

CENTRE FOR AIR POWER STUDIES (CAPS)

Forum for National Security Studies (FNSS)

AEROSPACE NEWSLETTER



Flight trial of Autonomous Flying Wing Technology Demonstrator: India joins elite club of countries to have mastered the controls for flying wing technology in tailless configuration

Image Source: pib.gov.in

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We wish all our readers Blue Skies and many Happy Landings in the year ahead

"HAPPY NEW YEAR 2024"

"We must seamlessly integrate air, space, cyber and ground capabilities to dominate the battlespace"¹

- Air Chief Marshal VR Chaudhari PVSM AVSM VM ADC

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¹ https://www.hindustantimes.com/india-news/mission-is-to-make-iaf-one-of-the-best-by-2032-air-chief-marshal-vr-chaudhari-101696759341137.html

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Opinions and Analysis

Why Macron's Republic Day Visit Could Precipitate the IAF's Long-Deferred Modernisation

Rahul Bedi | 24 December 2023

Source: thewire.in | https://thewire.in/security/whymacrons-republic-day-visit-could-precipitate-theiafs-long-deferred-modernisation



Indian Prime Minister Narendra Modi with French President Emmanuel Macron in 2017. Photo: Prime Minister's Office/Wikimedia Commons, GODL-India

New Delhi: Symbolism remains an important and subtle ingredient in bilateral diplomatic and national security dealings between countries. India and France, with robust, longstanding and ongoing materiel commerce, are certainly no exception.

Hence, the imagery of France's President Emmanuel Macron as the chief guest at next month's annual Republic Day parade in New Delhi, will not be entirely lost on many, given that the Indian Air Force (IAF) has, once again, fast-tracked its long overdue plans to acquire 114 multi-role fighter aircraft (MRFA) to boost its flagging combat squadrons.

"Apart from the reciprocity in inviting President Macron for the January 26 spectacle, in return for making Prime Minister Modi the chief guest at France's yearly Bastille Day parade in Paris in July, the prospect of India acquiring additional Dassault Rafales for the crucial MRFA tender, loomed in the background," said a veteran three-star IAF officer.

Such activity was all a part of 'discreet signalling' by the two sides with regard to these potential purchases, he added, declining to be named for fear of official retribution for speaking on such matters.

An assortment of serving and retired IAF officers, security officials and analysts broadly agreed. They also stated that the 'ground reality' with regard to the IAF's chances of inducting Rafales under its proposed MRFA programme was high on a number of counts.

Foremost, these included the 36 Rafales that the IAF had acquired in 2016 for around \$9 billion, its first overseas combat aircraft procurement in 23 years, after the first lot of Russian Sukhoi S-30MKI (India) multi-role fighters were first imported in the early 1990s before their indigenous licensed production began.

Thereafter, the Indian Navy (IN) had earlier this year opted for 26 Rafale-M (Marine) fighters, including four dual-seat trainers, for embarkation on the INS Vikrant, its newly commissioned aircraft carrier, making it a total of 62 French combat aircraft in service with India's military, all of them manufactured by Dassault.

According to media reports, negotiations over cost and delivery schedules for the Rafale-Ms were underway in the government-togovernment deal between Paris and New Delhi, and the deal was likely to be inked after a new Indian government came into office following parliamentary elections in early 2024.

"Adding to these 62 Rafales made eminent commercial, logistical and operational sense

as the support infrastructure and servicing and maintenance systems for them had already been established," said the above-mentioned IAF fighter pilot veteran.

More importantly, acquiring tried and tested Rafales would also hasten fighter inductions by dispensing with extended evaluation and trials, and in turn would speedily boost the IAFs fighter squadrons, which had depreciated to 29-30 from a sanctioned strength of 42, he declared.

Moreover, industry officials said that acquiring supplementary Rafales would also streamline the IAF's diverse fighter catalogue, which presently features seven different aircraft types, sustaining all of which was not only an enduring logistical nightmare but also a hugely expensive affair for the financially strapped force.

Besides, Rafales were already in 'serious' contention for the MRFA buy, which envisages importing a squadron of 18 shortlisted fighters in flyaway condition from amongst seven models on offer from overseas original equipment manufacturers (OEMs) who had responded to the IAFs April 2018 request for information (RfI).

The remaining 96 platforms would be built indigenously via a collaborative venture between the qualified OEM and a domestic strategic partner from either the private or public sector, with progressively enhanced levels of indigenisation, in the overall MRFA deal, estimated at around \$25 billion.

Industry and official sources said the MRFA tender was expected imminently, and senior IAF officers estimated that the initial number of fighters (114) could increase to around 200 units, in addition to possible export options, resulting in the platforms' cost amortisation. The six other OEMs, besides Dassault, who had responded to the IAF's RfI included Eurofighter (Typhoon), Sweden's Saab (Gripen-E), Russia's United Aircraft Corporation and Sukhoi Corporation (MiG-35 'Fulcrum-F' and Su-35' Flanker-E'), and the US's Boeing and Lockheed Martin (F/A-18 and F-15EX and the upgraded F-21).

However, in view of the ongoing war in Ukraine, the IAF is believed to have jettisoned the evaluation of the two Russian fighter types, given the grave spares and components crisis it is continuing to face with regard to its fleet of some 12-odd squadrons of around 263 Su-30MKIs and 50-odd upgraded MiG-29M fighter-bombers.

Besides, at his annual press conference in October, Air Chief Marshal V.R. Chaudhuri had declared that the IAF planned on domestically upgrading 84 of its Su-30MKIs to 'Super Sukhoi' status for Rs 60,000 crore, a venture that had earlier focused heavily on direct Russian involvement, which presently was questionable.

Alternately, shortlisting the Typhoon would only mean adding to the IAF's massive continuing logistic challenges, whilst the US's F-18 and the F-16 – a precursor to the F-21 – had both been rejected by it on multiple capability counts during trials conducted 2010 onwards for the binned Medium Multi-Role Combat Aircraft (MMRCA) contract floated in 2007.

Saab's Gripen-E, on the other hand, was a single-engine platform, and though the MRFA RfI had not specified any preference for single- or dual-power packs, the IAF's intrinsic preference for the latter remains unstated.

Hence, by a process of elimination, the Rafale was more than favourably placed in the MRFA

sweepstakes, due to its operational superiority over its competitors that has repeatedly been acknowledged by the IAF and, more recently, by the IN.

Furthermore, there was also the abandoned contractual template for the terminated MMRCA tender in which the Rafale had bested rivals Typhoon, F-16C/D, F/A-18E/F, MiG-35 and JAS 39 Gripen.

Industry officials said this could 'easily be tweaked' to suit an analogous MRFA purchase by resolving earlier glitches that would significantly compress negotiations, which in most instances stretched on interminably, way beyond the officially prescribed deadlines.

These previous anomalies in the MMRCA deal had centred on insistence by the Ministry of Defence (MoD) that Dassault shoulder eventual quality control responsibility for the 108 Rafales that were to have been licence-built by the stateowned Hindustan Aeronautics Limited (HAL) in Bangalore.

This unwarranted conditionality had emerged as the deal-breaker for the MMRCA deal and had led to the MoD procuring just 36 Rafales in flyaway condition many years later.

Even geopolitically, Indian diplomats, security officials and analysts conceded it was less 'arduous' conducting materiel commerce with Paris than with Washington, as the former was more flexible and pragmatic than the latter, especially with regard to transferring high-tech military knowhow and passing on source codes that manage fighter weapon and flight control systems.

The US, for its part, remained constrained by rigid export and associated regulations in this regard, and hidebound by personal political and diplomatic considerations over platform deployments.

France, on the other hand, was more 'relaxed' on all these counts, displaying Gallic savoir faire that strategically suited India, even if its platforms were somewhat dearer.

Thus even though President Macron was a 'replacement' chief guest at the Republic Day parade after US President Joe Biden had declined Delhi's invite due to pressing domestic compulsions, his attendance could eventually end up precipitating the IAFs long-deferred modernisation.

Likewise, it may well also facilitate multifarious engagements for India on a range of space, advanced technological spheres, environmental and nuclear-related issues with a Western country that had unconditionally and categorically backed Delhi after its 1998 Pokhran-II tests.

India's 'Air and Space Force': Spaceplane to 'Desi GPS', how IAF Renaming will Widen its Ambit

Smruti Deshpande | 23 December 2023

Source: The Print | https://theprint.in/defence/ indias-air-and-space-force-spaceplane-to-desi-gpshow-iaf-renaming-will-widen-its-ambit/1880160/



Illustration: Soham Sen | ThePrint

New Delhi: The proposal to change the name of the Indian Air Force (IAF) to the 'Indian Air and Space Force' is likely to come through "anytime now", ThePrint has learnt.

"Space, as a domain, is adaptable to the air force and is only a natural transition," said a highly-placed source in the IAF, adding that the proposal to change the force's name was sent to the Union government less than a year ago, in keeping with the defence minister's exhortation during the 37th Air Chief Marshal P.C. Lal Memorial Lecture on 5 May last year.

The IAF, Defence Minister Rajnath Singh had said at the time, must "become an aerospace force and be prepared to protect the country from the challenges of the future".

The Air Force is taking such measures to implement the changes, added sources in the defence establishment.

Indian armed forces already use NavIC, an Indian version of the US Global Positioning

System, which is inherently a positioning, navigation and timing (PNT) service. NaVIC services are accessible at a higher accuracy for defence purposes and at relatively lower accuracy for civilian purposes.

Such indigenous positioning and navigation services are important, given India's experience of being denied GPS support during the Kargil War.

NavIC, at this point, is however not comparable to the GPS, which offers global coverage. NavIC services are limited to 1,500 km beyond the Indian landmass.

"Additional satellites as part of the NavIC constellation are under consideration to be launched to expand the coverage," said the IAF source quoted earlier.

In September, Indian Space Research Organisation (ISRO) chairman S. Somanath had said that the space agency is trying to increase the navigation coverage of NavIC to 3,000 km. The widening of the coverage would mean that it would include neighbouring countries.

In addition to this, the Air Force is looking to make better use of space-based electro-optical sensors as well as electronic intelligence gathering (ELINT).

In its initial stages, the IAF aims to strengthen intelligence, surveillance and reconnaissance (ISR) capabilities through space assets, it is learnt.

Accurate prediction of terrestrial weather using satellites and space-based sensors helps support air and ground operations, besides helping forces plan missions better.

Space-based sensors will help in the prediction of terrestrial weather and enable forces to

carry out bigger and more accurate operations. Understanding space weather and constantly monitoring it is crucial to keeping space assets safe from various natural phenomena that can affect safe operation of satellites.

Likewise, space traffic monitoring would also help ensure safe and sustainable use of space and can prove effective in precisely timing satellite launches into space, avoiding any collision risks in orbit.

"It would be prudent for the country to merge this information with the Integrated Air Command and Control System (IACCS) of the IAF to provide comprehensive air and space situational awareness, since the IACCS is a fusion of all sensors held with the IAF, Army and Navy as well as civilian agencies," said the IAF source quoted earlier.

Explaining the need for the Air Force to transition into space, Air Marshal G.S. Bedi (retd), former director general (inspection and safety) of the IAF and currently a Distinguished Fellow at the Centre for Air Power Studies, told ThePrint: "With time, more and more threats are likely to emerge from space and will have to be detected from space-based sensors to neutralise them in time."

"Take, for instance, ballistic and hypersonic missiles. These are launched from far-off distances and cannot be detected by line-of-sight radars. Hence, ground-based radars and spacebased sensors will have to be integrated for timely detection of every kind of threat. If the Air Force is renamed as the 'Air and Space Force', it will only help in building its orientation towards space where there is an increased need to focus more," he added. The IAF is also carrying out space-related contingencies and exercises that includes training to function in a GPS-denied environment, satellitecommunications-denied environment, as well as space-based surveillance-denied conditions.

This is to ensure unhindered progress of operations, even in the face of adversity and threats that deny access to space-based capabilities.

Space Vision 2047

In terms of accessing space, the IAF is looking at procuring the Reusable Launch Vehicle (RLV) that is under development at ISRO.

The IAF source told ThePrint that the autonomous landing trials of this spaceplane have already taken place and the Air Force is keen on buying the vehicle, which is capable of circling the Earth at an altitude of 350 km in space for nearly a month.

The vehicle is similar to a space shuttle and would have a payload capacity of 200-1,000 kg. It will also be capable of carrying a human onboard. RLV is not a standalone rocket, instead, it is a winged aerospace vehicle that is mounted atop a rocket.

Only the US and China are known to possess operational spaceplanes.

Furthermore, the IAF is looking at the procurement of soft kill and defensive options to deploy into space to safeguard Indian satellites from being attacked by adversaries, said the IAF source.

For comprehensive operations, the air force is collaborating with ISRO and Indian National Space Promotion and Authorisation Centre, or IN-SPACe, which is a single-window autonomous agency under the department of space of the

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Government of India, for growth of the overall space ecosystem.

Once the name change is in place and details are ironed out, the IAF will enhance collaboration with NewSpace India, a commercial arm of ISRO, which is a wholly owned government company under the administrative control of the department of space.

To that effect, the IAF has already started training officers and airmen to operate in space by introducing theory studies in institutes including the College of Air Warfare. The IAF's think tank, Centre for Air Power Studies, now holds space capsules simulations to understand the domain better, it is learnt.

This comes as part of IAF's space vision 2047, which aims to build deterrence and defence capabilities in space, and to enhance national security, bolster R&D capabilities as well as provide business for the private industry. To that effect, the government is looking at the launch of more than 100 military satellites in the next seven-eight years.

Air Power

IAF goes Full Throttle to Turn into an 'Aerospace Power'

Rajat Pandit | 11 December 2023

Source: MSN | https://www.msn.com/en-in/ news/other/iaf-goes-full-throttle-to-turn-into-anaerospace-power/ar-AA11iaJb?ocid=winp1taskbar& cvid=e700108f79b74ad497551feffdea190d&ei=8



IAF goes full throttle to turn into an 'aerospace power' © Provided by The Times of India

NEW DELHI: The Indian Air Force has gone full throttle to rename itself as the Indian Air and Space Force (IASF) as part of its ongoing overall drive to transform from "a potent air-power" to "a credible aerospace power" in the years ahead.

After formulating a new doctrine that focuses on effective exploitation of the "air and space continuum" and a "Space Vision 2047", IAF has now explained to the government in detail the rationale of being renamed as IASF. "We expect the proposal to be cleared soon," a source told TOI.

Concomitantly, IAF has cranked up efforts to fully exploit the final frontier of space rather than restricting it to the existing ISR (intelligence, surveillance and reconnaissance), communication and navigation capabilities.

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IAF is collaborating with ISRO, DRDO, IN-Space (Indian National Space Promotion and Authorisation Centre) and the private industry to develop niche space-related technologies in a major way now.

"Work is underway in areas like PNT (positioning, navigation and timing), advanced ISR and communications, space weather prediction, space situational awareness, space traffic management and the like," he said.

IAF, in fact, is looking at India having over 100 big and small military satellites with the help of the private sector in the next seven to eight years, while the tri-Service Defence Space Agency set up in 2019 also evolves into a fullfledged Space Command.

"Space has been incorporated in the training for officers and airmen, which includes exercises for space-related contingencies. It's a natural progression from air to space," the source said.

IAF chief Air Chief Marshal V R Chaudhari in recent months has also repeatedly stressed the need for India to develop both defensive and offensive capabilities in the space domain by building on the success of 'Mission Shakti' in March 2019. DRDO had then tested an antisatellite (ASAT) interceptor missile to destroy the 740-kg Microsat-R satellite at an altitude of 283-km in low earth orbit.

"Near space, at an altitude from 20 to 100 km, and outer space will be the ultimate high-ground in the battles of the future. Advanced winged bodies are being built to operate seamlessly between air and space. India has to be prepared for all this," the source said.

China, of course, is rapidly developing and deploying ASAT weapons from "kinetic" ones like direct ascent missiles and co-orbital killers to "non-kinetic" high-powered lasers, electromagnetic pulse weapons, jammers and cyberweapons, as was earlier reported by TOI.

If China has the People's Liberation Army Strategic Support Force for the space domain, the US created a full-fledged Space Force (USSF) as a distinct branch of its armed forces in 2019. Several other countries like the UK, Japan, France and Russia also have space commands or wings in their air forces.

Consequently, IAF has no option but to gradually transcend from existing OCA (offensive counter air) and DCA (defensive counter-air) air-superiority missions to OCS and DCS operations also in the future.

Eventually, IAF's existing fully-automated air defence network called integrated air command and control system (IACCS) will also have to evolve into IASCCS. Space will have to be harnessed for the battlespace of the future.

First LCA Mark1A will be Deployed Soon

10 December 2023

Source: MSN | https://www.msn.com/en-in/news/ India/first-lca-mark1a-will-be-deployed-soon/ar-AA11hpNp?ocid=winp1taskbar&cvid=e700108f79 b74ad497551feffdea190d&ei=15



First LCA Mark1A will be deployed soon © Provided by The Economic Times

The Indian Air Force is planning to raise the first squadron of the indigenous LCA Mark1A fighter aircraft squadron at the Nal air base in Bikaner district of Rajasthan near the Pakistan front.

The aircraft, which would be much more advanced than the existing LCA Mark1 Tejas fighters, are being equipped with the latest indigenous radars and avionics.

"The first squadron of the LCA Mark1A fighters is planned to be based out of the Nal air base in Rajasthan and would be inducted in one of the two MiG-21 Bison squadrons deployed presently there," defence sources told ANI

The first LCA Mark1A aircraft is expected to be delivered to the Indian Air Force by February-March time frame by the Hindustan Aeronautics Limited, they said.

The LCA Mark1A fighter jets are now planned to be produced in large numbers as

83 aircraft are already under production and97 more have been cleared by the central government.

Along with the 40 LCA Mark-1 Tejas fighters, a total of 220 LCA Mark 1 and LCA Mark1A aircraft are planned to be inducted into service in the next 8-10 years.

Hindustan Aeronautics Limited has also increased the rate of production of fighter aircraft and is expected to reach the 24 aircraft per year mark by 2025.

The IAF is going to replace the MiG series aircraft that have been in its inventory with the LCA variants.

The LCA Mark1A aircraft would be the replacements for its MiG-21s, MiG-23s and the MiG-27s. While the MIG-23 and MiG-27 have already been phased out by the force, two squadrons of the vintage MiG-21 are still in service and will be phased out soon.

The Indian Air Force is expected to use indigenous fighters to replace the Mirage-2000 and Jaguar aircraft in future.

As per the plans, defence sources said that the 10 squadrons of the LCA Mark 1 and Mark 1A, 12-13 squadrons of the LCA Mark-2 and the Advanced Medium Combat Aircraft with the 13 squadrons of the Russian origin Su-30MKI will make up for the bulk of the Indian Air Force by the end of next decade.

The Indian Air Force is also clear about one thing it will now have only 'Made in India' fighter aircraft and would require around 120 Multirole Fighter Aircraft (MRFA) indigenously similar to the capability provided by the two squadrons of Rafale fighters to have the desired capability and capability to tackle the threats from both > Return to Contents Page the fronts.

The Indian indigenous fighter aircraft project received a strong boost when Prime Minister Narendra Modi took a sortie in the LCA trainer aircraft which was provided to the Indian Air Force only in early October this year.

The top Indian Air Force brass led by Air Chief Marshal VR Chaudhari has been fully backing indigenous projects and has achieved major success in this domain.

The Indian Air Force is also working on indigenising the Su-30MKI fighters by equipping them with the latest indigenous avionics and weapon systems.

It is also leading the programme to buy 156 Light Combat Helicopters of which 90 would be taken by the Indian Army and 66 by IAF.

The Defence Acquisition Council meeting cleared three major indigenous projects of the Indian Air Force in its last meeting worth over Rs 1.74 lakh crore. All three projects would be done by Hindustan Aeronautics Limited in partnership with private sector firms.

IAF Lands 'Super Hercules' Military Transport Aircraft on Unfeasible Strip for Tunnel Rescue Mission

Rahul Bedi | 18 November 2023

Source: thewire https://thewire.in/security/iaflands-super-hercules-military-transport-aircrafton-unfeasible-strip-for-tunnel-rescue-mission



The IAF assisting the ongoing tunnel rescue underway at Dharasu, Uttarakhand. An IAF C-17 has been deployed to airlift almost 22 tonnes of critical equipment from Indore to Dehradun. Photo: X@IAF_ MCC

In yet another instance of operational daredevilry, the Indian Air Force (IAF) successfully landed two of its Lockheed Martin C-130J-30 'Super Hercules' military transport aircraft at a rudimentary and unfeasible air strip in Uttarakhand. This mission was carried out in inclement weather, to deliver heavy engineering equipment to help rescue workers trapped inside a nearby under-construction mountain tunnel.

In an official statement, the IAF said that its two C-130J-30's executed three sorties to the rudimentary Dharasu advanced landing ground (ALG) on November 15. This was carried out in 'reduced visibility conditions', to ferry 27.5 tons of machinery needed to extricate 41 construction workers, entombed since Sunday, in the collapsed tunnel being built on Uttarakhand's Yamunotri National Highway.

The narrow and undeveloped 3,600 feet ALG, located at an altitude of 3,000 ft, some 30

kilometre from the mishap site, had earlier been declared 'unsuitable' by the IAF for C-130J-30 operations. Despite this, the urgency in reaching the critical equipment to rescue teams spurred the IAF and its pilots to, yet again, exploit their jugaad or innovative skills and fabled derringdo to professionally vindicate their mission objectives.

Ahead of undertaking the delivery flight, an IAF helicopter with C-130J-30 pilots on board had executed an exhaustive recce of the ALG's questionable condition and the many obstructions it posed, before eventually undertaking the equipment delivery mission. Thereafter, varied aspects of the reconnaissance were suitably 'war-gamed', taking all impediments into consideration, and an operational plan was then formalised.

The quasi-military Border Roads Organisation, or BRO, was roped in to clear the ALG of thick undergrowth and shrubbery, and in the best tradition of jugaad that defines a wide spectrum of its operational activity, as well as that of the Indian military, it also constructed a makeshift mud ramp to substitute for specialised off-loading equipment, simply unavailable at the remote ALG.

Based on inputs from the helicopter reconnaissance mission over Dharasu, the 'non-routine critical delivery' mission featured two C-130J-30's from the IAFs 77 'Veiled Vipers' Squadron at Hindan, on New Delhi's outskirts, and was ably completed in under five hours. The IAF declared that the entire operation was underscored by a 'calculated approach and adequate risk mitigation'. Its success, it added, stemmed from 'pinpoint execution'.

One of the IAF's other, larger, Boeing C-17

Globemaster III air lifters, too, were involved in the tunnel rescue operations. One of them shipped 22 tons of heavy equipment from Indore to Uttarakhand's capital Dehradun, from where it was shipped to Dharasu by road, for onward transshipment to the accident spot.

The IAFs daredevil Dharasu delivery operation was reminiscent of its 17 daring flights, featuring C-130J-30's and C-17s, which were undertaken earlier this year as part of Operation Kaveri to repatriate thousands of Indians from war-torn Sudan.

At the time, the Wire had reported on some of these C-130J-30 flights, which were executed in pitch darkness, with calmness and dexterity on the unfamiliar Wadi Sayyidna airstrip that had neither any navigational approach aids nor critical landings lights, some 40 km north of the Sudanese capital Khartoum, wracked by civil war.

The IAF's fleet of 12 C-130J-30s, inducted into service 2011 onwards, are split between the 77 Squadron at Hindan and the 87 'Wings of Valour' Squadron at Panagarh in the east, from where they support the Indian Army's deployment along the disputed line of actual control (LAC) with China. The IAFs 11 C-17s operated as part of No 81 "Skylords' squadron, also from Hindan.

Both aircraft types were acquired via the Foreign Military Sales (FMS) route, with the C-130J-30's costing around \$2-2.5 billion and the C-17s priced at around \$4.1 billion. In recent times, both platforms had been instrumental in transporting army personnel – and their assorted assets-like tanks and infantry combat vehicles – to the LAC to counter the ongoing three-year-long face off with China's People's Liberation Army.

The IAF had last acquired some 70-odd

second-hand twin-piston engine Fairchild C-119 'Flying Boxcars' from the US in the 1950s, after which New Delhi's relationship with Washington deteriorated and those with Moscow proliferated, lasting the duration of the Cold War era, which ended only in the early 1990s. The C-119s, however, were retired in the 1980s, following their extensive employment in two wars with Pakistan in 1965 and 1971.

Hence, for over five decades thereafter, the IAF remained dependent almost entirely on legacy Soviet-origin transport platforms. This was in addition to combat aircraft-like the Ilyushin Il-76s and Antonov An-32s, which a cross-section of IAF pilots maintained had recently been 'technologically outmanoeuvred' by the newly inducted US transports.

"The fully automated, state-of-the-art flight decks of both the US models fitted with +4 generation avionics were far superior to those of the two Soviet transports, making them relatively effortless to operate," a former IAF transport pilot said, declining to be identified. Besides, the US platforms were 'significantly' more fuel efficient, requiring a smaller, three-person crew – two pilots and a loadmaster – to operate, compared to five personnel needed for an II-76 and four for an An-32, he said.

Besides ease of operation both in the air and on ground, the US transports had a 12-week maintenance cycle, which was almost three times higher than that of the II-76s and even the 60-70 retrofitted and upgraded twin-turboprop An-32s, both of which required regular servicing every three to four weeks, said the C-17 pilot quoted above.

"The total technical life cycle of C-130J-30 and C-17 engines, too, is notably higher – almost 10 times more than that of the fuel-intensive Soviet aircraft power packs," retired Air Marshal V.K. Bhatia said. This operational aspect increased platform efficiency and considerably reduced maintenance and operating costs, he added.

Besides, by undertaking the Dharasu delivery mission, the IAF had 'stretched' the C-130J-30's operational envelope, possibly even a little beyond what its manufacturers Lockheed had anticipated and could, in time, further boost the transport platform's commercial appeal.

Or as the adage goes, the only way to discover the limits of the possible, is to go beyond them into the impossible; or in this case, the nearimpossible, an endeavour in which the Indian military excels on multiple fronts in exploiting its assorted platforms and equipment.

Indian Air Force inducts SAMAR Air-Defence System

Kapil Kajal | 20 December 2023

Source: Janes | https://www.janes.com/defencenews/news-detail/indian-air-force-inducts-samarair-defence-system



The SAMAR air-defence system – as seen at Aero India 2023 – uses Ashok Leyland vehicle mounted with refurbished R-73E missiles on rail launchers. (Janes/ Rahul Udoshi)

The Indian Air Force (IAF) has inducted the Surface to Air Missile for Assured Retaliation (SAMAR) system, an IAF source told Janes on 20 December.

According to the source, the service also testfired the system in mid-December at Air Force Station Suryalanka located in the southern coastal region of India.

The source did not elaborate on the number of systems the service has inducted. However, another IAF official told Janes in February that the first batch will include five SAMAR units.

SAMAR is a short-range air-defence system jointly developed by the IAF's 7 Base Repair Depot (BRD) and 11 BRD in association with Indian private-sector companies Simran Flowtech Industries and Yamazuki Denki.

The system provides air defence against lowflying aerial targets with a maximum striking range of 12 km.

SAMAR employs the IAF's shelf-life-expired Russian Vympel R-73E infrared-guided air-to-air missiles (AAMs). The AAMs are refurbished and upgraded to perform surface-to-air roles and the missiles can be launched in both single and salvo mode.

The system comprises launch beams, a firecontrol unit, an electronic control unit, and auxiliary units including a self-loading knuckle crane, a power supply system, and a servo mechanism feedback unit.

SAMAR is intended to replace the IAF's Pechora systems, which have been in service since the 1970s.

Exercise Astrashakti: Indian Akash Air Defence Missile System Destroys 4 Targets Simultaneously

17 Deecember 2023

Source: The Hindu| https://www.thehindu.com/ news/national/exercise-astrashakti-indian-akashair-defence-missile-system-destroys-4-targetssimultaneously/article67647579.ece



Image used for representative purpose only. | Photo Credit: PTI

Looking to export its indigenous weapon systems, India has strongly demonstrated the firepower of its Akash surface-to-air (SAM)

weapon system, where a single firing unit simultaneously engaged and destroyed four unmanned targets during the recent Exercise Astrashakti 2023.

With this demonstration during the Air Force Exercise Astrashakti-2023, India has become the first to demonstrate the capability of engaging four targets simultaneously at such ranges by command guidance using a single firing unit, defence officials told ANI.

"India demonstrated the firepower of the indigenous Akash missile system, where four targets (unmanned aerial targets) were engaged simultaneously by a single Akash firing unit. The demonstration was conducted by the IAF during Astrashakti 2023 at Suryalanka Air Force Station on December 12," they said.

Explaining the trials, the officials said that during the exercise, four targets were coming from same direction in a close formation and were split to attack their own defence assets from multiple directions simultaneously.

"The Akash firing unit was deployed with Firing Level Radar (FLR), Firing Control Centre (FCC), and two Akash Air Force Launcher (AAFL) launchers having five armed missiles," they said.

The FLR was detected and tracked and the air scenario with four targets was updated to a higher echelon.

The targets were assigned to the Akash Firing Unit to neutralise the threat and the commander issued the firing commands when the system prompted the engagement as per system capability.

"Two Akash missiles were launched from two launchers and the same launcher was assigned for next two targets. A total of four missiles were launched within a short span and all four targets were successfully engaged at maximum range (around 30 km) simultaneously," they said.

The Akash Weapon System is indigenously designed and developed by the Defence Research and Development Organisation (DRDO) and produced by defence public sector units along with other industries.

Akash has been deployed by the Indian Air Force and the Indian Army for the last decade. The current firing was done from the system, which was ordered in September 2019 as a repeat order from the IAF.

The Akash weapon system is also one of the indigenous defence systems that have bagged orders from international customers. It is also being constantly upgraded by the DRDO scientists involved in it and they may get more orders from Southeast Asia and the Middle East.

Recently, DRDO chief Dr Samir V Kamat inaugurated a replica of the missile at the Indian Institute of Technology (IIT) in Mumbai to attract talented youth towards defence research and development.

US Shoots Down 12 Houthi Attack Drones, 5 Missiles; Israeli Jet Downs Eilat-Bound UAV

Emanuel Fabian | 26 December 2023

Source: Times of Israel | https://www.timesofisrael. com/witnesses-report-2-explosions-off-sinai-coaststrange-object-falling-into-water/



A Houthi drone is seen over the Red Sea, shortly before being downed by an Israeli fighter jet, December 26, 2023. (Israel Defense Forces)

The United States said Tuesday that it had shot down 12 attack drones and five missiles launched by the Iran-backed Houthis, as the Israeli military said a fighter jet successfully shot down a "hostile aerial target" — believed to be a drone launched at Israel from Yemen — over the Red Sea.

In a statement, US CENTCOM said the USS Laboon, a guided-missile destroyer, and F-18 fighter jets from the Eisenhower carrier strike group were involved in the effort to down 12 one-way attack drones, three anti-ship ballistic missiles, and two land attack cruise missiles in the southern Red Sea that were fired by the Houthis over a 10-hour period.

There was no damage to ships in the area or injuries reported, the US Central Command said.

The Laboon is in the southern Red Sea as part of a US-led coalition meant to protect shipping lanes from attack by the Houthis in the key Bab el-Mandeb strait.

The US announcement came shortly after the Israel Defense Forces issued a short statement on the downing of a "hostile aerial target," which the military said was heading toward Israel, adding that the IAF's air traffic control monitored the device throughout the incident.

The Iran-backed Houthis in Yemen claimed to have fired several drones at Israel's southernmost city of Eilat, in solidarity with the Gaza Strip, where Israel is battling Hamas terrorists.

In an evening press conference, IDF Spokesman Rear Adm. Daniel Hagari said the Houthis' attacks on Israel are "acts of terror."

"This is an act that is carried out under Iranian directives," he added.

The IDF released footage showing the interception, which reportedly occurred off the coast of Egypt's Sinai Peninsula.

Witnesses cited by Egyptian media said they saw something fall into the Gulf of Aqaba.

Al Qahera News television, which has links to state intelligence, reported that blasts were heard about two kilometers (1.2 miles) from the Egyptian seaside town of Dahab, which lies around 125 kilometers (75 miles) south of Eilat.

"We heard a loud explosion coming from the direction of the sea, and then we saw a strange object falling into the water," an eyewitness told AFP.

No casualties or damage were reported.

Footage posted by the Saudi-owned news network Al-Arabiya appeared to show the aerial interception over the Red Sea.

Aerospace Newsletter

The Houthis also claimed a missile strike on a 'vessel in the Red Sea on Tuesday.

In a statement, the Iran-backed group said it had "carried out a targeting operation against a commercial ship" they identify as MSC UNITED, and launched several "drones against military targets" in southern Israel.

Yemen's Houthis have launched a flurry of drone and missile attacks at Israel since the start of its war with Hamas.

Most have failed to reach their targets and many have been intercepted.

The war began on October 7, when some 3,000 Hamas terrorists burst across the border into Israel from the Gaza Strip by land, air and sea, killing some 1,200 people and seizing over 240 hostages of all ages under the cover of a deluge of thousands of rockets fired at Israeli towns and cities. The vast majority of those killed as gunmen seized border communities amid horrific acts of brutality were civilians — including babies, children and the elderly.

The Houthis say the strikes are in solidarity with the people of Gaza, where the Hamas-run health ministry says more than 20,900 people have been killed in the conflict. However, these figures cannot be independently verified, and are believed to include both Hamas terrorists and civilians, and people killed as a consequence of terror groups' own rocket misfires.

In late October, six people were wounded in Egypt when two drones came down in Taba, which borders Israel.

The Egyptian air force earlier this month shot down a drone that had been detected over Egypt's territorial waters, also near Dahab, though a security source said the origin of the drone was "unknown."

Space

U.S. Space Command Declares 'Full Operational Capability'

Sandra Erwin | 15 December 2023 <u>Source: Space News | https://spacenews.com/u-</u> <u>s-space-command-declares-full-operational-</u> <u>capability/</u>



U.S. Space Command leaders hosted delegates from various NATO organizations to the Joint Commercial Operations Cell (JCO) where they discussed opportunities for increased collaboration. Credit: U.S. Space Command

WASHINGTON — U.S. Space Command, the Defense Department's combatant command responsible for space operations, has achieved full operational capability, its commander Gen. James Dickinson announced Dec. 15.

In short, this means that U.S. Space Command is now fully up and running. It has the staff, infrastructure and plans it needs to handle its mission of conducting space operations and protecting American and allied assets and interests in space.

U.S. Space Command, established in 2019 in Colorado Springs, is tasked to monitor space

activity and threats, support other military units with space capabilities like communications and surveillance, respond to crises involving space, deter aggression and defeat enemies if needed.

The declaration that it has reached full operational capability comes after an extensive evaluation of the command's ability to carry out its mission, Dickinson said, including the ability to execute operations "on our worst day, when we are needed most."

Dickinson said the command just completed a large-scale wargaming exercise with U.S. Indo-Pacific Command, "which served as a major step in validating the headquarters staff as a ready, joint force."

While declaring full operational capability is a milestone, Dickinson said, more work lies ahead as the complexity of space operations continues to grow. The command will need additional resources to keep pace with emerging threats from rival nations, he said.

Fight Continues Over Headquarters Location

U.S. Space Command's declaration of full operational capability comes amid a nearly three-year political battle over the location of its headquarters. President Joe Biden in July said that the headquarters would remain at Peterson Space Force Base, Colorado Springs, reversing plans made under former President Donald Trump to move it to Redstone Arsenal, in Huntsville, Alabama.

So while the Space Command now says it has the staff and capabilities to carry out missions, its long-term home base is still caught up in partisan Washington fights. Congress in the 2024 National Defense Authorization Act passed this week included language barring Space Command from spending money on a new Colorado Springs headquarters building until further investigation of Biden's basing decision is completed.

Amazon to Connect Kuiper Satellites with Laser Links to Boost Space Internet Network

Michael Sheetz | 14 December 2023

Source: CNBC | https://www.cnbc.com/2023/12/14/ amazon-to-connect-kuiper-internet-satellites-withlaser-links.html



A visualization of laser links connecting Kuiper satellites in orbit around the Earth

Amazon will include a key speed-boosting technology in its coming Project Kuiper internet satellites, the company announced Thursday.

Amazon says it tested the laser link tech successfully during its recent Protoflight mission. Traditionally, satellites are limited to sending data between an individual spacecraft and the ground. Laser links connect satellites to each other.

The Kuiper satellites' "optical inter-satellite links," also known as OISLs, serve as a way to transmit data through space. Laser links are a feature that Elon Musk's SpaceX began introducing in later generations of its Starlink

satellites. The links help improve both the latency and speed of these networks.

"With optical inter-satellite links across our satellite constellation, Project Kuiper will effectively operate as a mesh network in space," Rajeev Badyal, Amazon's Project Kuiper vice president of technology, said in a statement.

Amazon's pair of Kuiper prototype satellites "completed multiple successful" laser link demonstrations, the company said. During the tests, the Kuiper prototype satellites maintained links that transferred data at 100 gigabits per second (Gbps) over a distance of nearly 621 miles between the spacecraft.

"Because light travels faster in space than it does through glass, Kuiper's orbital laser mesh network will be able to move data approximately 30% faster than if it traveled the equivalent distance via terrestrial fiber optic cables," Amazon said.

The company plans to include laser links from the outset in production of its commercial Kuiper satellites, with the network planned to consist of 3,236 satellites in low Earth orbit. To date, Amazon has ordered 97 rocket launches to begin deploying its satellites in the first half of next year. In full, Amazon expects to invest upward of \$10 billion to build Kuiper.

China Launches Mystery Reusable Spaceplane for Third Time

Aerospace Newsletter

Andrew Jones | 14 December 2023 Source: Space News | https://spacenews.com/ china-launches-mystery-reusable-spaceplanefor-third-time/



Liftoff of the Long March 2F carrying Shenzhou-12 at 9:22 p.m. Eastern, June 16, 2021. Credit: CASC

HELSINKI—China launched its experimental reusable spacecraft for the third time Thursday while maintaining strict secrecy around the mission.

A Long March 2F rocket lifted off from the Jiuquan Satellite Launch Center in the Gobi Desert Dec. 14, sending a "reusable test spacecraft" into low Earth orbit, Chinese language state media Xinhua reported.

Airspace closure notices suggest a launch time of around 10:00 a.m. Eastern (1500 UTC), but the report, published within an hour of expected launch, did not provide a time. The terse report stated that the test spacecraft will "operate in orbit for a period of time" before returning to its intended landing site in China.

"During this period, reusable technology verification and space science experiments will be carried out as planned to provide technical support for the peaceful use of space," the report read, according to a machine translation.

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The gap between the spacecraft's first and second missions—launching in 2020 and 2022 respectively—was one year and 11 months. The third launch comes just over seven months after the spacecraft returned to Earth after its 276-daylong second mission.

The shortened time between missions suggests the spacecraft's developer, the China Aerospace Science and Technology Corporation (CASC), has made progress in aspects relating to reusability of the spacecraft.

U.S. Space Force space domain awareness later cataloged the spacecraft in a 333 by 348-kilometer-altitude orbit inclined by 50 degrees. Space launch activity observer Jonathan McDowell estimated launch occurred at around 1412 UTC, based on the orbital data.

China has revealed no details of its experimental reusable spacecraft project. No images of any of the launches have been published. The suspected spaceplane is launched vertically on a Long March 2F, a rocket used to launch China's Shenzhou crewed missions.

The launcher has a payload capacity of just over eight metric tons to low Earth orbit. This suggests that the spacecraft could be somewhat similar in size and function to U.S. Air Force's X-37B spaceplane.

This notion is reinforced by apparent images of the payload fairing wreckage recovered from the second launch and posted on the Sina Weibo social media site. The images give possible clues as to the dimensions and shape of the spacecraft.

The previous missions included deploying satellites into orbit and may have involved scientific and other experiments. The spacecraft also performed numerous small and much larger orbital maneuvers during its second flight. The third flight will likely have a different scope and seek to further test the spacecraft's capabilities.

The reusable spacecraft may be the orbital segment which will operate in combination with a reusable suborbital first stage. A reusable suborbital spacecraft was tested for the first time in 2021. A second mission launched in August 2022. The suborbital craft uses a vertical takeoff and a horizontal landing.

CASC has previously stated plans to develop a fully reusable, two-stage-to-orbit (TSTO) space transportation system. CASC's spaceplane project last year acquired national level funding from the Natural Science Foundation of China.

Sino-U.S. Space Competition

The U.S. started launching its reusable X-37B in 2010. It is set to launch on its seventh mission on a Falcon Heavy rocket later this month. The launch has been hit with delays in recent days. The mission will test new orbital regimes, experiment with space domain awareness technologies, and investigate radiation effects on materials provided by NASA.

The Chinese and Boeing's X-37B projects may, despite opacity surrounding respective intentions and capabilities, be illustrative of the broader space situation.

"Based on what little information we have, I think the Shenlong [Chinese spaceplane] and the X-37B are likely doing many of the same missions," Brian Weeden, Director of Program Planning at the Secure World Foundation, told SpaceNews. "That is, primarily being used for experimenting and testing new technologies, sensors, and perhaps even operational practices.

"I think both programs are reflective of the

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current relationship between the US and China," says Weeden. "Each sees the other's secretive spaceplane program as a potential threat and destabilizing weapon, while insisting that their own program is important but benign."

"That to me signals that we are in the midst of a security dilemma in space, where actions taken by both sides to reinforce their own security end up adding to the instability in the overall relationship." spaceplane plans in 2021. The firm stated last year it was aiming for space tourism test flights in 2025.

China has been seeking to boost its flexibility and range of access to space in recent years. In 2014 the government allowed private capital into the space sector to help foster a commercial space sector.

Commercial launch firms now operate a number of solid and liquid launch vehicles.

Mission	Launch Date	Landing Date	Duration	Time Since Previous Mission	Launch Site	Landing Site
Mission 1	September 4, 2020	September 6, 2020	2 days	N/A	Jiuquan spaceport	Lop Nur air base
Mission 2	August 4, 2022	May 8, 2023	~276 days	l year, ll months	Jiuquan spaceport	Lop Nur air base
Mission 3	December 14, 2023	N/A	N/A	7 months, 6 days	Jiuquan spaceport	N/A

Mission information for China's experimental reusable spacecraft.

The development of reusable spacecraft technology is part of China's broader strategy to become a major spacefaring nation. Chinese President Xi Jinping has set a national goal for China to become a powerful aerospace country. Xi also noted the space industry to be a critical element of overall national strategy.

Further Chinese Efforts

CASIC, a sister giant defense and space contractor, is working on its own TSTO spaceplane, named Tengyun.

Chinese commercial firm Space Transportation raised more than \$46.3 million for its hypersonic

Hop tests are now underway at Jiuquan as firms attempt to develop reusable rocket capabilities.

CASC is meanwhile developing a super heavy-lift reusable launch vehicle named Long March 9. The Long March 10, intended to launch crew and take astronauts to the moon, will have a potentially reusable first stage.

Russia, China Time Suspicious Space Activity for Some US Holidays: Leo Labs

Theresa Hitchens | 12 December 2023

Source: Breaking Defense | https:// breakingdefense.com/2023/12/leolabs-russiachina-time-suspicious-space-activity-for-someus-holidays/



LeoLabs says its radar spotted the release of a subsatellite, dubbed Object C, by Russia's Cosmos 2570 satellite on Thanksgiving Day. (LeoLabs handout)

WASHINGTON — Space monitoring startup LeoLabs says it has spotted a trend: Russia in particular, but China too, seem to be timing potentially threatening on-orbit activities to coincide with US holidays — presumably when fewer American skywatchers are actually looking.

"It may be on purpose. It probably is," Ed Lu, LeoLabs cofounder and chief technology officer, told Breaking Defense.

The latest evidence happened on Nov. 23, US Thanksgiving, when Russia's Cosmos 2570 satellite in low Earth orbit (LEO) revealed itself to be a Matryoshka (nesting) doll system comprising three consecutively smaller birds, performing up-close operations around each other, according to the company.

This "spawning" event mimicked the activity of Cosmos 2565, launched on Nov. 30, 2022

and believed to be an electronic reconnaissance satellite, which released a daughter satellite (Cosmos 2566) on Dec. 2, and which, in turn, released its own baby satellite on Dec. 24 (Christmas Eve), according to LeoLabs.

Similarly, on the 25 and 26 of November 2022, LeoLabs said it observed China's spaceplane, which Beijing calls Test Spacecraft 2, "conduct[ing] rendezvous and proximity operations" that involved a docking maneuver by a satellite it released, Victoria Heath, LeoLabs team lead for communications and marketing, told Breaking Defense. A second docking "likely took place" around Jan. 10, 2023, she said.

While it's unclear what the child-satellites are up to, sub-satellite deployments "can be a method of deploying co-orbital ASATs [antisatellite weapons] or covert payloads that may pose a risk to sensitive or classified satellites," LeoLabs said in an analysis of the Russian operations provided to Breaking Defense.

Owen Marshall, a space domain awareness analyst at LeoLabs, told Breaking Defense that the convenient timing can allow some satellite maneuvers to go undetected for periods of time and thus provide adversaries with a "warfighting advantage."

"So, the the fact that you can release something, and if you can release it in such a way that that nobody realized you released it, then you essentially have a secret payload up there without its own launch. Until somebody catches up to it, it's hidden for some periods," he explained.

With regard to Cosmos 2570, LeoLabs's analysis said that based on Space Force's data, the service's 18th Space Defense Squadron,

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responsible for space domain awareness, lost track of it when it maneuvered shortly after launch, but that LeoLabs days later was able to find it and its daughter, called Object C.

"We were able to track both objects quickly and send frequent updates. On November 24, we were the first to detect, catalog, and deliver alerts to the Joint Task Force – Space Defense (JCO) on a secondary object released by subsatellite Object C before the public catalog was able to respond. This prompted urgent action by all parties to track and identify the new object, now called Object D," said the LeoLabs analysis, provided to Breaking Defense.

"We were able to track both objects quickly, utilizing a cue received from the 18th, and send frequent updates," LeoLabs added.

JCO stands for the Joint Task Force-Space Defense (JTF-SD) Commercial Operations Cell, which coordinates with private satellite operators and companies offering space tracking services for US Space Command. The JTF-SD is SPACECOM's functional component command responsible for space domain awareness.

Col. Raj Agrawal, commander of the Space Delta 2, under which the 18th Space Defense Squadron falls, told Breaking Defense that the Delta "tracked Cosmos 2570 starting from launch with consistent updates to the TLEs (two line elements) except for when the satellite maneuvered. ... Upon completion of the maneuver, Space Delta 2 quickly re-associated the satellite's TLE. The time it takes for analysts to publish the re-associated TLE can appear to external agencies as a "delay;" however, there was no loss of custody of Cosmos 2570." (Two line elements are the basic measurements of an objects position on-orbit.) Then on Dec. 6, Cosmos 2570's granddaughter began another maneuver, bringing it within less than 1 kilometer of its mother — extremely close and well beyond what is normally considered safe for orbital operations, Heath said. That move happened in "favorable lighting conditions," suggesting that the granddaughter "has an electrooptical (EO) sensor payload."

Lu said that the problem of keeping tabs on sub-satellites and their maneuvers is already outpacing the ability of human analysts to keep up, and is only going to get worse as the pace of launch continues to grow every year. This means that it is imperative for the Pentagon to bring automated systems to sort through the data to bear as soon as possible.

"There are too many satellites, there are too many places to hide. This year, there were more than 3,000 satellites launched. So, that's 10 new satellites a day. There aren't that many analysts, right? And next year is going to be another 40 percent larger than that. OK, so, we're talking 15 satellites a day on average," he said.

"We have to make that transition to these automated systems for monitoring."

In the meantime, as the winter holidays approach, US government space-watchers might have a lot more on their plates than tracking Santa.

China's Reusable Rocket Race Heats up with New Hop Test

Andrew Jones | 11 December 2023

Source: Space News | https://spacenews.com/ chinas-reusable-rocket-race-heats-up-with-newhop-test/



The iSpace Hyperbola-2Y test article during a hop test, Dec. 10, 2023. Credit: iSpace

HELSINKI — Launch startup iSpace has successfully launched and landed a test article, a month after a first hop test, as Chinese reusable rocket efforts intensify.

ISpace's Hyperbola-2Y methane-liquid oxygen reusable verification stage lifted off from a pad at Jiuquan Satellite Launch Center in the Gobi Desert at 4:07 a.m. Eastern (1107 UTC) Dec. 10.

The Hyperbola-2Y reached an altitude of 343.12 meters, translating 50 meters to a landing zone and touching down with a velocity of 1.1 meters per second and an accuracy of 0.295 meters. The entire flight lasted 63.15 seconds, according to an iSpace press statement.

The flight came just over a month after a first hop test Nov. 2. That test reached 178 meters and returned to its landing spot. iSpace says it will attempt a test at sea next year after completing ground tests.

The company said the flight obtained

further flight data of and provided a basis for the company's ongoing development of the Hyperbola-3 reusable launch vehicle provides key technology verification.

The company is targeting a first flight of the 13.4-metric-ton to low Earth orbit (LEO) Hyperbola-3 rocket in 2025. A demonstration of recovering and reusing a first stage will follow in 2026. The 69-meter-long rocket will be able to lift 8.5 tons to LEO in reusable mode. iSpace says it aims to conduct 25 Hyperbola-3 launches per year by 2030.

The tests come years after Chinese commercial firms first announced plans to develop launchers with reusable first stages. Other companies, which began emerging after a Chinese policy shift in late 2014, are seemingly not far behind.

Fellow Beijing-based competitor Landspace is also gearing up for its first hop test. That will also take place at Jiuquan and before the end of the year.

The test is part of the development of the newly-announced, two-stage methalox Zhuque-3. Landspace aims to fly the stainless steel rocket for the first time in 2025.

The rocket will be 4.5 meters in diameter and have a total length of 76.6 meters. It will have a payload capacity to LEO will be 21,000 kilograms when expendable. It will carry up to 18,300 kg when the first stage is recovered downrange, or 12,500 kg when returning to the launch site.

Landspace revealed details of the Zhuque-3 and imminent hop test plans following the second successful flight of its methalox Zhuque-2 over the weekend.

Elsewhere in China, Galactic Energy performed a hop test with a jet engine-powered test article in August. The test is part of development of the Pallas-1 kerosene-liquid oxygen reusable launcher. A first, expendable flight is planned for the third quarter of 2024.

CAS Space, a spin-off from the Chinese Academy of Sciences, has likewise conducted such tests. These were used to verify algorithms for vertical takeoff, vertical landing (VTVL) rockets.

Another firm, Jiangsu-based Deep Blue Aerospace, is meanwhile planning the first flight of its Nebula-1 kerolox rocket in 2024. The launch will take place from commercial launch facilities near the Wenchang Satellite Launch Center on Hainan island.

The firm conducted a kilometer-level hop test in May 2022. Unlike iSpace's recent hops, that test did not use a rocket engine intended for orbital flights.

Space Pioneer, the first Chinese commercial startup to reach orbit with a liquid propellant rocket, is planning to launch its Tianlong-3 rocket in June 2024. The rocket will be comparable to Falcon 9 in launch capability and eventually have a reusable first stage.

Company	Rocket Name	Rocket Type	Key Features or Notes
iSpace	Hyperbola- 3	Methane-liquid oxygen reusable	Payload capacity of 8,500 kg to Low Earth Orbit (LEO); first flight planned for 2025.
Landspace	Zhuque-3	Methalox reusable	Payload capacity up to 21,000 kg to LEO; first flight planned for 2025.
Galactic Energy	Pallas-1	Kerosene-liquid oxygen reusable	Payload capacity of 5,000 kg to LEO, or 3,000 kg to a 700 km sun-synchronous orbit (SSO).
CAS Space	Kinetica 2	Kerolox reusable	Payload capacity of 7,800 kg to 500 km SSO.
Deep Blue Aerospace	Nebula-1	Kerolox reusable	Payload capacity of 1,000 kg to 500 km SSO; first flight planned in late 2024.
Space Pioneer	Tianlong-3	Kerolox	Comparable to Falcon 9 in launch capability; plans for a reusable first stage.
CASC	Various	Various	Working on reusable rockets including a new-generation human-rated launcher and Long March 9 super heavy-lift launcher.

Non-exhaustive list of planned Chinese reusable rockets.

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China's state-owned main space contractor CASC is also aiming for reusable rockets. This includes a new-generation human-rated launcher for lunar crewed missions and an evolving Long March 9 super heavy-lift launcher.

CASC is also considering a reusable airlaunched rocket. It is also developing a two-stage spaceplane concept. It uses a reusable VTHL suborbital first stage and a reusable spacecraft second stage.

A third flight of the reusable orbital spaceplane is expected to launch via a Long March 2F Dec. 14, according to newly-released airspace closure notices.

Global Aerospace Industry

F-35 Head Warns Future Upgrades at Risk, Production Shutdown Possible

Stephen Losey | 06 December 2023

Source: Defence News https://www. defensenews.com/air/2023/12/15/f-35-headwarns-future-upgrades-at-risk-productionshutdown-possible/?utm_source=sailthru&utm_ medium=email&utm_campaign=c4-overmatch



An F-35A takes off from Edwards Air Force Base, California, on January 6, 2023, in the first test flight of an F-35 loaded with Technology Refresh 3 hardware and software upgrades. The F-35 program is warning hardware maturity and software integration issues, as well as problems with concurrency, are creating serious problems for a future modernization known as Block 4, and said a production shutdown could happen if development slips. (Air Force)

WASHINGTON — The F-35 Joint Strike Fighter is facing "significant challenges" on its future weapons and other capability upgrades that, if delayed, could lead to a production shutdown, the officer in charge of the program told lawmakers this week.

F-35 program executive officer Lt. Gen. Michael Schmidt said in written testimony to the House Armed Services subcommittee on tactical air and land forces that the upgrade known as Block 4 has had considerable issues related to the maturity of its hardware design, and timelines for integrating its software.

Block 4 upgrades — intended to allow the F-35 to carry more weapons, better recognize targets, and improve its electronic warfare capabilities, among other features — are also facing serious concurrency problems, Schmidt said in written testimony. Concurrency occurs when a system moves through development and into procurement at the same time, which makes it harder to fix problems discovered in testing.

"Development and production concurrency is Block 4's most critical challenge, and we are dealing with its consequences today," Schmidt said. "The F-35 [Joint Program Office], Lockheed Martin, and other industry partners have identified high risk concurrency in the F-35 Block 4 schedule, which would threaten to shut down aircraft production if development slips."

In a statement to Defense News, Lockheed Martin said some Block 4 capabilities have already been delivered, starting in 2019, years ahead of schedule. Those already-delivered capabilities, which do not require TR-3 to work, include the F-35's Automatic Ground Collision Avoidance System, or Auto GCAS, the Navy's Joint Standoff Weapon variant known as C-1, and the ability to attack moving targets on the ground using laser-guided GBU-49 bombs.

Lockheed also said Block 4 hardware and software components are in different stages of development, and will be delivered incrementally as contracts are awarded and development on those elements is finished. In its response, Lockheed did not address Schmidt's comments about a potential production shutdown if Block 4 development is further delayed.

The F-35 program is also struggling to field another series of improvements, known as Technology Refresh 3, that is a prerequisite for major portions of the Block 4 upgrades. Schmidt's comments on Block 4 show that multiple F-35 modernization efforts are facing major headwinds, which could have ripple effects on the program for years.

Software problems have delayed TR-3, which was originally meant to be ready in April 2023, but now could be finished at least a year late. Schmidt said at Tuesday's hearing slow production of some key parts for TR-3 has also held up the physical completion of some new jets at Lockheed Martin's facility in Fort Worth, Texas. The government is not accepting newly built F-35s intended to have TR-3 installed, because it cannot carry out the necessary check flights.

Jon Ludwigson, director of contracting and national security acquisitions at the Government Accountability Office, said at the hearing the F-35 program's plans for Block 4 have grown over the years as requirements for the jet have evolved. Block 4's expected costs have also grown, and it has slipped behind schedule, he said.

Block 4 was originally meant to add 66 new capabilities at a cost of \$10.6 billion by 2026, Ludwigson said. That has swelled to 80 capabilities costing \$16.5 billion, he said, and now isn't expected to be done until 2029.

Ludwigson acknowledged software development is hard, but also pinned some of the problems with Block 4 on the program not setting realistic expectations on how long it would take to develop the upgrades.

"Some of the challenges that have emerged [with Block 4] is because they didn't have requirements, they didn't necessarily have a firm sense of what was technically achievable," Ludwigson said. "They didn't have a strong basis

for understanding how long these things were going to take. It became a bit of a journey of discovery and took time for them to figure out."

Schmidt said the program is focused on eliminating the concurrency problems and setting a realistic delivery schedule.

Bill LaPlante, undersecretary of defense for acquisition and sustainment, ordered a technical baseline review on Block 4's development earlier this year, Schmidt said. And experts from the Navy and Air Force have been evaluating Block 4's development schedule, hardware maturity, program risks, software tools, and the skills in the government and industry workforces.

The Pentagon also awarded a contract on Block 4 earlier this year that focuses on reducing the risks of concurrency, he said, including setting milestones for carrying out a thorough review of Block 4's hardware and software readiness to be folded into future production lots of F-35s.

Schmidt also said the program needs nine flight sciences aircraft, or F-35s specially configured to test and evaluate modernizations such as Block 4. The program now has the resources to convert three production F-35s into the test jets it needs, Schmidt said. But it needs to convert six more to meet its requirements, and that will require congressional authorization.

"The F-35 program must make investments in flight sciences aircraft and software labs at Lockheed Martin and throughout supplier locations to get the most operational capability out of the F-35 weapons system," Schmidt said.

Aerospace Newsletter

Air India Welcomes First of 20 Airbus A350-900 Aircraft

27 December 2023

Source: Times Aerospace | https://www. timesaerospace.aero/news/air-transport/air-indiawelcomes-first-of-20-airbus-a350-900-aircraft



Air India

Campbell Wilson, chief executive officer & managing director, Air India, said: "This moment marks a red-letter day for all of us at Air India. The A350 is not just metal and engines; it's the flying embodiment of the relentless efforts of all Air India employees towards our airline's continuing transformation and of our commitment to setting new benchmarks. It is also, in many ways, a declaration of Indian aviation's resurgence on the world stage."

"As a symbol of the new age of flying, the A350 promises a world-class, long-haul travel experience on our non-stop routes, providing an unparallelled level of comfort. Its excellent flight economics and state- of-the-art technology underscore our dedication to commercially successful operations and to achieving our sustainability goals," Wilson added.

Air India's A350 will enter commercial service in January 2024, initially operating domestically for crew familiarisation, followed by longerhaul flying to destinations across continents. The

Aerospace Newsletter

schedule of commercial operations with the A350 will be announced in the coming weeks.

Indian Aerospace Industry

India can Export Military Systems to Global South Countries: IAF Chief

Rahul Singh | 22 December 2023

Source: Hindustan Times | https://www. hindustantimes.com/india-news/india-can-exportmilitary-systems-to-global-south-countries-iafchief-101703251326421.html



Chief of Air Staff Air Chief Marshal VR Chaudhari (PTI Photo)

NEW DELHI: India's growing indigenous defence capability has opened the doors for partnerships with the countries of the Global South, and fighter jets, combat helicopters and missile systems hold export potential, Indian Air Force chief Air Chief Marshal VR Chaudhari said on Friday.

"Platforms like the light combat aircraft, light combat helicopter and Akash missile system offer competitive and reliable options for air forces of the Global South, boosting India's economic and technological clout," Chaudhari said in his inaugural address at the 20th Subroto Mukherjee seminar on India and the Global South: Challenges and Opportunities. The seminar was organised by the Centre for Air Power Studies. Countries that are developing or are less developed, are referred to as the Global South.

Establishing joint ventures with these nations can be mutually beneficial, and it could involve codevelopment of components, sharing production facilities and creating regional maintenance and support hubs, Chaudhari said.

"Capability development in the areas of global supply chains, creating manufacturing hubs and setting up maintenance, repair, and overhaul (MRO) facilities are some areas that need to be concentrated on. Another area that we need to explore is joint research and development projects, defence innovation and technological exchange," he added.

IAF will act as a catalyst for progress, fostering strategic partnerships and contributing to the collective advancement of the Global South, Chaudhari said, adding that the air force has trained more than 5,000 foreign trainees from the countries of this grouping and the number is only increasing.

"Our air power engagements with the countries of the Global South have resonated across the board and allowed us to exchange best practices, improve interoperability and build trust. We have increased the footprint of training and cooperation with these nations, and IAF conducts regular training programmes for these partner nations, sharing best practices in the fields of operations and maintenance," he said.

Roles played by the Indian military advisory teams and courses offered through the Indian Technical and Economic Cooperation (ITEC) programme have paved the way for increased cooperation and led to capacity building and human resource development, he said, adding that ITEC has trained more than 200,000 officials from these countries in the civilian and defence sectors.

"IAF has a long and proud tradition of training air force cadets from nations of this group, alongside its own air warriors. This exchange of knowledge and experience has broadened our stature and strengthened diplomatic ties and cooperation," said the IAF chief.

India has played a proactive role in international fora to protect the Global South's interest and is giving voice to the countries belonging to this group, Chaudhari said. "This was amply displayed this year when India championed their concerns and put it at the centre of its G-20 presidency."

He underlined the need to identify contemporary security challenges faced by India and the Global South, and create fora for discussing terrorism, cyber threats, regional conflicts and other shared concerns and coming up with collaborative defence strategies to mitigate these challenges.

"The world is at a pivotal juncture and winds of change are blowing strongly in our favour. India's rise in the Global South marks a pivotal point in international affairs. Rooted in a rich historical tapestry, the country's emergence from colonial shadows to a prominent global player brings forth a myriad of challenges and opportunities. Understanding the complex dynamics at play is crucial in navigating a future shaped by interconnectedness," the IAF chief added.

IAF Tapping into Self-Reliance for Repair, Overhaul of Russian-Origin Aircraft

Aerospace Newsletter

Rahul Singh | 22 December 2023

Source: Hindustan Times | https://www. hindustantimes.com/india-news/iaf-tapping-intoself-reliance-for-repair-overhaul-of-russian-originaircraft-101703250126997.html



Indian Air Force's Russian-origin Sukhoi-30 fighter jet (HT Photo)

NEW DELHI: The ongoing Russia-Ukraine war has hit the repair and overhaul (ROH) of critical equipment in the Indian Air Force's Russian-origin aircraft, including aero-engines and avionics, and self-reliance plans are being pursued to address the situation, the defence ministry said in a comprehensive end-of-year review published on Friday, highlighting the key developments in the sector during 2023.

"The Russia-Ukraine conflict has resulted in the inability to send major aggregates like aero-engines, critical avionics and specialist weapons abroad for ROH. To mitigate the situation, 44 shortlisted projects pertaining to Russian fighters, transport aircraft and helicopters are being progressed through Other Capital Procurement Procedure (OCPP)," the year-end review said.

OCPP deals with enhancing the utility of the military's existing assets through ROH under the

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Defence Acquisition Procedure (DAP) 2020.

The shortlisted projects are being pursued through OCPP under several categories, including life extension, development and execution of ROH technologies for airframes, electro-mechanical rotables, avionics and electronic warfare systems, repair and refurbishment of Russian engines and avionics, and replacement of avionic aggregates, the ministry said in the review.

IAF operates several Russian/Soviet-origin platforms, including the Sukhoi-30s, MiG-29s, MiG-21s, Il-76 heavy-lifters, AN-32 transport planes and Mi-17 helicopters.

"A comprehensive self-reliance plan to engage the defence industrial corridors in Uttar Pradesh and Tamil Nadu has been chalked out. The industry has been appraised in detail on the indigenisation requirements of IAF," it said.

The developments highlighted in the review include steps taken to boost selfreliance, modernisation of the armed forces, record defence production, rise in exports, key acquisitions and contracts, border infrastructure push and the focus on Nari Shakti in the three services.

Calling 2023 a landmark year "as giant strides were made towards creating a strong, secure, self-reliant India", the ministry said the record defence exports, an all-time high production, and increase in the number of items in the positive indigenisation lists were a "testament to the government's unwavering commitment to make India a global manufacturing hub."

"Efforts to achieve 'Aatmanirbharta' in defence and the modernisation of the armed forces surged ahead with renewed thrust, with the country witnessing record defence exports and all-time high defence production. Strengthening border Infrastructure, utilising Nari Shakti and ensuring ex-servicemen welfare has been at the core of the functioning of MoD...and these have moved forward with unprecedented pace and vigour."

Pursuing an ambitious agenda for achieving self-reliance in the defence manufacturing sector, the ministry in April slapped an import ban on 98 weapons and systems, including futuristic infantry combat vehicles, shipborne unmanned aerial systems, medium-range precision kill systems, a variety of ammunition, radars, sensors, and equipment for fighter jets, maritime surveillance planes, warships, helicopters and tanks.

The fifth positive indigenisation list, released by Union defence minister Rajnath Singh in April, took the number of defence items placed under an import ban during the last three years to 509.

"All these items will be procured from indigenous sources as per provisions in DAP 2020 in staggered timeline," the review said.

In May, India announced that the value of defence production in the country had crossed Rs.1 lakh crore for the first time on the back of key reforms to spur growth in the sector. The value of defence production by state-run companies and the private sector has almost doubled over the past five years which saw the government take a raft of measures to cut the country's dependence on military imports and strengthen its position as an exporter of weapons and systems.

The government is continuously working with defence industries and their associations to remove the challenges faced by them and

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promote defence production in the country, the review noted.

"A number of policy reforms have been taken to achieve the objective of ease of doing business, including the integration of MSMEs and start-ups into the supply chain. Due to these policies, industries, including MSMEs and start-ups, are forthcoming in defence design, development and manufacturing, and there is almost a 200% increase in the number of defence licenses issued to the industries in the last seven to eight years," it said.

India produces a raft of weapons and systems, including the light combat aircraft (LCA) Tejas, different types of helicopters, warships, tanks, artillery guns, warships, missiles, rockets and a variety of military vehicles. India is eyeing a turnover of $\gtrless1.75$ lakh crore in defence manufacturing by 2024-25.

India has sharpened its focus on the defence manufacturing sector during the last five to six years and has taken several measures to achieve self-reliance. These include banning the import of a range of weapons, systems and parts, creating a separate budget for buying locally made military hardware, increasing foreign direct investment from 49% to 74% and improving ease of doing business.

On defence exports, the review said that defence exports reached an all-time high of almost Rs.16,000 crore in FY 2022-23 "through consistent policy initiatives and tremendous contribution" of the defence industry. This is a notable tenfold increase since 2016-17 when the figure stood at a mere Rs.1,521 crore.

India is currently exporting military

hardware to around 85 countries. The country's defence exports cover missile systems, artillery guns, rockets, armoured vehicles, mine-protected vehicles, radars, surveillance systems, ammunition, and body armour. The review pointed out that there is a growing global demand for LCA Tejas, light combat helicopters, aircraft carriers, and maintenance, repair, and overhaul of weapons and platforms.

India is in talks with Egypt and Argentina for the possible sale of LCA to their air forces.

Setting aside a budget for India-made weapons and systems is one of the key measures to boost self-reliance. Around Rs.1 lakh crore was earmarked for domestic procurement in this year's defence budget, compared to Rs.84,598 crore, Rs.70,221 crore and Rs.51,000 crore in the three previous years.

The review also touched upon the ongoing border row with China in eastern Ladakh.

"As part of diplomatic and military efforts concerning the ongoing standoff along the Line of Actual Control, 20 rounds of corps commander-level meetings and 14 related Working Mechanism for Consultation and Coordination (WMCC) meetings have been held. Both sides have agreed to maintain the momentum of dialogue and negotiations through the relevant military and diplomatic mechanisms. Indian Army has exercised the established border mechanisms to maintain peace and tranquillity along LAC in all sectors."

On force restructuring, the review added that efforts towards jointness and integration, preceding theaterisation, were being made with renewed impetus.

In August, the Parliament passed a bill to

empower the government to notify the setting up of inter-services organisations, including joint services commands, and bestow powers on heads of such organisations to act against personnel from any of the three services to ensure discipline and effective discharge of duties.

The Inter-Services Organisations (Command, Control and Discipline) Bill, 2023, was passed by both houses amid a renewed push for theaterisation, a long-awaited military reform for the best use of the military's resources to fight future wars.

India Tests Flying-Wing Stealth UAV Towards Building Unmanned Strike Aircraft

Rajat Pandit | 16 December 2023

Source: Refiff.com | https://www.rediff.com/news/ report/govt-nod-to-buy-97-more-tejas-lcas-156choppers-worth-rs-223-lakh-cr/20231130.htm

NEW DELHI: In another step towards building a stealth unmanned combat aerial vehicle (UCAV) and eventually a larger remotely-piloted strike aircraft (RPSA), India conducted a flight trial of the "autonomous flying wing technology demonstrator" from the aeronautical test range at Chitradurga in Karnataka of Friday.

"The Successful flying demonstration of this autonomous stealth UAVis a testimony to the maturity in technology readiness levels in the country.

With this flight in the final tailless configuration, India has joined the elite club of countries to have mastered the controls for the flying-wing technology," the defence ministry said.

Designed and developed by DRDO's Aeronautical Development Establishment (ADE),

the high-speed flying-wing UAV -- will lead to a major project to develop the RPSA in the years ahead, sources told TOI.

"The critical technologies involved have been proven in th improved final configuration now. The RPSA project, after the government sanctions it, will involve scaling up the size and the dimensions of the UAV with a new aeroengine,"a source said.

The ADE's has been focusing on developing "stealthy" drones and aircraft, with a reduced radar cross-section to evade hostile air defence systems, which have autonomous take-off and landing capabilities. "The priority has to be on NGAD (next-generation air dominance) like the US and a few other countries," he said.

After its maiden flight was conducted in July 2022, six flight trials of the flying-wing UAV with two prototypes in various developmental configurations have been carried out.

These fight-tests have led to the development of a robust aerodynamic and control system, integrated real-time and hardware-in-loop simulation, and state-of-the-art ground control station. "The development team optimized the avionic systems, integration and flight operations towards the successful seventh flight in the final configuration on Friday," another official said.

The aircraft prototype, with a complex arrowhead wing platform, is designed and manufactured with "light-weight carbon prepreg composite material" developed indigenously.

"The autonomous landing of the UAV, without the need for ground radars, infrastructure and pilot, showcased a unique capability demonstration, allowing take-off and landing from any runway with surveyed coordinates," he said.

"This was possible using onboard sensor

data fusion with indigenous satellite-based augmentation using GPS-aided GEO augmented navigation (GAGAN) receivers," he added.

The Indian armed forces have a large number of UAVs, mainly of Israeli-origin, for real-time reconnaissance and precision-targeting. The IAF also has Israeli Harop "killer" of Kamikaze drones that act as cruise missiles by exploding into enemy targets and radars.

But India currently does not have full-fledged UCAVs that are controlled by satellites and can fire missiles on enemy targets before returning to re-arm for further missions. Towards this end, the mega \$3 billion contract for 31 armed MQ-9B Reaper of Predator-B drones -- 15 for Navy and 8 each for Army and IAF - is likely to be inked with the US within this fiscal, as was reported by TOI earlier.

Technology Development

Helicity Space Raises \$5 Million for Fusion Engine Development

Debra Werner | 11 December 2023

Source: Space News | https://spacenews.com/helicityspace-raises-5-million-for-fusion-engine-development/



Credit: Helicity Space

SAN FRANCISCO — Helicity Space, a California startup developing fusion engines for spaceflight, has raised \$5 million in a seed funding round announced Dec. 11.

Helicity attracted funding from Airbus Ventures, TRE Ventures, Voyager Space Holdings, E2MC Space, Urania Ventures and Gaingels.

"We're happy to be backed by long-term strategic partners of substance," Helicity cofounder Stephane Lintner told SpaceNews. "We almost look at them as future clients."

Helicity, founded in Pasadena in 2018, avoided publicity in its early years.

"The company took a lot of time dotting the i's, crossing the t's and lining up the right science advisors to make sure that before we raised capital, we de-risked the project as much as possible," said Lintner, a former Goldman Sachs managing director with a Ph.D. in applied mathematics from the California Institute of

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With the latest funding, "we'll deliver a proof-of-concept fusion drive that the company is building," Lintner said. "Before we put things in space, we need to demonstrate the full device working on Earth at smaller scale. The funding allows us to demonstrate the novelty of this concept."

Deep Space Missions

Fusion power has been a staple of science fiction because it promises clean, plentiful energy. For spaceflight in particular, fusion engines could slash the travel time to Mars and beyond.

"If we really want to create this expansion, where we actually get to the asteroid fields or to deeper space, even to map it out and figure out what resources are there, you need a different kind of propulsion," Lintner said.

In contrast to nuclear thermal or nuclear electric power, fusion "frees up much more energy in an extremely efficient way that requires very little fuel," Lintner said. "Until recently fusion has always been very elusive."

Helicity's technology is based on the work of Setthivoine You, Helicity co-founder and chief scientist. You, a plasma physics researcher with a Ph.D. from Imperial College London, has published patents related to fusion drive.

Helicity's magneto-inertial fusion method was "developed from the ground up with space propulsion in mind," You said in August at an Interstellar Research Group Symposium.

Helicity's "has developed a novel approach to fusion reactions, using multiple recombining plasma jets to create and control the conditions necessary for fusion to occur," Airbus Ventures partner Lewis Pinault told SpaceNews by email. "With several years of research and meticulous supercomputer modeling to prove the viability of this approach, along with private sector investment, the Helicity Space team is now deploying and testing hardware to turn theory to reality."

Reasonable Belief

Technology development and testing continues in Helicity's Pasadena laboratory.

"It's going to take a few years and it's going to require capital," Lintner said. "We're just at the beginning of the journey, but we have reasonable belief that this may work. Given the importance of this type of propulsion for mankind, for our children, to keep Earth clean, we're really excited with the prospect."

Pinault added "fusion-based propulsion will revolutionize humankind's ability to traverse deep space. From establishing settlements on other planets and moons to venturing beyond our solar system and to other capabilities long locked in the realm of science fiction, our collective capacity for space mobility will take one giant leap forward on the back of Helicity Space's technology."

Helicity strategic advisors include former NASA astronaut William Ready, a retired U.S. Navy captain and former NASA associate administrator; Alan Stern, former NASA's Science Mission Directorate leader with a Ph.D. in astrophysics and planetary science from the University of Colorado, Boulder; and Simon "Pete" Worden, former NASA Ames Research Center director and retired U.S. Air Force brigadier general with a Ph.D. in astronomy

Reliable Robotics makes History with Fully Automated Cargo Flight

Parijat Sourabh | 07 December 2023

Source: Statetimes | https://www.stattimes.com/ aviation/reliable-robotics-makes-history-with-fullyautomated-cargo-flight-1350634?infinitescroll=1



The. U.S. based startup Reliable Robotics has achieved a significant milestone as the company successfully piloted a fully autonomous flight. The company utilized a Cessna 208B Caravan aircraft with no crew on board. The unmanned aircraft was supervised by a remote pilot from Reliable's control center, which was located 50 miles away. The Reliable autonomous flight system enables a ground-based pilot to remotely control the aircraft, enhancing safety by automating all phases of operation, from taxi to takeoff and landing. The company employs multiple layers of safety and cutting-edge navigation technology, irrespective of the aircraft type, to carry out autonomous flights. According to Reliable Robotics, the system aims to prevent controlled flight into terrain (CFIT) and loss of control in flight (LOC-I), which account for the majority of fatal aviation accidents.

The flight took off from Hollister Municipal Airport in California. Equipped with Reliable's continuous autopilot system, the Cessna Caravan flew autonomously for about 12 minutes, handling taxiing, takeoff, flying in a pattern, and landing.

Textron Aviation Inc, the designer, and manufacturer of the Cessna Caravan, expressed its commitment to advancing aviation improvements through its collaboration with Reliable Robotics. Chris Hearne. Senior Vice President of Engineering and Programs at Textron Aviation, stated, "Textron Aviation is dedicated to ongoing improvements in aviation. Our collaboration with Reliable Robotics signifies a significant milestone for the industry, showcasing the successful uncrewed flight of a Cessna 208 Caravan and the introduction of new technology to aviation." In addition to Textron Aviation, Reliable has been collaborating with ASL Aviation Holdings since 2022 to explore the integration of advanced aircraft automation into its global operations. ASL Aviation Holdings is a worldwide aviation services provider, operating airlines in Europe, Asia, Africa, and Australia.

Reliable and the U.S. Air Force are jointly examining how this commercially developed technology might be applied to large multi-engine aircraft for missions such as aerial refueling, cargo logistics, and other applications. This collaboration builds on advancements made in remote piloting for the Cessna Caravan. Reliable has been working with the U.S. Air Force under various contract agreements since 2021. Reliable's autonomous flight has also provided valuable data that will inform the company's proposals to the FAA on creating operating rules for remotely piloted aircraft. In July, the FAA formally accepted Reliable's autonomous flight system certification plan.

Commentary

- 'Small and micro launchers in the NewSpace era: New missile proliferation risks or more of the same? - <u>https://www.sipri.org/</u> <u>commentary/topical-backgrounder/2023/small-</u> <u>and-micro-launchers-newspace-era-new-missile-</u> <u>proliferation-risks-or-more-same?</u>
- 2. UAV Trends <u>https://www.sps-aviation.</u> com/story/?id=3424&h=UAV-Trends&s=08

- **Further Reading**
- 'Rafale Jets: Why India "Rejected" French Aircraft Way Back in 2004 At 25% Of The Costs; Is Acquisition Policy To Be Blamed? -<u>https://www.eurasiantimes.com/rafale-jets-whyindia-rejected-french-fighters-way-back-in-2004/</u>

"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 Marshal Anil Chopra, PVSM AVSM VM VSM (Retd).

Centre for Air Power Studies

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