-haul network. The Indian low-cost airline operates only two Boeing 777-300ERs to Istanbul on a wet lease from Turkish Airlines and has ordered 30 A350-900s for long hauls on dense routes. The airline also has purchased 70 XLRs that it can use to develop routes from secondary markets in India to destinations in Asia, Europe and the Middle East.

Growing IndiGo's long-haul operations could disrupt European legacy carriers that are reliant on feed beyond their hubs and the Middle Eastern super-connectors that channel large numbers of connecting passengers through their systems. IndiGo's future long-haul network also will compete with Air India, which is trying to recover market share based on a more traditional model.

"We are expanding more and more internationally," IndiGo CEO Pieter Elbers said at the recent International Air Transport Association (IATA) annual general assembly in Dubai. "The XLR will introduce direct flights to Europe and Asia. Passengers will no longer have to connect elsewhere."

IndiGo has introduced a premium cabin layout for the main domestic routes in India, a move that could indicate plans to abandon pure

low-cost play on the much longer international flights.

Of the U.S. Big Three, American and United have large XLR orderbooks, but Delta Air Lines has not yet ordered the type. American plans to offer a business class section with lie-flat seats in suites with doors, a premium economy section and regular coach. The airline has not yet announced how many seats will be available in each cabin or when operations will start. According to Fleet Discovery, the first aircraft is to be delivered in May next year, and all remaining XLRs are to be handed over by the end of 2027.

United is expected to receive its first XLR later in 2025 and will install a new version of its Polaris business class. The aircraft will replace the 757 fleet and will primarily fly routes from the East Coast to Europe and Latin America. The premium product would also make it a good option for transcontinental domestic flying.

Air Canada plans a 50-50 split between international and North American routes when it scales up to 30 A321XLRs. The airline is scheduled to take delivery of its first aircraft in late 2025, "but for us it's really like a 2026 event," Mark Galardo, executive vice president of revenue and network planning, said at the IATA meeting.

Canada is a very seasonal market with "big amplitudes between summer and winter, and that's why that airplane was so key to our strategy going forward," Galardo said. He cited the Montreal-Toulouse route, noting that "in the summer, a widebody is fine—but in the winter, it's a bit much. As you get the A321XLR, you

start to better match demand with capacity.”

Galardo speculated that the A321XLR could open up new European routes, such as Porto, Portugal, and Marseille, France. “There are still a few European destinations that we want to cover,” he said. “It’s just the opportunity cost of a widebody is just way too big.”

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## Indian Aerospace Industry

### Policy Switch to Make Full Fighter Jets in India

Shahid Faridi | 28 June 2024

Source: [Indian Express](https://www.newindianexpress.com/nation/2024/Jun/28/policy-switch-to-make-full-fighter-jets-in-india) | <https://www.newindianexpress.com/nation/2024/Jun/28/policy-switch-to-make-full-fighter-jets-in-india>



Indian Air Force's SU-30 aircraft in lead with two Jaguar and two Hawk aircrafts fly in a formation over Yelahanka air base during Aero India. File Photo |

Vinod Kumar T, EPS

NEW DELHI: Not content with piecemeal Make in India initiatives in its defence procurement, the Union government has made a policy switch to buy as many as 114 Multi-Role Fighter Aircraft (MRFA) only from a vendor who is ready to set up a manufacturing unit in India for the entire aircraft.

It also wants transfer of technology and full

production in India in a joint venture with a local partner.

A new global tender incorporating these conditions is likely to be floated soon. The radical shift in policy is expected to delay the MRFA acquisition further. India has 31 squadrons of fighter jets as against the sanctioned strength of 42.

A large number of parts of fighter aircraft purchased earlier are already being manufactured in India under the offset obligations. This is the first time that the government will be insisting on manufacturing complete aircraft in India with technology transfer.

Approximately valued at \$20 billion, the MRCA is said to be one of the world’s biggest defence deals in recent times. Among the aircraft in the race to bag the contract are Dassault’s Rafale, Boeing’s Super Hornet F/A-18, SAAB’s Gripen, Lockheed Martin’s F-21, Russian MiG-35 and the Eurofighter Typhoon.

Sources said French company Dassault, makers of Rafale, which has been the frontrunner to bag the contract, is not keen to transfer technology for production in India. The Indian government has already bought 36 Rafale jets for the Indian Air Force and is likely to go ahead with its decision to purchase 26 Rafale Marine to replace the ageing MiG-29s being used on INS Vikrant and INS Vikramaditya.

The Union government has been encouraged by its success in getting US company GE Aerospace Defence and Systems to produce fighter jet engines in India in collaboration with the state-owned Hindustan Aeronautics Ltd.

As per the deal signed during Prime Minister Narendra Modi's last visit to the US, GE will transfer 80% technology of its F414 jet engines that will power the Mk2 version of India's indigenously-developed Light Combat Aircraft.

The government has increased the FDI sectoral limit in defence to 74% to make the country a defence manufacturing hub.

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## Indian Air Force Orders Six Made-in-India Tapas Surveillance Drones from Centre

Aveek Banerjee | 23 June 2024

Source: [India TV News](https://www.indiatvnews.com/news/india/indian-air-force-proposes-centre-for-acquisition-of-six-made-in-india-tapas-drones-defence-capabilities-updates-2024-06-23-938433) | <https://www.indiatvnews.com/news/india/indian-air-force-proposes-centre-for-acquisition-of-six-made-in-india-tapas-drones-defence-capabilities-updates-2024-06-23-938433>



*Tapas surveillance drone*

New Delhi: In a major boost for enhancing India's defence surveillance capabilities via indigenous weapons, the Indian Air Force has made a proposal to the Centre to buy 10 made-in-India Tapas drones, according to officials. Out of the ten drones, six made-in-India drones would be used for the Indian Air Force, while the remaining four would be used by the Indian Navy.

The Indian Air Force will be the lead agency for the induction and acquisition of the Tapas

drones into the defence forces, defence officials told news agency ANI. These two defence forces are only focusing on acquisition of drones and the IAF proposal is expected to be soon taken up for discussion by the Defence Ministry.

### What are Tapas drones?

Tapas drones are medium-altitude long, endurance-category drones that have been developed indigenously by the Defence Research and Development Organisation and have to be manufactured by a consortium of Bharat Electronics Limited and Hindustan Aeronautics Limited. Although the drones have not been able to meet the requirements of the defence forces, their limited induction is expected to help in their upgradation in the near future to meet larger requirements, said officials.

The IAF has a fleet of Israeli-origin Searcher, Heron Mark-1 and Mark-2 drones and is looking to induct the American Predator MQ-9B drones in the future as part of a tri-services acquisition. The six indigenous Tapas drones would help it improve unmanned surveillance on both the northern and western fronts, they said.

### Capabilities of Tapas Drones

The Indian Navy intends to use the Tapas for surveillance activities over the maritime zone. In recent times, the Indian Air Force has emerged as one of the staunchest supporters of Make in India in Defence, with orders for 180 LCA Mark 1A and 156 LCH attack choppers worth around Rs 1.6 lakh crore getting placed or are about to be placed by it.

The Tapas drones have been tested by the

Indian defence forces and during the trials, they managed to reach 28,000 feet altitude and could fly for over 18 hours. The deliveries would be made faster by the consortium as the first bird would be ready for delivery within 24 months of signing the contract, as per the officials.

Meanwhile, the DRDO is continuing with the Tapas project to further develop the system. The Tapas drones being developed by the Aeronautical Development Establishment Laboratory have not been able to fully meet the Joint Services Qualitative Requirements of flying at 30,000 feet for over 24 hours at a stretch and have been excluded from the category of mission mode projects.

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## India Successfully Completes new Booster Design on Abhyas HEAT

Andrew Salerno-Garthwaite | 28 June 2024

[Source: Airforce Technology | https://www.airforce-technology.com/news/india-successfully-completes-new-booster-design-on-abhyas-heat/?cf-view](https://www.airforce-technology.com/news/india-successfully-completes-new-booster-design-on-abhyas-heat/?cf-view)



*The Abhyas tested a new booster configuration successfully in six trials. Credit: Indian MoD/ Government of India/Press Information Bureau*

India's Defence Research and Development Organisation (DRDO) completed trials on an improved booster configuration for the High Speed Expendable Aerial Target (Heat), Abhyas,

announced the Department of Defence (FoD) on 27 June 2024.

Details of the new booster design were not disclosed, but as recently as October 2021 the Abhyas, which is programmed for fully autonomous flight, launched using a twin underslung booster.

Six successful consecutive developmental trials were completed, with the Abhyas trial under observation from an improved radar cross section, visual and infrared segmentation system. The Heat system contains a Luneburg lens in the nose cone that can enhance the target's radar cross-section for weapons practice.

The Chairman of the DRDO, Dr Samir V Kamat – who also serves as the Secretary of Research and Design for the DoD – congratulated the success and said “The system is cost effective with huge export potential.”

India's Minister of Defence Rajanth Singh complimented the work of industry, the services and the DRDO for the development of Abhyas: “The successful tests are noteworthy testimony of synergy between scientists and industry.”

Two of the trials were launched back-to-back in 30 minutes, to demonstrate low logistics burden and ease of operation. The mission objectives of the full set of trials included safe booster release, launch clearance, and endurance tests.

DRDO conducted the first experimental launch of the system in 2012, with Rs150m (\$1.8m) in initial funding from the Indian Government for the project, with a per unit cost of Rs4m (\$48,000).

As a HEAT, the Abhyas is intended to offer a realistic threat scenario for weapon systems practice. Under operation from an autopilot and a laptop-based ground control system. The ground control system enables aircraft integration, allows for autonomous flight, and performs pre-flight checks. The autopilot system can support live-fire weapons tests.

The vehicle is equipped with a small gas turbine engine and leverages MEMS-based inertial navigation system to navigate and the Flight Control Computer for guidance and control.

While the Abhyas is expendable, it does contain a data recorder for post-flight analysis. In addition, Abhyas is equipped with an acoustic miss distance indicator that allows users to find out how much a missile missed its target by.

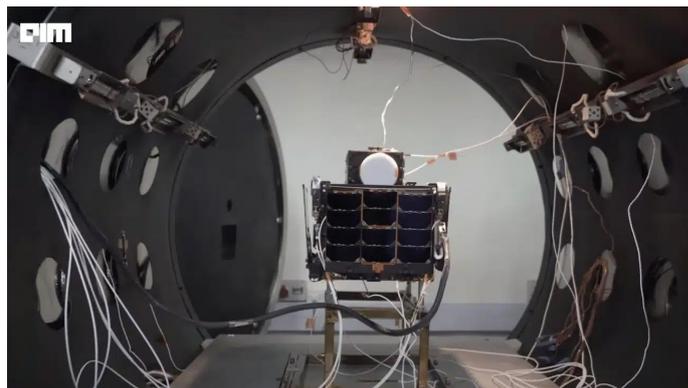
The Abhyas system was designed by DRDO's Aeronautical Development Establishment in Bengaluru in collaboration with Hindustan Aeronautics Limited, Larsen, and Toubro. The new booster design was designed by Advanced Systems Laboratory, and the navigation system came from the Research Centre Imarat.

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## Pixxel to Manufacture Miniaturised Satellites for Indian Air Force Under iDEX Grant

*Shyam Nandan Upadhyay | 25 June 2024*

*Source: Analytics India Mag | <https://analyticsindiamag.com/pixxel-to-manufacture-miniaturised-satellites-for-indian-air-force-under-idex-grant/>*



*A rendering of a ViaSat-3 satellite, the first of which launched April 30, 2023 on a SpaceX Falcon Heavy and suffered an issue post launch that prevented the deployment of the broadband satellite's large reflector antenna. Credit: Viasat*

Bengaluru-based space technology startup Pixxel has signed the 350th contract under the iDEX (Innovations for Defence Excellence) program to manufacture miniaturised multi-payload satellites for the Indian Air Force.

The contract, awarded as part of the iDEX Prime Space grant, marks a significant milestone in Pixxel's mission to revolutionise the space industry in India.

The contract was signed between Awais Ahmed, CEO of Pixxel, and Anurag Bajpai, Additional Secretary (Defence Production) and CEO of IDEX-DIO, in the presence of Defence Secretary Giridhar Aramane, the Vice Chiefs of the Armed Forces, and other officials of the Ministry of Defence.

“We are delighted to receive iDEX’s grant and utilise our expertise of building microsatellites in-house to manufacture satellites externally for the first time,” said Ahmed. “This recognition highlights Pixxel’s dedication to pushing the boundaries of space exploration and innovation.”

Under the multi-crore contract, Pixxel will develop small satellites weighing up to 150 kg for electro-optical, infrared, synthetic aperture radar, and hyperspectral applications. The company will leverage its indigenous hyperspectral satellite technology and manufacturing expertise to build these satellites, enabling ease of manufacture, low cost, and ease of launch.

As Pixxel sets out to launch six commercial-grade hyperspectral satellites, ‘Fireflies’, this year, the company remains committed to harnessing its indigenous expertise and the power of hyperspectral satellites for a sustainable future. Building on its expertise, Pixxel now offers high-performance, cost-effective satellite manufacturing solutions, empowering clients to drive meaningful change with space data.

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## India’s Booming Civil Aviation – Time to Make Airliners & Manage MRO

*Air Marshal Anil Chopra (retd), Former DG CAPS | 28 June 2024*

*Source: IADB | <https://www.iadb.in/2024/06/28/indias-booming-civil-aviation-time-to-make-airliners-manage-mro/>*



*Photo: Courtesy of Hubei Sanjiang Group, CASIC Su-30MKI firing the BrahMos-A missile (via Platform X)*

On a typical day in May 2024, Indian airports receive nearly 3,100 domestic and 625 international flights, involving 6,200 aircraft movements, having over 1,115,000 passenger footfalls. The airline’s passenger load factor is close to 90 percent. India’s post-Covid-19 civil aviation turnaround has been extraordinary. India has 157 operational airports. Positive attitudes, progressive policies, and deep trust among passengers are taking it to new heights every day. The two largest Indian airlines Indigo and Air India have announced plans to acquire over 500 aircraft each in the coming decade.

### Civil Aviation Statistics

India’s domestic air passenger traffic was 153 million in 2023. It is expected to increase two-fold to touch 300 million by 2030, the

Civil Aviation Minister Jyotiraditya Scindia told the Wings India 2024 conference and exhibition in Hyderabad in January. The year 2023 saw a growth of 26.98 percent compared to the year before. The increase reflects India's rising economy and income levels and demonstrates the strength and durability of India's aviation sector, and the rising demand for air transportation.

In its 2023 report, Airbus' Global Market Forecast (GMF) for 2023-2042, predicts demand for passenger traffic will grow annually by 3.6% CAGR (Compound Annual Growth Rate) over the next 20 years. As of June 2022, the total worldwide commercial aircraft fleet size was 28,674 aircraft (23,513 active and 5,161 grounded). Airbus has forecast a demand for 40,850 new passenger and freighter aircraft deliveries over the next 20 years, of which 32,630 will be typically single-aisle and 8,220 wide-body. A June 2023 Boeing forecast expects airlines will need to buy 42,595 jets from now until 2042, with 32,420 being single-aisle jets, 7,440 wide-body planes, 1,810 regional jets and 925 freighters.

A Bain and Company report forecasts that by 2030, Europe-North America travel could increase about 17% from its 2019 demand volume in the baseline scenario, while Asia intra-regional travel could jump 61%. Asia maintains a much stronger outlook for long-term disposable income growth, and low-cost carriers also continue to accelerate growth.

## Transport Aircraft Production Ecosystem in India

Hindustan Aeronautics Ltd (HAL) has been

producing the HS-748 'Avro' and Dornier D-228 aircraft in India under licensed production. Both have also been used for civil aviation. Also, National Aeronautics Laboratory has designed and test-flown the 'Saras' small transport aircraft. This is a work still in progress.

The Tata Group companies are already building aero-structures for many helicopters and also C-130J transport aircraft for global customers. Tata Group is working with GE to manufacture CFM International LEAP engine components in India. Many Indian MSMEs and start-ups are in aircraft systems production.

Meanwhile, a Tata consortium will build 40 EADS CASA C-295 MW aircraft and significant numbers of its sub-systems in India at a plant in Baroda, Gujarat. The first Made-in-India aircraft will roll out of the new facility in September 2026. Before the completion of deliveries in 2031, a D-level MRO (maintenance, repair, and operations) facility will be set up in India. This facility will act as a regional MRO hub for various variants of C-295 aircraft. The indigenous content in these planes will be the highest ever in India, with 96 percent of the work that Airbus does in Spain gradually being done at the new facility in India. This project should also help India in pushing its commuter aircraft.

In February 2024, Embraer Defence & Security and India's Mahindra Group announced that they have signed a Memorandum of Understanding (MoU) with the objective of jointly fulfilling the acquisition of the C-390 Millennium multi-mission aircraft by the Indian Air Force (IAF) in its upcoming Medium Transport Aircraft (MTA) procurement project. More than 125 domestic MSME suppliers spread across different states.

## Global Regional Jet Players

While Boeing and Airbus have dominated the large commercial aircraft market. Regional jets are smaller aircraft, fly shorter ranges, and carry fewer passengers. Bombardier of Canada and Embraer of Brazil are the historical leaders in the regional jet market. Commercial markets also include turboprops. There are other players in the business jet market such as Beechcraft, Cessna, Dassault, Gulfstream, etc. The HAL/NAL Indian Regional Jet (IRJ) is planned to be 90-seater with a targeted first flight around 2026. But the work is still in slow progress.

Boeing and Airbus each manufacture roughly 500 narrow-body aircraft and 100 wide-body aircraft annually. Around 200 regional jets are built by various manufacturers every year. Boeing has delivered over 20,000 jetliners since the era of B-707 which was inducted in the late 1950s. Airbus, a European multinational aerospace corporation, was founded in 1970. Airbus has built more than 13,500 commercial aircraft. Clearly, the US and Europe dominate the sector.

Both Russia and China depend on the West for globally certified aero-engines and for some avionics. They also need US Federal Aviation Agency (FAA) and European Union Aviation Safety Agency (EASA) clearances for their airliners to fly to most destinations. China has a huge civil aviation sector with nearly 16 percent of global civil aircraft. Their civil aircraft fleet comprises close to 3,500 medium to large-sized and 240 small-sized aircraft. The fleet size is expected to grow to 8,500 by 2041. It is pertinent to mention that China's COMAC C919 narrow-body airliner is about to enter service and has nearly 1,000 orders from Chinese airlines.

## Indian Airliner – When?

Indian civil aviation market has a huge demand for civil aircraft and their aeroengines. There is also a huge maintenance Repair and Overhaul (MRO) market to be tapped. The next logical step would be to build our own short-haul ATR-42 class (42-48 seats) aircraft, and later also single-aisle aircraft of Boeing 737 and Airbus A320 class.

Initially, ATR, Airbus or Boeing should be asked to set up a production line in India. Similarly, India must also get some major civil airliner aero-engine manufacturer to set up a production line in India with a local partner. Even the C-295 which is being made in India has been certified for civil purposes, and India could consider a civil variant.

The GE-414 fighter aero-engine will be made in India by General Electric in a joint venture with Hindustan Aeronautics Ltd (HAL), with some level of technology transfer. These will be used for the Light Combat Aircraft (LCA) and Advanced Medium Combat Aircraft (AMCA). For civil aeroengine, we must insist on a joint venture with significant technology transfer by leveraging high numbers and growing markets. All this will give a further push to the Atmanirbharta (self-reliance).

## Tapping the Huge MRO Market

India has a huge MRO market for civil and military aircraft and engines. The current airliner fleet of around 750 aircraft will more than double in five years. IATA predicts that it will be the third-largest fleet in the world by 2026 surpassing the UK. A 2023 CRISIL report states that India's MRO sector still faces obstacles such as difficulty obtaining credit, inadequate infrastructure, high

taxes, licensing and certification issues, and high rental costs. However, the Indian government has introduced several policies to support making the country a global MRO hub. These include reducing GST on MRO services from 18% to 5%, land lease policies for longer durations to lower rental costs and discontinuing the 13% government-charged royalty on revenue. These should support the reduction of costs by 10-20 percent.

Setting up an MRO is highly capital intensive with a long break-even time. It requires continuously reskilled manpower and repeat investments in tooling, and certification from safety regulators such as the FAA and EASA, and global OEMs such as Airbus, Boeing, and many others.

The second aircraft MRO hub in Mihan-SEZ at Nagpur has been operational since 2021. Meanwhile, the Delhi and Bengaluru airports have established dedicated MRO facilities, and these are being extended. A huge MRO hub will come up at the upcoming Noida International Airport, Jewar, Uttar Pradesh. More airports like Belegavi, Bhopal, and Tirupati will have MRO facilities. India's Directorate General of Civil Aviation (DGCA) would have to stipulate international standards on the lines of those by the FAA and EASA for international recognition.

Indian government's top think-tank, NITI Aayog has recommended an incremental approach, by first setting up joint ventures in India with global players, and gradually ascending the work-value chain. Ultimate India must aspire to be an international-class MRO hub like in Singapore. A surge in local MRO facilities will be good for airline operations, safety and costs.

As per Niti Ayog's report of October 2022, the Indian MRO industry was \$1.7 billion in 2021. The global MRO market was worth US\$78.6 billion in 2022. The Indian market is expected to be \$4.0 billion by 2031, growing at 8.9% CAGR, faster than any other country. India thus has great potential to be a significant regional MRO hub and gradually strive to establish its foothold in the global supply chain.

### **Current MRO Players**

The current major Indian MRO players are, AIESL (Air India Engineering Services Ltd), Air Works India, and GMR Aero Technic Limited, among a few others. The airlines' growth makes a great case for strategic investors, Original Equipment Manufacturers (OEMs) and global MRO players. Policy initiatives such as the MRO Policy 2021, National Civil Aviation Policy 2016 and rationalization of GST, are great incentives.

Hindustan Aeronautics Limited (HAL) and Airbus have formalized an agreement to establish state-of-the-art Maintenance, Repair, and Overhaul (MRO) facilities for the A320 family of aircraft.

### **Way Ahead India**

In November 2022, at the foundation stone ceremony of a Tata-Airbus manufacturing facility in Gujarat, Prime Minister Narendra Modi said that India would soon be manufacturing large passenger aircraft. He added that they would also be marketed across the globe. The PM perhaps meant two things. Firstly, to convince foreign civilian aircraft makers to set up a final assembly line in India. Secondly, or in parallel, design and build an Indian passenger plane from the ground

up.

Prime Minister Modi also inaugurated the new state-of-the-art Boeing India Engineering & Technology Center (BIETC) campus in Bengaluru, Karnataka in January 2024. Built with an investment of Rs 1,600 crore, the 43-acre campus is Boeing's largest such investment outside the USA. The Prime Minister said that this facility demonstrates India's commitment to driving global tech, research & innovation, design and demand. "This strengthens the 'Make in India-Make for the World' resolution", he said.

100 percent FDI is already cleared in most sectors of civil aviation, but India has not yet leveraged large airliner orders. The country does have manufacturing and assembly skills but lacks original design work. The narrow-body airliner market is huge. India must insist Boeing and Airbus to set up assembly lines in India and give component orders to local manufacturers. Large groups like Tata with aero-structure manufacturing experience, and simultaneously operating a huge airline, can bag more manufacturing orders. In the civil aviation sector, HAL is already manufacturing aircraft parts for Boeing and Airbus. Manufacturing Dornier 228 for RUAG of Switzerland. But it is a minuscule part.

India must set up an independent authority on the lines of the Aeronautical Development Agency (ADA) to push civil aviation aircraft development. It must function under PMO as it would involve inter-ministerial support. It may subsume the transport aircraft building facilities of HAL and NAL. The agency can also be tasked to work on the MTA for IAF. The agency must also drive building MRO facilities. We may seek foreign consultancy for aircraft design. India

must insist on foreign OEMs to set up engine manufacturing through a joint-venture route. We must do all aircraft interior work in India to begin with. Why cannot India make aircraft seats and other interiors in India itself? Avionics is another area where India is way behind and that requires task-force-like action.

West is moving out of China. Europe has a high cost of production. India is the next best destination. India also has large land banks near airports, especially the newer Greenfield ones. Government policies are becoming more attractive for promoting the manufacture and shifting MRO to India. Finally, India must invest much more in R&D. Developing your own designs and having your own patents is important. It must be a whole-of-nation approach. India is a rising star, the time to act is now, lest we lose another golden opportunity.

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## Commentary

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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.”*



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

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