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AEROSPACE NEWSLETTER

Indian Air Force Participates in Exercise Pitch Black 2022 in Australia

Source: theprint.in

UAE Air Force MRTT Aircraft Assists Mid-Air Refuelling the IAF Su-30 MkI

Source: Hindustan Times

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A modern, autonomous, and thoroughly trained Air Force in being at all times will not alone be sufficient, but without it there can be no national security.

Henry H. Arnold

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Air Power

Indian Air Force Participates In Exercise Pitch Black 2022 In Australia

25 August 2022

Source: The Print | https://theprint.in/world/indian-air-force-participates-in-exercise-pitch-black-2022-in-australia/1100317/

Indian Air Force participates in Exercise Pitch Black 2022 in Australia (Photo: Twitter/@IAF_MCC)

Darwin [Australia], August 25 (ANI): The Indian Air Force (IAF) took part in multiple missions with the participating Air Forces in the first phase of Exercise Pitch Black 2022 in Australia.

In a tweet, the Indian Air Force said that various situations were simulated that involved varied platforms during the drill.

"In the first phase of #ExPitchBlack22, #IAF team took part in multiple missions with the participating Air Forces. Various situations were simulated which involved varied platforms," IAF tweeted.

On Friday, an Indian Air Force contingent reached Australia's Darwin to participate in Exercise Pitch Black 2022, hosted by the Royal Australian Air Force (RAAF).

Previously, the exercise was scheduled to be held in 2018 but the COVID-19 pandemic cancelled all the plans and after a hiatus of four years, it was re-scheduled this year, according to a statement released by the Defence Ministry.

"The IAF contingent, led by Group Captain YPS Negi, comprises over 100 air warriors, deployed with four Su-30 MKI fighter and two C-17 aircraft. They will undertake multi-domain air combat missions in a complex environment and will exchange best practices with the participating air forces," as per the statement.

PBK22 is Air Force's biennial capstone international engagement activity with key strategic partners.

This year's participants include Australia, Canada, France, Germany, Indonesia, India, Japan, Malaysia, Netherlands, New Zealand, the Philippines, Republic of Korea, Singapore, Thailand, UAE, the UK and the US.

Significantly, Germany, Japan, and the Republic of Korea will be participating fully for the first time.

PBK22 Director Engagement Group Captain Peter Wood said he was pleased to see a return to Pitch Black after the extended break, added the release.

"International participation in Exercise Pitch Black, from within the Indo-Pacific region and further abroad, provides all nations' personnel with experience in working with aircraft, systems and work practices, in northern Australia's unique environment, that would otherwise be unfamiliar," Group Captain Wood said.

The exercise is a biennial three-week multi-national large force employment exercise conducted primarily from RAAF Base Darwin and RAAF Base Tindal. RAAF Base Amberley, located near Ipswich will also be included in the exercise this year.

Exercise Pitch Black will run from August 19 – September 8, 2022. (ANI)

India's Su-30MKI Fighter Jets get Refuelled Mid-Air by UAE Air Force Tanker

24 June 2022

Source: Hindustan Times | https://www.hindustantimes.com/india-news/indias-su-30mki-fighter-jets-get-refuelled-mid-air-by-uae-air-force-tanker-101656073051614.html

UAE Air Force MRTT aircraft assists mid-air refuelling the IAF Su-30 MkI.(Twitter / @IAF_MCC)

The Indian Air Force (IAF) on Friday thanked the UAE Air Force for providing mid-air refuelling to its Sukhoi Su-30MKI fighter jets on their way to Egypt. The IAF said that the UAE's MRTT aircraft assisted the Su-30MKI formation to undertake nearly six hours non-stop ferry while proceeding to Egypt for a leadership program.

The air force also shared the breathtaking pictures of Sukhoi Su-30MKI jets and UAE's MRTT aircraft flying in a formation for the in-flight refueling.

"#IAF deeply appreciates the in-flight refuelling provided by Su-30MKI formation @ UAE Air Force MRTT aircraft which assisted the IAF Su-30 MkI formation to seamlessly undertake nearly 6 hours non-stop ferry while proceeding to Egypt for the Tactical Leadership Program," IAF tweeted from its official handle.

In aerial refueling, fuel is pumped from one aircraft to another while they fly in formation.

This is not the first time that UAE Air Force has assisted in mid-air refueling. In March last year, the air force tankers of the Arab nation provided aerial refuelling to a batch of three Rafale fighter jets during a non-stop flight from France to India. The IAF had then described the cooperation as another milestone in the strong relationship between the two air forces.

On Wednesday, a team of the Indian Air Force arrived in Egypt to participate in a bilateral 'Tactical Leadership Programme' with the Egyptian Air Force. The IAF said that the aim of the exercise is to understand and assimilate the best practices.

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IAF Air Chief Marshal Flies Tejas MK1, Light Combat Helicopter & HTT-40 In Bengaluru

Kamal Joshi | 05 August 2022

Source: Republicworld.com | https://www.republicworld.com/india-news/general-news/iaf-air-chief-marshal-flies-tejas-mk1-light-combat-helicopter-and-htt-40-in-bengaluru-articleshow.html

Image: Twitter/@IAF_MCC

Indian Air Force (IAF) Air Chief Marshal Vivek Ram Chaudhari on Friday flew indigenous planes including Light Combat Aircraft Tejas Mk1 made by Hindustan Aeronautics Limited, Light Combat Helicopter and training aircraft HTT-40.

These aircraft are being inducted into the Indian Air Force as part of its drive towards

"Atma Nirbhar (self-reliant) in Defence". Air Chief Marshal Chaudhari is presently on a two-day visit to Bengaluru.

The upgrades on the Tejas programme and the capabilities of the other two indigenous platforms were demonstrated to the IAF chief. He also interacted with the test crew and designers to understand the current status and future plans.

Tejas is a single-engine, delta wing, light multirole fighter developed by HAL. The Tejas currently has three production models- Tejas Mark 1, Mark 1A and the trainer variant.

The HAL Light Combat Helicopter is a multi-role attack helicopter. HAL HTT-40 is a training aircraft which replaces the Air Force's retired HPT-32 Deepak as a basic trainer.

IAF Retiring One MiG-21 Squadron by Sep-end, Entire Fleet by 2025

The Indian Air Force recently said that it is going to retire one more squadron of the MiG-21 Bison aircraft by September 30. "The 51 Squadron based out of Srinagar air base is being number plated on September 30. After this, only three squadrons of the planes would be left in service and would be phased out by the year 2025," sources said.

The upgrades on the Tejas programme and the capabilities of the other two indigenous platforms were demonstrated to IAF Chief, Air Chief Marshal Chaudhari.

Now every year, one squadron each of MiG-21 will be number plated, sources added. The MiG-21 fighter jets are replaced by more capable aircraft like the indigenous Light Combat Aircraft (LCA) and the Su-30.

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How IAF Transitioned Into a Formidable Force

Air Marshal N V Tyagi (Retd) | 12 August 2022

Source: Financial Express | https://www.financialexpress.com/defence/how-iaf-transitioned-into-a-formidable-force/2627652/

The Indian Air Force (IAF) is the fourth largest air force in the world today, the top three being US, Russia and China. It is bigger than the air forces of the UK and France. Though short of its sanctioned strength, it is a modern and strategic force with internationally recognised credentials. It has been a transformational journey in the last 75 years for the youngest of the three services of our Armed Forces.

At the time of independence, India had inherited the Royal Indian Air Force (RIAF) with six fighter squadrons equipped with Tempest and Spitfire aircraft, one squadron of C-47 Dakota transport aircraft and one Air Observation flight. RIAF dropped 'Royal' to become IAF only in 1950, when India became a republic. This fledgeling force was still trying to absorb the impact of division of resources between the two nations, when it was pressed into operations. Intrusion of insurgent forces into Kashmir from Pakistan called for a quick response. Troops were airlifted on October 27, 1947 from Palam to Srinagar and the Indian army went into action to save Kashmir.

This airlift was remarkable because operations were successfully executed without losing time in detailed preparations. Within days, fighters were engaged in strafing the raiders and their advance was checked. The fighting continued for 15 months till cease fire came into force on January 1, 1949.

Our national leadership was quick to realise the importance of air power in the then existing geopolitical scenario. Initial effort was directed at creating an organisational structure under Air Headquarters and increasing the force strength with whatever resources could be mustered. USAF (US Air Force) discarded B-24 Liberator bombers were retrieved to equip an additional squadron. The Jet era arrived soon with the induction of Vampires in November 1948. Due to deteriorating relations between India and Pakistan, it was decided to expand the IAF to make it fit for a full-scale war. 100 Ouragans (Toofanis in IAF) were procured from France, starting in 1953. Progressively, French Mystere and British Hunters were inducted by 1957, which heralded the beginning of the transonic era for the IAF. Canberra Bombers and Fairchild Packet transport aircraft also put into service during this period. Incidentally, Ouragan and Mystere were products of Dassault, the same company from which Mirage-2000 and Rafale were procured later.

By early 1960s the IAF had grown to be a 33-squadron force. Indian Canberra bombers participated in UN operations in Congo in 1961-62. China had emerged as another adversary for India by then. India had started procuring aircraft from the Soviet Union. Induction of Mi-4 helicopters and An-12 transport aircraft had a profound effect on the air logistics capability of the force, as demonstrated during the 1962 conflict with China. In October 1962, Government of India accorded sanction for 45 squadrons for the IAF.By then, it had been decided to get urgent supplies of fighters and missiles from the Soviet Union and order was placed for MiG-21 supersonic fighters and SA-2 long range surface to air missiles.

Air power was utilised to full extent in 1969 and 1971 conflicts. Pakistan had been armed with active support of the USA. The Gnat proved immensely successful against the F-86 in 1965 war and earned the sobriquet of 'Sabre Slayer'. By 1971, the MiG-21 had been operationalised. Hindustan Aeronautics Limited (HAL) designed and manufactured Marut HF-24 had also been inducted. In order to bolster ground strike capability, it was decided to procure Sukhoi-7 from the Soviet Union. At the start of 1970s, the IAF had 26 fighter and bomber squadrons, 12 transport squadrons and a handful of other units of smaller planes and helicopters. Aerial action during the 1971 war started almost 12 days before the outbreak of full-fledged conflict on 03 December.

On 22 November, a formation of Sabres attacking Mukti Bahini positions in East Pakistan was intercepted by Gnats and three Sabres were shot down. The highlights of 1971 in the eastern sector were Tangail AirDrop to induct Indian troops behind the enemy line and air attacks on enemy's lines of communications and Command centres to weaken its war waging capability. MiG-21 strike on the Governor's House in Dhaka finally expedited surrender of Pakistani forces and formation of Bangladesh. MiG-21 proved superior to the US origin F104 starfighter in every engagement in the western sector.

Force modernisation and strength enhancement was pursued with vigour in order to maintain an edge over the adversaries. HAL started production

of the MiG-21 and it remained the mainstay of IAF in various versions for decades. Four squadrons of MiG-21 Bison are still in service. In the decade starting 1978, Jaguar, MiG-23, MiG-25, MiG-27, MiG-29 and Mirage-2000 were added to the fighter fleet. Of these Mirage-2000 proved to be the most successful. Airlift capability got a major boost with the procurement of An-32, IL-76 transport aircraft and Mi-8 helicopters. Mi-25 attack helicopters and heavy lift Mi-26 were also sourced from the Soviet Union, so were the surface-to-air missile systems. Mirage-2000 was a class apart amongst the fighters of that era. For the first time operators got the feel of modern computer-based systems and precision guided weapon systems. This aircraft is still in service. It proved to be a game-changer in Kargil Operations in 1999 and was used for an air strike over Balakot in 2019.

The financial crisis of the early 1990s created a setback for modernisation. The Light Combat Aircraft program was running behind schedule. China had initiated modernisation of her armed forces. There were replacements needed for retiring aircraft. India decided to procure the SU-30 from Russia. The planned strength of 190 finally got enhanced to 272 and 12 more are likely to be procured. This fighter in SU-30MKI version has been manufactured by HAL through transfer of technology.

Experience of the Kargil operations highlighted the shortfalls in military hardware in India. The matter was examined by a group of Ministers and various committees were set up to overhaul India's defence procurement system. An Acquisition Wing was formed in the MoD and instead of processing cases on files; decisions were taken in collegiate meetings. Acquisitions were to be made based on competitive merits, instead of political and other considerations, as was the case earlier. Defence procurement procedure gave elaborate guidelines in 2005/06, which streamlined the process. Despite criticism of the procedure, the forces have been able to modernise to a great extent during the ensuing period.

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India Objects to Recent Airspace Violations, CBM Breaches by China

Rajat Pandit | 06 August 2022

Source: Times of India | https://timesofindia.indiatimes.com/india/india-objects-to-recent-airspace-violations-cbm-breaches-by-china/articleshow/93380406.cms

India objects to recent airspace violations by China

NEW DELHI: India has strongly objected to the recentairspace violations and breach of confidence-buildingmeasures by China during a special round of military talksbetween the two countries, while their soldiers and heavyweapon systems continue to be ranged against each otheralong the frontier in east Ladakh since May 2020.

The Indian military delegation led by a Major General raisedthe need to curb the "provocative behaviour" of Chinesefighters flying close to the LAC during the meeting with hisPeople's Liberation Army counterpart at the Chushul-Moldoborder meeting point in eastern Ladakh on Tuesday, sourcessaid.

An Air Commodore from IAF's operations branch wasspecially included in the Indian delegation to discuss the"heightened Chinese air activity" in the region since June,which has seen Chinese fighters often violate the 10-km no-fly zone CBM along the LAC, as earlier reported by TOI.

China Boosted Air Bases Facing India in Last Two Yrs

A fresh round of talks between India and China were a notch lower than the Lt-General-rank corps commander talks, which were last held on July 17, without any concrete progress on disengagement and de-escalation of the troop stand-offs at Patrolling Point-15, Demchok and the largest one at the strategically-located Depsang Bulge area.

China is also indulging in aggressive behaviour in the Taiwan Strait, with multiple firings of ballistic missiles and its fighters crossing the "median line", after US speaker visit to the region earlier this week.

In eastern Ladakh, while there are two-three Chinese fighter sorties on an average per day near the LAC, there have been "at least two confirmed incidents" of the jets even flying over the stand-off or "friction" points since the last week of June.

All such incidents trigger activation of air defence measures by the IAF, which include scrambling its Mirage-2000 and MiG-29 fighters that have been forward deployed from their peacetime bases ever since the border row erupted with China over two years ago.

"There is no strict pattern as such but Chinese air activity, including by reconnaissance aircraft, has certainly gone up a lot all along the 3,488-km long LAC, especially in the eastern Ladakh and Arunachal Pradesh sectors," a source said.

This is a direct result of China having systematically upgraded all its major air bases facing India like Hotan, Kashgar, Gargunsa and Shigatse over the last two years. The extended runways, hardened shelters or blast pens and fuel storage facilities at these airbases means the PLA-Air Force can now deploy more J-11 and J-8 fighters, long-range bombers and reconnaissance aircraft there.

This slightly offsets the advantage IAF has over the PLAAF, which suffers from a terrain constraint because the weapon and fuel-carrying capacity of its jets is limited due to the high-altitude and rarefied air in the region.

India, on its part, is keeping all its airbases facing the northern borders on a high operational alert, having inducted frontline Sukhoi-30MKI, MiG-29, Mirage-2000 and Jaguar fighters there two years ago.

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114 Multi-Role Fighters, LCA Tejas, AMCA Jets, S-400 Missiles – IAF Chief Outlines his Game Plan for Possible Conflict with China

Prakash Nanda | 30 August 2022

Source: Eurasian Times | https://eurasiantimes.com/114-multi-role-fighters-lca-tejas-amca-jets-s-400-missiles-iaf/

The Indian Air Force Tejas performs at the opening ceremony of the Singapore Air Show on February 15, 2022.

"What we are witnessing today, and the war in Ukraine provides us some lessons, is that the nature of warfare is changing. Now wars are of blended nature. These are hybrid wars. The enemy resorts to asymmetric methods and aims at disproportionate impacts, which one has to fight conventionally and beyond by developing multi-domain capabilities", the Air Chief said.

"The weapons India now needs in future wars will range from a small computer to hypersonic missiles. We must rebuild India's traditional war-fighting machinery amid a new emerging paradigm.

Need of the hour is to re-imagine, re-invent, re-train, and re-dedicate", he pointed out while delivering the 20th Major General Samir Sinha lecture at India's tri- service, the United Services Institute (USI) today (August 30). He was talking about "The Indian Air Force: Present Status and the Way Ahead."

The CAS talked of preparing for a two-front war, but it seems that in this two-front, Pakistan was not a matter of much concern for him. He highlighted how one has to fight on two fronts against China – one front in the east (North-East) and the other in the North (Ladakh). He asserted that India is well-prepared to meet the Chinese threat, a threat that will remain both short-term as well as long-term.

However, the Indian Air Chief did admit that given the resource constraints, the IAF will be emphasizing on "enablers" to add to the impact of the arms and ammunition that the forces' inventory will have. But, "I do say that the numbers do matter, and our inventory needs expansion," he pointed out.

According to him, the "future plans" of the Indian Air Force to have these numbers:

- Six squadrons of the LCA MK1 A
- Six squadrons of LCA MK2
- 114 MRFA aircraft
- Seven squadrons of AMCA
- Five squadrons of S-400
- 106 Basic Trainers
- 6 AEW&C systems
- Upgradation of Su-30MKI
- Upgradation of Mi-17 and Mi-18

The Air Chief also talked of the need to have more UCVs, transporters, and weapons such as Astra, Rudra, Brahmos, and radars, which he included in the "hardware" section of the need.

But what is more important than even the hardware today is the software, he said. Because the domains of the war now include cyber to space, he explained.

For him, Space-based assets significantly

enhance the potency of air power, and outcomes in the space domain will probably decide the eventual victor in future conflicts.

While traditional communication safeties with geosynchronous orbits have proved their worth due to longer service life and a wide area of coverage, the communication satellites in low and medium earth orbits have their own advantages, the Air Chief said.

"Therefore, we are witnessing a highly proliferated low earth orbit with multiple commercial players entering this segment. In due course, this technology of low earth orbit satellites will evolve, and we shall see reduced manufacturing and launching costs which will favor the shift towards this concept.

While capability enhancement in multiple domains of space application is the way forward, I strongly feel that this evolution can only be fast-tracked through increased civil-military fusion, which is a blend of institutes, industries, startups, academia, research and development, and test and evaluation laboratories," he noted.

According to Chaudhari, the Defence Space Agency, which is the lead agency for aggregating the requirements of the armed forces, would play a key role in synergizing civil-military cooperation to achieve the desired capabilities in the days to come.

This would mandate increased interplay between the government and commercial space agencies. Like the air power's effect on surface battles, aerospace power is fast emerging as a new paradigm that will greatly influence all surface activities, he highlighted. "The outcomes in the aerospace domain will probably decide the eventual victor in future conflicts."

Information warfare is another dimension of the future war, which the Air Chief explained in great detail. Fighting all this requires the fifth generation of technologies, which must be indigenous, he stressed. " We have to be self-reliant as much as we can."

He also emphasized the need for "Working Smart" by "faster decision-making," which is possible because of the ongoing technological revolution.

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First squadron of indigenous helicopter Rudra will be stationed in Jodhpur

Muskan Kumawat | 31 August 2022

Source: Sangri Today | https://www.sangritoday.com/first-squadron-of-indigenous-helicopter-rudra-will-be-stationed-in-jodhpur

Air Marshal VR Chaudhari | Twitter/@PIB_India

Indigenous attacker helicopter Rudra is going to be deployed at the country's largest and most powerful Jodhpur Air Force Station. This will be the country's first squadron of Light Combat Helicopters (LCH) to be stationed in Jodhpur. This will be the first squadron of the Air Force version. In June last, the army got its squadron.

10 helicopters are going to be received from Hindustan Aeronautics Limited (HAL) on Air Force Day on 8 October. This will increase the air force on the western border. Five years ago, the first squadron of indigenous Advanced Light

Helicopters was stationed in Jodhpur.

Its specialty is that it will keep an eye on the Indo-Pak border and India-China border. It can land on top of Siachen. It also has a gun in the front.

On 1 June, the Indian Army created the first squadron of Light Combat Helicopters in Bengaluru. It is being told that it will be extended further next year so that it can keep an eye on China's activity on the LAC and put an end to their antics. According to the army, it will buy 95 more LCH now. Seven units of these will be made. Out of which seven will be deployed in hilly areas.

Rudra has a maximum speed of 268 mph and a range of 550 kms. This helicopter can fly continuously for 3 hours and 10 minutes. Can go up to a maximum height of 6500 feet. It has a 20 mm gun, which can attack air-to-air and air-to-ground. Apart from this, there are four hardpoints i.e. rockets, missiles and bombs that can be planted simultaneously.

The Light Combat Helicopter is an evolved variant of the Dhruv Helicopter. For the first time, its lack was felt during the 199 Kargil War. However, the work on its developed form was going on then. Be it Siachen, desert, jungle, or the Himalayan mountains of 13-15 thousand feet high, this helicopter demonstrated its ability to fly in all types of areas of India during the trials.

The enemy can neither hide nor attack with the state-of-the-art avionics system installed in this helicopter, because these systems inform this helicopter as soon as it becomes the target of the missile. Apart from this, a radar and laser warning system has been installed. There are also the chef and flare dispensers, so that enemy missiles and rockets can be destroyed in the air.

These indigenous LCH helicopters have been trialled from Siachen Glacier to the desert of Rajasthan before being fully prepared for the Indian Air Force. During this, a sufficient amount of fuel and its weapons were also engaged in the LCH. Even before formally joining the Air Force, two LCH helicopters have been deployed on the LAC adjoining Eastern Ladakh.

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Space

ITU Issues Warning on Interference with Radio Navigation Satellite Service

24 August 2022

Source: Space Watch | https://spacewatch.global/2022/08/itu-issues-warning-on-interference-with-radio-navigation-satellite-service/

ITU defines harmful interference as a radio system receiving unwanted energy to an extent that inhibits the functioning of a radio-navigation service. In addition, such interference can seriously degrade, obstruct, or repeatedly interruptsany radiocommunication service operating in accordance with the Radio Regulations. This poses a threat to critical infrastructure like commercial aviation, energy distribution and satellite navigation systems, ITU says.

The International Telecommunication Union (ITU) issued a warning to its 193 Member States on the harmful interference such as blocking, jamming or serious degradation of radio-wave-based services.

ITU claims it received 329 reports of harmful interference or infringements of the Radio Regulations between 1st February 2021 and 31st January 2022. Following these incidences, the Union urged its Member States to take preventative measures.

ITU suggests that the 193 Member States to reinforce the resilience of navigation systems and develop mitigation techniques for loss of services. Furthermore, they are to increase collaboration between radio regulatory, military, aviation, and law enforcement authorities. In addition, they are asked to reinforce civil-military coordination and retain essential conventional navigation infrastructure for contingency support..

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Indian Navy's Space Prowess Could Turn the Tides

Girish Linganna | 16 August 2022

Source: Raksha Anirveda | https://raksha-anirveda.com/indian-navys-space-prowess-could-turn-the-tides/?fbclid=IwAR30nQ71qO9oOubKxJjqIC4baZbF_r71dRJ4hvE1T1Q96vf4thPp70B-myg

The Space Applications Centre (SAC – ISRO), Ahmedabad and the Indian Navy signed a memorandum of understanding (MoU) on August 5 regarding data sharing and collaboration on satellite-based naval applications in oceanology and meteorology.

With the help of this initiative, both organisations will have a common ground for cooperation, allowing the scientific developments made by SAC to be integrated into the efforts of the Indian Navy to keep the country's defence in step with the rapid advancements made in the field of satellite data retrieval and applications. The collaboration between the two organisations will advance thanks to this MoU, which is an extension of an earlier MoU signed in 2017.

The broad area of cooperation includes the exchange of non-confidential observational data, the operational exploitation of SAC-generated weather products, and the provision of Subject Matter Experts (SME) for the processing of satellite data for the development of new tools, the calibration of ocean models, and the

validation of ocean models.

The Indian Navy and SAC signed the MoU, according to a press release from the Navy, in order to continue deepening their mutually beneficial interactions and business dealings.

Several long-term acquisitions, including the GISAT-2, are among the 21 planned purchases, according to information from the ministry of defence (MoD). Additionally, the navy's capability development and modernisation efforts are being carried out in line with the long-term plans being established for the ensuing ten years.

According to budget projections for 2022–2023, the navy has been given Rs 45,250 crore for modernisation. By 2026–2027, it is anticipated that it will receive more than Rs 2.7 lakh crore for modernisation, assuming a 10% annual growth rate. According to the MoD, modernisation projects totalling more than Rs 1.9 lakh crore and Rs 2.5 lakh crore (under Part A and B of the annual acquisition plan) are being advanced for contract conclusion over the next five years. The navy's total committed liabilities as of right now are Rs. 1.20 lakh crore.

Several long-term acquisitions, including the GISAT-2, are among the 21 planned purchases, according to information from the ministry of defence (MoD). Additionally, the navy's capability development and modernisation efforts are being carried out in line with the long-term plans being established for the ensuing ten years.

Aside from GISAT-2, the navy will acquire the following: next generation missile vessels, fleet support ship (FSS), high and medium altitude long endurance remotely piloted aircraft systems, multi-role carrier borne fighters, indigenous aircraft carrier-2, next generation fast attack craft, next generation corvettes, destroyers, fast interceptor craft, and survey vessel, national hospital ship, electronic warfare system, extra large unmanned underwater vehicle, anti-ship missiles.

Although the MoD has designated GISAT-2 for procurement during this fiscal year, a firm schedule for the satellite's development and launch has not yet been established. When it comes to acquiring satellites, the Navy has been in the lead among the armed forces.

GISAT Satellite Family

The GISAT-2 will be built to deliver images of significant regions of interest in close to real time at regular intervals, aiding the navy not only in surveillance but also in the planning of operations. The satellite, which is in a geostationary orbit, will enable near-real-time observations even when there are no clouds.

Similar to GISAT-1, a satellite of the 2+ tonne class called GISAT-2 will be built around an altered I-2k satellite bus. In August of last year, ISRO's attempt to launch GISAT-1 into orbit was unsuccessful because the GSLV-Mk2 carrying it experienced problems with the cryogenic upper stage.

The space agency attempted to launch the satellite three times before deciding against it for various reasons. The most recent attempt was in August 2021.

According to insider sources, ISRO is developing a variety of payloads and that GISAT-2's payload specifications will differ from those of GISAT-1. Another official stated, "The first one (GISAT-1) was for civilian use, but GISAT-2 is for strategic purposes, and the navy has very specific requirements that the ISRO need to meet." The

satellite will be launched by ISRO on the GSLV-MK2 once it has received the necessary financial approvals.

Defence Satellites

The Defence Acquisition Council (DAC), under the direction of Rajnath Singh, the defence minister, granted acceptance of necessity (AoN) for military proposals totaling 8,357 crore on March 22, 2022. According to the Ministry of Defence (MoD), the equipment will be purchased domestically. The Indian Army's (IA) GSAT-7B satellite, air defence fire control radars, light vehicles, and image intensifiers are all included in the AoN. The acquisition of these tools and systems will improve operational readiness of the armed forces by enhancing mobility, communication, visibility, and the ability to detect enemy aircraft, according to a statement from the MoD.

Similar to GISAT-1, a satellite of the 2+ tonne class called GISAT-2 will be built around an altered I-2k satellite bus. In August of last year, ISRO's attempt to launch GISAT-1 into orbit was unsuccessful because the GSLV-Mk2 carrying it experienced problems with the cryogenic upper stage.

An existing GSAT-7 satellite belongs to the Indian Navy (IN). The DAC granted AoN for a Rs 2,236 crore proposal by the Indian Air Force (IAF) to purchase GSAT-7C satellites and ground hubs for enhanced real-time communication in November 2021. The GSAT-7 series of high-tech satellites is designed and constructed by the Indian Space Research Organisation (ISRO) to offer users communication capabilities over wide areas, including over oceans. The Indian Army could improve border area surveillance with the aid of the GSAT-7B satellite. The Indian Navy and Air Force use the GSAT-7 (Rukmini) and GSAT-7A (Angry Bird) satellites, which are the country's only two solely dedicated military satellites.

Additionally on March 22, 2022, the DAC authorised the purchase from start-ups and micro, small, and medium-sized businesses of 14 defence items for more than 380 crore (MSMEs). This year, India has allocated 68% of the military's capital budget for domestic purchases, and the approvals follow Atmanirbhar Bharat. Because of the conflict in Ukraine, which the US is escalating against Russia by using Ukraine as a pawn, there are additional worries. Supply chains may be disrupted and our need for defence may be affected by a protracted conflict, as the US desires.

The government has recently promoted self-reliance in the defence industry and increased the foreign direct investment (FDI) limit from 49% to 74%, announced a list of defence products that cannot be imported, and established a separate budget for purchasing locally made military equipment. However, the DAC's approval of the AoN for the aforementioned defence items is merely the first step in the process of acquiring military hardware; there is still much work to be done before the equipment is developed and, more importantly, put into service.

This entails the issuance of a request for information (RFI), the specification of specific qualitative requirements (QR), the request for proposals (RFP) and the response, the choice of a development agency (DA), a thorough technical evaluation, field tests, and similar procedures prior to the signing of the contract, production, and fielding.

Given ISRO's track record, it is certain that

the Army will receive its own exclusive military satellite as soon as possible. What remains unclear, though, is when the military will receive the remaining approved items. In this context, a number of issues need to be addressed, including the continued presence of foreign content in varying degrees in what we refer to as "indigenous" and "Make in India."

As per the Stockholm International Peace Research Institute, India was the world's second-largest importer of defence equipment between 2016 and 2020 after Saudi Arabia, making up 9.5% of the global arms trade (SIPRI). In addition, the MoD imported an average of 41.24 percent of its materiel requirements annually between financial years 2010 and financial years 21 worth Rs 3,25,942.53 crore ($42.73 billion), according to an analysis of previous reports by the Parliamentary Standing Committee on Defence.

In contrast, India's domestic purchases during the same time period came to a total of Rs 4,64,383.01 crore ($60.88 billion), but they also included a variety of imports made by Indian manufacturers, including gearboxes and transmission systems, missiles, radars, specialised ammunition, rockets, and various sub-assemblies and components. The MoD purposely left these items off the import list, misleading the public in the process, all in an effort to win brownie points for Atmanirbhar Bharat or self-reliance.

While serving as the Chief of Army Staff, General V.K. Singh, who is currently a Minister of State in the Ministries of Road Transport and Highways and Civil Aviation, claimed that all files pertaining to military purchases slid sharply back to the top from the middle just as the end appeared imminent, similar to how the counters do in the game "snakes and ladders." Since then, our great bureaucracy hasn't changed much, and it's unlikely that will change until they continue to hold the politicians captive and maintain their hegemonic position in the government.

Recently, the government has promoted self-reliance in the defence industry, increased the foreign direct investment (FDI) ceiling from 49% to 74%, announced a list of defence products that cannot be imported, and established a separate budget for purchasing military equipment made in-country.

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'Make in India' will still involve the original equipment manufacturers. India is one of the harshest and trickiest markets to operate in, according to an unnamed OEM, who was quoted in the media. This is because of India's complex acquisition procedures and the MoD's uncooperative and erratic bureaucracy, which make it difficult to do business there. The ability of the MoD to develop defence policy plans and procurements and to successfully carry them out, in contrast to other "compact and self-contained" ministries like the railways and commerce and industry, was a "mystery," according to Amit Cowshish, a former MoD acquisitions advisor. He claimed that the MoD could be described as a "siphonophore" or an assembly of zooids, similar to a wide variety of marine species that clone.

Indian Army Conducts Exercise Skylight to Test Resilience of its Satellite Communications

Dinakar Peri | 06 August 2022

Source: The Hindu | https://www.thehindu.com/news/national/indian-army-conducts-exercise-skylight-to-testresilience-of-itssatellite-communications/article65733174.ece

Indian Army is utilising the services of a number of ISRO satellites as it does not have a dedicated satellite. | Photo Credit: Twitter/@adgpi

The Army has carried out detailed studies of cyber and electromagnetic effects in the war in Ukraine

To test the operational readiness of satellite systems and personnel manning them, the Indian Army last week carried out Exercise Skylight validating and showcasing the resilience of its communication capabilities in case terrestrial connectivity is disrupted in future conflicts, officials in the security establishment said.

"During the two-week long exercise, all satellite communication assets in the Army were activated and various technical and operational scenarios in space domain were simulated. Various agencies responsible for space and ground segments, as also the Indian Space Research Organisation (ISRO) participated in the exercise," a source in the security establishment said. This includes over 200 static platforms and over 80 vehicle based and man portable systems that were incorporated.

"We could validate our capability and it was a very successful exercise," the source stated adding the exercise covered the eastern part of the country, northern borders and the island territories. "This will be done regularly," the source saidd.

The Army has carried out detailed studies of cyber and electromagnetic effects in the war in Ukraine. Electronic warfare has played a major role in Ukraine, sources said, "We had multiple iterations on how this conflict has panned out, at various levels," the source cited above said.

The studies established efficacy of reliable satellite communication like the one afforded by 'Starlink', officials said. Taking a cue from the same and also the latest trends in satellite technology, the Army has placed some realisable challenges before the industry and academia. These include the future requirement of fighting troops for small form factor hand held secure satellite phones, satellite IoT and satellite high speed data backbone, some of which will call for utilisation of Low Earth Orbit (LEO) satellite constellations, one official explained.

As on date, Indian Army is utilising the services of a number of ISRO satellites as it does not have a dedicated satellite. In March, The Defence Acquisition Council cleared a proposal for a GSAT-7B communications satellite. The army is on course to get its own satellite by December 2025.

"The indigenous multiband satellite with advanced security features will support tactical communication requirements of not only troops deployed on the ground, but also remotely piloted aircraft, air defence weapons and other mission-critical and fire support platforms," another official stated.

To train its personnel on all aspects of satellite communication, the Army recently published Request for Information for its own student satellite, for training engineering students in Military College of Telecommunication Engineering on satellite technology.

In this line, another domain the Army is actively pursuing is Quantum computing which gives added security and also gives ability to deny the space to an adversary.

While national R&D is focused in this field, Indian Army is closely watching the advancements made by our adversaries, to ensure that these vital capabilities are inducted into our armed forces well ahead of times, officials added.

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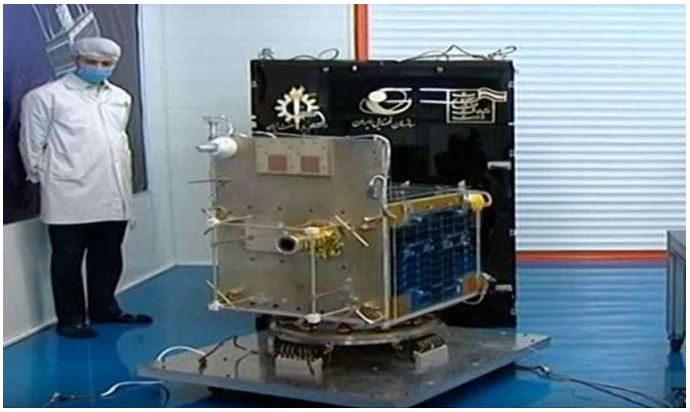
Russia to Put Iran Satellite into Orbit

04 August 2022

Source: Space War | https://www.spacewar.com/reports/Russia_to_put_Iran_satellite_into_orbit_next_week_999.html



Russia will launch an Iranian remote sensing satellite into orbit next Tuesday, the two countries confirmed, two weeks after President Vladimir Putin visited Tehran.

"In cooperation with Russia, the Khayyam satellite will be launched next week from the Baikonur space station in Kazakhstan by a Soyuz satellite carrier," the Iranian space agency said late Wednesday.

The satellite, apparently named after 11th-12th century Persian polymath Omar Khayyam, aims to "monitor the country's borders", enhance agricultural productivity and monitor water resources and natural disasters, the agency added.

Russia's State Space Corporation Roscosmos confirmed the launch is scheduled for Tuesday.

"On August 9, 2022, a Soyuz 2.1B rocket is scheduled to be launched from the Baikonur Cosmodrome... to put the Khayyam remote sensing device ordered by the Islamic Republic of Iran into orbit," it said in a statement.

"The Khayyam device was designed and manufactured at enterprises that are part of the state corporation Roscosmos," it added.

News of the launch follows Putin's visit to Iran on July 19, when he met President Ebrahim Raisi and Iran's supreme leader Ayatollah Ali Khamenei.

Khamenei called for strengthening "long-term cooperation" with Russia in his talks with Putin.

Iran's state news agency IRNA said the satellite has high imaging accuracy and is capable of filming the earth's surface in different image spectra.

Russia is putting the satellite into space but it will be guided and controlled from ground stations in Iran, IRNA added.

Khayyam will not be the first Iranian satellite to be put into space by Russia.

In October 2005, Iran's Sina-1 satellite, which aimed to study and observe the Earth, was

deployed from Russia's Plesetsk cosmodrome.

In June 2021, Putin denied a US media report that Russia is set to deliver an advanced satellite system to Iran that will vastly improve its spying capabilities.

Iran insists its space programme is for civilian and defence purposes only, and does not breach the 2015 nuclear deal between Iran and world powers, or any other international agreement.

Western governments worry that satellite launch systems incorporate technologies interchangeable with those used in ballistic missiles capable of delivering a nuclear warhead, something Iran has always denied wanting to build.

Iran successfully put its first military satellite into orbit in April 2020, drawing a sharp rebuke from the United States.

In March, the Revolutionary Guards, the ideological arm of Iran's armed forces, announced it had successfully put a military "reconnaissance satellite", Nour-2, into orbit.

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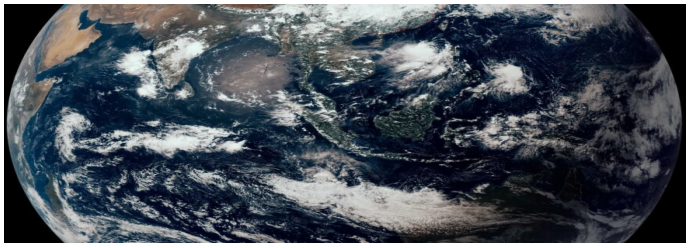
Global Aerospace Industry

Boeing Pitches F/A-18 Super Hornet to Indian Navy and Commits $3.6 Billion Investment

Andrew Jones | 05 August 2022

Source: Space News | https://spacenews.com/chinese-space-firm-raises-funds-for-commercial-weather-data-satellite-constellation/



A section of a full disk view of the Earth from China's Fengyun-4A satellite. Credit: National Satellite Meteorological Center

HELSINKI — A Chinese private company wants to build a constellation of 80 satellites to provide weather data, further illustrating the growth and scope of China's commercial space sector.

Tianjin-based Yunyao Yuhang recently secured nearly $14.8 million in "Pre-A+" funding, the company announced Aug. 4, following a previous round worth "tens of millions of yuan" in July 2021. The new round was led by Zhongwei Yihe Investment.

Yunyao Yuhang was founded in 2019 in response to a call for deepened "military-civilian integration" in China. The company's aim is to provide data for global weather forecasting and even short-term earthquake forecasting, including for countries involved in the Belt and Road Initiative.

Earlier statements from the company laid out a 2023 target for establishing the 80-strong

constellation, a timeline omitted from the latest press release.

However, instead of using dedicated satellites, the company has apparently chosen the route of arranging for its GNSS occultation (GNSS-RO) and GNSS reflectometry (GNSS-R) payloads to fly aboard the satellites of other firms.

GNSS-RO remote sensing payloads in low Earth orbit are designed to pick up GPS, Beidou and other GNSS satellite signals, with changes to the signals as they pass through Earth's atmosphere and ionosphere providing data useful for weather forecasting and atmospheric processes, ionospheric research and other areas.

GNSS-R payloads collect signals reflected from the Earth's surface and can be used to monitor ocean, land and ice surfaces, wind state, soil moisture, sea levels and more.

Yunyao Aerospace has already sent a number of payloads into orbit, including aboard the small Baoyun satellite launched on a Ceres-1 solid rocket in December, on sats developed by Changguang Satellite Technology (CGST), a remote sensing satellite company.

Most recently Yunyao Yuhang saw its first dual-polarization L-band GNSS-R payload for ocean measurements sent into space aboard the Jilin-1 Kuanfu 01C satellite launched May 3. Yunyao Aerospace and CGST signed a deal in 2020 for carrying 23 GNSS occultation payloads.

The firm's core team of engineers and meteorological industry experts are former employees of the China Aerospace Science and Technology Corporation (CASC), the country's giant state-owned space contractor.

Commercial satellite weather data is also of interest elsewhere, with American startups including Boston-based Tomorrow.io, Colorado-based PlanetiQ and Florida-based Acme.

The U.S. Space Force is considering buying commercial weather data services to supplement data collected by its own sensor satellites.

China's government opened up the space sector in late 2014, with a particular initial aim of attracting private capital to boost small satellite and remote sensing capacity.

A number of launch and small satellite firms have notably emerged, but commercial and private space activity has spread to various upstream and downstream segments and applications, including satellite communications, subsystems, component manufacturing, ground stations, antennae, electric propulsion, laser communications, space resources and beyond.

A number of cities and provinces are seeking to attract and foster clusters of these high-end technology firms, including Shanghai, Beijing, Wuhan, Guangzhou, Beijing, Shenzhen, Chengdu, Xi'an, Changsha and Wenchang and the Yangtze Delta region.

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Astra to Sell Electric Thrusters to Airbus One Web Satellites

Jeff Foust | 30 August 2022

Source: Space News | https://spacenews.com/astra-to-sell-electric-thrusters-to-airbus-oneweb-satellites/

The Astra Spacecraft Engine, developed by startup Apollo Fusion that was acquired by Astra in 2021, had more than 100 committed orders before the deal with Airbus OneWeb Satellites announced Aug. 29. Credit: Astra Space

TITUSVILLE, Fla. — Astra Space announced Aug. 29 it won a contract from Airbus OneWeb Satellites to provide electric propulsion systems for the Arrow line of small satellites.

Astra said that Airbus OneWeb Satellites will acquire an unspecified number of its Astra Spacecraft Engines, an electric propulsion system, for Arrow satellites. Astra did not disclose or answer questions about the number of thrusters ordered or the value or duration of the deal.

The Astra Spacecraft Engine is an electric thruster that uses xenon or krypton as propellants. Astra offers two versions of the thruster, one that requires 400 watts of power and produces up to 300 kilonewton-seconds of total impulse, and another that uses 1,450 watts of power and produces up to 1.5 meganewton-seconds of total impulse.

The thruster was originally developed by a startup, Apollo Fusion. Astra, which started as a launch vehicle developer, acquired Apollo Fusion in 2021 as part of an effort to obtain technologies it needed for its vision of a vertically integrated company that could produce spacecraft as well as rockets.

Astra, in a quarterly earnings call Aug. 4, said it had received more than 100 "committed" orders for the Astra Spacecraft Engine through the end of the second quarter, and announced it was leasing a new 5,575-square-meter facility that will be devoted to production of the engine. Engine production will ramp up by the middle of 2023, although the company didn't give an estimate of how many it expects to produce.

Chris Kemp, chief executive of Astra, said in the earnings call that customers of the Astra Spacecraft Engine are attracted by features such as a higher specific impulse, a measure of engine efficiency, as well as experience of having operated "hundreds of times" in space to date. "It's very cost competitive, and as we work with our customers, we're trying to strike that balance of offering a product that is high performance and lower cost," he said.

In that same earnings call, Astra announced it was discontinuing its existing launch vehicle, the Rocket 3.3, after its most recent launch failure in June. The company is now focusing on a larger vehicle, Rocket 4, but test flights of that vehicle won't begin until some time in 2023, and executives cautioned the new vehicle might not be ready for commercial, revenue-generating launches before the end of 2023.

In the near term, Astra expects its revenue to be dominated by sales of its Astra Spacecraft Engine. "If you look at 2023, what we're looking at in terms of revenue forecasts will largely be spacecraft engines," Kemp said.

Airbus OneWeb Satellites, a joint venture

of satellite constellation company OneWeb and Airbus Defence and Space, did not disclose how the company plans to use the thrusters. The company is best known for producing the first generation of OneWeb satellites at its facility near the Kennedy Space Center in Florida but is also signing up commercial and government customers for its Arrow smallsat bus.

Airbus OneWeb Satellites had previously used electric propulsion systems from Fakel, a Russian company, for the OneWeb satellites it produced. However, those thrusters are no longer available after Russia's invasion of Ukraine and subsequent sanctions..

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India in Advanced Stage of Talks with US for Procuring MQ-9B Drones

21 August 2022

Source: IMR India | https://imrmedia.in/india-in-advanced-stage-of-talks-with-us-for-procuring-mq-9b-drones/?gr_s=Bh1gzqm&gr_m=BGatHc&gr_x=a62b

In December 2020, the Indian Navy took two MQ-9B Sea Guardian drones on lease for two years from the US

India is in an "advanced stage" of negotiations with the US to procure 30 MQ-9B Predator armed drones for over USD 3 billion to crank up its surveillance apparatus along the frontier with China as well as in the Indian Ocean region, people familiar with the developments said on Sunday.

The MQ-9B drone is a variant of the MQ-9 "Reaper" which was used to launch a modified version of the Hellfire missile that eliminated al-Qaeda leader Ayman al-Zawahiri in the heart of Kabul in July.

Authoritative sources in the defence establishment said talks between New Delhi and Washington are underway for the government-to-government procurement of the General Atomics-built drones, and rejected reports that the deal is off the table.

Dr Vivek Lall, the Chief Executive for the General Atomics Global Corporation, told PTI that the acquisition programme is at an advanced stage of discussions between the two governments.

"We understand that the MQ-9B acquisition programme is at an advanced stage of discussion between the US and Indian governments," he said.

"Any questions on those discussions should be addressed specifically to the respective governments. From a company perspective, General Atomics is ready to support India and values our longtime relationship," Lall added.

The hunter-killer drones are being procured for the three services as they can carry out a variety of roles, including maritime surveillance, anti-submarine warfare and over-the-horizon targeting.

The high-altitude long-endurance (HALE) drones are capable of remaining airborne for over 35 hours and can carry four Hellfire missiles and around 450 kgs of bombs.

The MQ-9B has two variants SkyGuardian and its sibling SeaGuardian.

The sources said the talks are focused on

sorting out certain issues relating to cost, weapons package and technology sharing.

It is learnt that the procurement proposal figured in the fourth two-plus-two foreign and defence ministerial dialogue between India and the US in Washington in April.

In 2020, the Indian Navy had taken on lease two MQ-9B Sea Guardian drones from General Atomics for one year for surveillance in the Indian Ocean. The lease period has been extended subsequently.

The Indian Navy has been bolstering its surveillance mechanism to monitor growing Chinese activities including frequent forays by PLA warships in the Indian Ocean Region.

When asked about the two drones, Lall said they have performed "very well" and flew close to 3,000 hours in support of the Indian Navy's maritime and land border patrol objectives.

"General Atomics has supported India over the past three years by providing two MQ-9 remotely piloted aircraft as part of a Company Owned/Company Operated (COCO) lease agreement," he said.

"Over the past six months, close to 3,000 hours have been flown in support of the Indian Navy's maritime and land border patrol objectives, covering over 14 million square miles of operating area," he said.

"Our Indian customer has been impressed by the MQ-9's over-the-horizon ISR (intelligence, surveillance and reconnaissance) support for surface units and Indian warships, as well as the exceptional endurance and operational availability of the platform," the top executive added.

The MQ-9Bs are designed to not only meet the standards of NATO (North Atlantic Treaty Organization) but also to comply with civil airspace requirements in the US and around the world, according to General Atomics.

Indian armed forces have been focusing on procuring unmanned platforms, including armed drones, in the backdrop of the eastern Ladakh border standoff with China and for tracking movements of Chinese warships in the Indian Ocean region.

The procurement proposal has been moved by the Indian Navy and all three services are likely to get 10 drones each.

The drone is the first hunter-killer unmanned aerial vehicle (UAV) designed for long-endurance and high-altitude surveillance.

The MQ-9B has signals intelligence and communications intelligence systems integrated onboard, but it can take any number of other custom sensors as necessary.

In 2019, the US approved the sale of armed drones to India and even offered integrated air and missile defence systems.

The Indian Navy has been strongly pushing for the procurement to boost its overall surveillance over the Indian Ocean, a region that has witnessed increasing forays by Chinese ships and submarines in the last few years.

In February 2020, India sealed a USD 2.6 billion deal with the US for the procurement of 24 MH-60 Romeo helicopters from American aerospace major Lockheed Martin for the Indian Navy. The delivery of the helicopters has already begun.

Following the eastern Ladakh standoff, India

has significantly enhanced its day and night surveillance over the Line of Actual Control (LAC) using a fleet of remotely piloted aircraft.

The Indo-US defence ties have been on an upswing in the last few years. In June 2016, the US designated India a 'Major Defence Partner', paving way for sharing of critical military equipment and technology.

The two countries have also inked key defence and security pacts over the past few years, including the Logistics Exchange Memorandum of Agreement (LEMOA) in 2016 that allows their militaries to use each other's bases for repair and replenishment of supplies.

The two sides signed COMCASA (Communications Compatibility and Security Agreement) in 2018 which provides for interoperability between the two militaries and provides for the sale of high-end technology from the US to India.

In October 2020, India and the US sealed the BECA (Basic Exchange and Cooperation Agreement) agreement to further boost bilateral defence ties.

The pact provides for sharing high-end military technology, logistics and geospatial maps between the two countries.

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DARPA Selects Companies for Inter-Satellite Laser Communications Project

Sandra Erwin | 10 August 2022

Source: Space News | https://spacenews.com/darpa-selects-companies-for-inter-satellite-laser-communications-project/

Under a program called Space-Based Adaptive Communications Node (Space-BACN), DARPA seeks a low-cost, reconfigurable optical communications terminal. Credit: DARPA

DARPA is pursuing a new laser terminal design that would be compatible with any constellation

HUNTSVILLE, Ala. — Five commercial satellite operators — SpaceX, Telesat, SpaceLink, Viasat and Amazon's Kuiper — are among 11 organizations selected by the Defense Advanced Research Projects Agency to help develop laser terminals and technical standards to connect satellites in space.

Under a project called space-based adaptive communications node, or Space-BACN, DARPA is pursuing a new laser terminal design that would be compatible with any constellation and make it easier for government and commercial satellites to talk to each other.

DARPA announced Aug. 10 it selected 11 teams for phase 1 of Space-BACN. The goal is to create an internet of low Earth orbit satellites, "enabling seamless communication between military, government and commercial and civil satellite constellations that currently are unable to talk with each other," Greg Kuperman,

program manager at DARPA's Strategic Technology Office, said in a statement.

CACI, MBryonics and Mynaric were selected to develop a small optical terminal. II-VI Aerospace and Defense, Arizona State University and Intel Federal will work on a reconfigurable optical modem and will help define the interface between system components.

The five satellite operators will help define command-and-control requirements to support optical intersatellite link communications across constellations.

Phase 1 of Space- BACN will last about 14 months and will conclude with a preliminary design review and a connectivity demonstration in a simulated environment.

DARPA said at the completion of phase 1, some of the providers will be selected to participate in an 18-month phase 2 to develop engineering design units of the optical terminal components. The satellite operators during phase 2 will continue to evolve concepts for cross-constellation communications..

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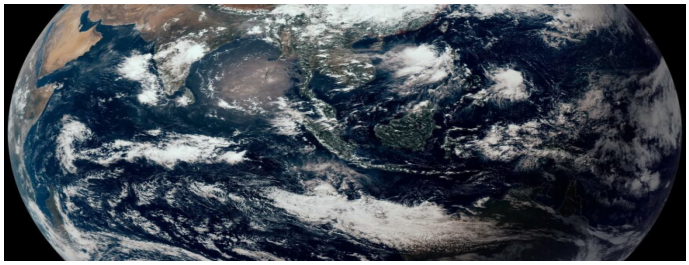
Chinese Space Firm Raises Funds for Commercial Weather Data Satellite Constellation

Andrew Jones | 05 August 2022

Source: Space News | https://spacenews.com/chinese-space-firm-raises-funds-for-commercial-weather-data-satellite-constellation/



A section of a full disk view of the Earth from China's Fengyun-4A satellite. Credit: National Satellite Meteorological Center

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Indian Aerospace Industry

HAL Signs $100m Contract With Honeywell for HTT-40 Engines

28 July 2022

Source: News India Express | https://www.newindianexpress.com/states/karnataka/2022/jul/28/hal-signs-100m-contract-with-honeywell-for-htt-40-engines-2481405.amp

Hindustan Aeronautics Limited in Bengaluru (Photo | EPS)

BENGALURU: Defence Public Sector Undertaking Hindustan Aeronautics Ltd (HAL) on Wednesday signed a contract worth over $100 million with Honeywell for supply and manufacture of 88 TPE331-12B engines/kits along with maintenance and support services to power the Hindustan Trainer Aircraft (HTT-40), the basic trainer aircraft The contract was exchanged by Eric Walters, Senior Director OE Sales, Honeywell Defense & Space, and B Krishna Kumar, Executive Director (E & IMGT) in the presence of R Madhavan, Chairman & Managing Director, HAL.

The TPE331-12B engine is a single shaft turboprop engine with integral inlet and gearbox, two stage centrifugal compressor, power turbine, gearbox, three stage axial turbine and turbine exhaust diffuser. Besides, it displays reliable power and outstanding operational characteristics. The HTT-40 prototypes are powered by TPE331-12B engines and has been serving well since 2014.

Entering into this 'Manufacturing & Repair license agreement for Honeywell TPE331-12B Turboprop engine' marks a major milestone in the execution of 70 HTT-40 aircraft contract with IAF. HAL is working closely with Honeywell for its support for export potential of HTT-40. HAL and Honeywell are exploring other areas such as 1MW Turbo Generators, manufacturing, Repair & Overhaul of TPE 331-10GP / 12JR engines for variants of Dornier. "HAL has successfully developed the Basic Trainer Aircraft (HTT-40) to address the basic training requirements of the IAF.

There is potential requirement of 70 aircraft. The contract for the same with IAF is under advanced stage of approval," Madhavan said. Walters said, "The TPE331-12 family of engines has proven itself in operations all over the world, and we have committed to support and deliver engines as well as kits within the stipulated schedule to meet the requirements of the IAF. Honeywell is committed to support export of HTT-40 aircraft along with other engine programmes which are currently on radar. This contract would pave the way for future collaboration between HAL and Honeywell."

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Lithium-Ion Batteries Power HTT-40 Indian Aircraft Trainer

Boyko Nikolov | 02 August 2022

Source: bulgarianmilitary.com | https://bulgarianmilitary.com/2022/08/02/lithium-ion-batteries-power-htt-40-indian-aircraft-trainer/

Photo credit: Wikipedia

NEW DELHI ($1=78.45 Indian Rupees) — The HTT-40 [Hindustan Turbo Trainer-40] is a combat trainer in the inventory of the Indian Air Force [IAF]. Recently, the state-owned company Hindustan Aeronautics Limited [HAL] announced in a report changes to the equipment of the HTT-40. HAL says the HTT-40 is now powered by a lithium-ion battery developed specifically for military aviation.

India's online portal Indian Defense Research Wing says the HTT-40 is the first military aircraft on the continent [Asia] to be powered by lithium-ion batteries. HAL gives little information about the fuelless configuration – they say only that the batteries have passed tests, have dozens of protections, and already produced spare parts for them.

The use of lithium-ion batteries in the past has a bad history. Evidence of vehicle fires abounds, including the self-ignition of batteries. But HAL says that the HTT-40 is doing great with the new power supply and so far there hasn't been a single incident reported.

The HTT-40 is the primary training aircraft of the Indian Air Force. The HTT-40 will replace India's current trainer aircraft, the HPT-32 Deepak.

The HTT-40 is still under development and HAL has produced two prototypes to date. The first flight of the HTT-40 was made in 2016. One prototype is powered by lithium-ion batteries, the other by a 1,100-horsepower turboprop engine, a Honeywell Garrett TPE331-12B model.

The prototype with a turboprop engine has a range of 1,000 km [there is no official information on the range of the lithium-ion aircraft]. The maximum speed that the HTT-40 reaches is 400 km/h. It can fly at an altitude of 6,000 meters and its g limits are +6/-3. This aircraft can be equipped with weapons for full pilot training. India has ordered 106 units of it, which are expected to be delivered by the end of 2030.

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India Offers to Sell Malaysia Trainer Variant of Tejas Fighter

05 August 2022

Source: NDTV | https://www.ndtv.com/india-news/india-offers-to-sell-18-fighter-jets-to-malaysia-defence-ministry-3227898

The Tejas has been beset by design and other challenges

New Delhi: India has offered to sell 18 trainer variant of light-combat aircraft (LCA) "Tejas" to Malaysia, the defence ministry said on Friday, adding that Argentina, Australia, Egypt, the United States, Indonesia, and the Philippines were also interested in the single-engine jet.

The government last year gave a $6 billion contract to state-owned Hindustan Aeronautics Ltd for 83 of the locally produced Tejas jets for delivery starting around 2023 - four decades after it was first approved in 1983.

Prime Minister Narendra Modi's government, keen to reduce India's reliance on foreign defence equipment, has also been making diplomatic efforts to export the jets. The Tejas has been beset by design and other challenges, and was once rejected by the Indian Navy as too heavy.

The defence ministry told parliament that Hindustan Aeronautics in October last year responded to a request for proposal from the Royal Malaysian Air Force for 18 jets, offering to sell the two-seater variant of Tejas.

"Other countries which have evinced interest in the LCA aircraft are: Argentina, Australia, Egypt, USA, Indonesia, and Philippines," India's junior defence minister, Ajay Bhatt, told members of parliament in a written reply.

He said the country was also working on manufacturing a stealth fighter jet, but declined to given a timeline citing national security concerns.

Britain said in April it would support India's goal of building its own fighter jets. India currently has a mix of Russian, British and French fighter jets.

India is looking to ground all its Soviet-era Russian fighter jets, the MiG-21, by 2025, following a number of fatal crashes, the Times of India daily reported last month..

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Govt Clears LCA-Mk2 Fighter's Development

01 September 2022

Source: Hindustan Times | https://www.hindustantimes.com/india-news/govt-clears-lca-mk2-fighter-s-development-101661969910161.html

Bengaluru : Indian Air Force's Light Combat aircraft Tejas takes off during the inauguration of the 11th biennial edition of AERO INDIA 2017 at Yelahanka Air base in Bengaluru on Tuesday. PTI Photo by Shailendra Bhojak(PTI2_14_2017_000089a) (for Shishir Gupta's story) (PTI)

The government has given its nod for developing the next generation variant of the light combat aircraft — LCA Mk-2 — a platform that will form an important element of future air

combat, officials familiar with developments said on Wednesday.

The government has sanctioned around ₹10,000 crore for the project, and the LCA Mk-2 is likely to take first flight in two years, setting the stage for its production and subsequent operational availability around 2028, said one of the officials cited above, asking not to be named.

Hindustan Times reported on Wednesday that the sanction for LCA Mk-2 project was imminent and could come as early as this week.

The LCA Mk-2 project will provide a significant boost to the Aatmanirbhar Bharat (self-reliant India) campaign, one of the government's foremost priorities.

The new fighter jet is expected to cater to the future requirements of the Indian Air Force (IAF), which has already inducted earlier variants of the LCA and has ordered 83 Mk-1A variants.

The Mk-2 fighter will be the most advanced LCA variant to be designed and developed indigenously by the Aeronautical Development Agency (ADA), said the official. It will be equipped with a more powerful engine (GE-414) , a superior radar, better avionics and electronics, and will be capable of carrying a higher weapons payload, said a second official, requesting anonymity.

"This is a much awaited and welcome decision. IAF is grappling with a shortage of fighter squadrons, and LCA Mk-2 will play a key role in plugging capability gaps. At the same time, it is important to ensure that the production rate of LCA Mk-1A is ramped up," said Air Marshal Anil Chopra (retd), director general, Centre of Air Power Studies.

In 2021, the defence ministry had awarded a ₹48,000-crore contract to Hindustan Aeronautics Limited (HAL) for 83 LCA Mk-1A jets for the IAF. The first aircraft is expected to be delivered by March 2024, with the rest slated to join the combat fleet by 2029.

IAF could order more than 210 LCA Mk-2 fighters in the long term, said the second official.

Of the 123 LCA fighters already ordered, 20 each are in the initial operational clearance (IOC) and the more advanced final operational clearance (FOC) configurations, according to officials. The remaining 83 fighters will come with additional improvements over FOC aircraft. IAF has already inducted some of the earlier LCA variants.

The Mk-1A will come with digital radar warning receivers, external self-protection jammer pods, active electronically scanned array radar, advanced beyond-visual-range missiles, and significantly improved maintainability.

LCA Mk-2 is expected to fill the gap between Mk-1A and the homegrown fifth-generation fighter programme — the advanced medium combat aircraft (AMCA). There is a possibility of equipping AMCA with directed energy weapons, superior anti-missile systems, advanced missile approach warning systems, and teaming it with unmanned systems, HT had previously reported.

A new import ban imposed by the government on hundreds of military sub-systems and components on Sunday has brought India's quest for indigenisation into sharper focus, set goals for the local defence manufacturing industry, and turned the spotlight on the journey so far and the long road ahead for attaining meaningful self-reliance.

The main steps taken to inject momentum

into the self-reliance drive include bringing out a series of 'positive indigenisation lists' (six have been published so far to ban the import of major weapons, platforms, sub-systems and components), creating a separate budget for buying locally made military hardware, earmarking a research and development budget for private industry and start-ups, and raising foreign direct investment (FDI) in defence manufacturing.

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Indian Navy MiG-29k Is Testing a New Mission Computer

02 September 2022

Source: Defence Aviation Post | https://defenceaviationpost.com/indian-navy-mig-29k-is-testing-a-new-mission-computer/

Image credit : PTI

The Indian Navy is testing a new mission computer for its carrier-based fighter aircraft Mikoyan-Gurevich MiG-29K/KUB.

Hindustan Aeronautics Limited, a defence company owned by the government, made the mission computer (HAL). HAL told Janes that the new system will give the navy the freedom to combine air-launched weapons made in India or in the West with the Soviet-era MiG-29K.

Janes was told by a source in the industry who knew about the project that the programme started in January 2021, after Russia refused to upgrade the mission computer or give HAL the source code.

In a statement, R Madhavan, who used to be the Chairman and Managing Director of HAL, said that the MiG-29K/KUB can only carry Russian-made weapons on air-to-air and air-to-surface missions.

"The plane can't be used with weapons that weren't made in Russia without a lot of changes," Madhavan said. "It's hard to put local weapons or weapons from the West on the MiG-29 because we don't have any design data or documentation about how the system is put together."

The Indian Navy thinks that the MiG-29k's inability to carry weapons made in India is a "serious limitation," HAL told Janes.

Janes has heard that the navy has been testing the flight computer since June 2022. "The trials are going on right now. "The system is being tested on a number of different levels," HAL said.

"We think it could take between six and eight months to finish the trials," said a source in the business.

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Technology Development

5 Trends And Technologies at Farnborough Airshow Reveal the Future of Aerospace

Joseph Flaig | 31 August 2022

Source: IME | https://www.imeche.org/news/news-article/5-trends-and-technologies-at-farnborough-airshow-reveal-the-future-of-aerospace

The Vertical Aerospace VX4 flying taxi was the star of the show, attracting huge public interest (Credit: Vertical Aerospace)

NEW DELHI (The skies were filled with the roar and rumble of fighter jets and swooping airliners once again as the Farnborough International Airshow returned in July. Some cutting-edge technologies were much closer to take-off following a four-year gap – here are five of the most promising.

High-Mach Projects Take Shape

If commercial supersonic flight does return to the skies, chances are it will look something like the Overture. Prospective Concorde successor Boom Supersonic unveiled a 'refined' design for its supersonic airliner, designed to fly at up to Mach 1.7 over water and Mach 0.94 over land. Based on 26 million hours of simulation, the 65-80-passenger aircraft now includes four engines rather than two, which Boom says will reduce noise and decrease costs for airlines when Overture starts flying later this decade.

Hypersonic passenger flight is unlikely to take off any time soon, but military investment in Mach 5+ technology is increasing following Russia's invasion of Ukraine. The biggest hypersonic announcement during the airshow came from propulsion experts Reaction Engines, Rolls-Royce, the Royal Air Force, the Defence Science and Technology Laboratory and the National Security Strategic Investment Fund, which revealed plans to collaborate on a reusable hypersonic aircraft to provide 'significant enhancements' to the UK's defence capabilities.

Reaction Engines CEO Mark Thomas told Professional Engineering: "Big amounts of money are being spent to pursue hypersonic technologies, but most of them are aimed at devices that are on a one-way trip. What we're exploring is something different, which is a reusable asset designed to go off, do a job, come back, and be used over and over again – but also making sure it's sufficiently low-cost that you can have a fleet of these systems."

The Hypersonic Air Vehicle Experimental (HVX) programme clearly has no lack of ambition, but its aims present some considerable challenges. Air temperatures reach more than 1,000ºC at speeds of Mach 5 and above, and that stress will quickly build up on the engine and airframe over multiple flights. Thankfully, Thomas said the project partners have the precise expertise needed to overcome such hurdles. "Reaction Engines has the propulsion system engineering knowledge," he said. "Rolls-Royce has been doing gas turbines for many decades so they've got incredible capability. But we also bring the cooling technology – that's the absolute key."

Initially designed for the Sabre spaceplane engine, Reaction's precooler uses thousands of

thin-walled tubes filled with helium to rapidly absorb heat from incoming airflow, cooling 1,000ºC+ air in less than 1/20th of a second.

Reaction presented a 'hypothetical' concept vehicle at Farnborough, but Thomas insisted that the project will achieve its objectives "very rapidly," helped in part by the firm's fast-paced, experimental culture and private-company ethos. The vehicle design will be refined over the next 12-18 months, followed by engine testing and flight trials.

Sustainable Change Needed

On the second day of the airshow, the UK baked in its hottest ever temperatures. There was huge disruption around the country as the mercury topped 40ºC, including airports closing because of melted runways. There could no longer be any doubt – the aerospace sector must become more sustainable, and it must do so now.

"Aviation is only 2-3% of mankind's total carbon footprint," said Dr Guy Gratton, associate professor of aviation and the environment at Cranfield University, pilot and programme manager for the Enabling Aircraft Electrification (Enabel) project, and IMechE fellow.

"However, whilst every other industry is successfully decarbonising, the reality – if you ignore the glitch that is Covid – of air transport is that it has been reducing its per-passenger mile carbon footprint by about 2% year-on-year, but it's been growing by about 5% year-on-year, the 3% difference being our fundamental problem.

"So there is a real risk we will outgrow everybody else's carbon reductions and end up the world's largest emitter, which we are keen as an industry not to do."

With destructive climate change already here, and Covid showing that many flights are unnecessary, the sector's sustainability drive cannot rest solely on the shoulders of engineers. Sales of commercial planes showed little sign of a substantial slowdown, however. According to AeroTime Hub there were 282 firm orders, down from 400 in 2018 but not far below the 335 orders in 2016.

Hydrogen Propulsion Flies Closer

Sustainable flight options could arrive sooner than expected thanks to the development of key technologies, GKN Aerospace claimed on the second day of the airshow.

Hyperconducting systems proposed by the West Midlands company would use onboard liquid hydrogen as a heat sink, cooling electrical conductors to less than -200°C to dramatically reduce their electrical resistivity. This reduction in resistivity would enable electrical power distribution at low voltage, lower-mass conducting cables, and electric motors with over 99% efficiency, GKN claimed, helping enable rapid scaling of hydrogen-electric flight from 19 or 48 passengers to 96 and beyond.

Hydrogen flight is already well under way at British-American firm ZeroAvia, which plans to bring a 9-19-seat aircraft into service in 2024. Speaking at the airshow, hydrogen CTO Rudolf Coertze said the company was on the cusp of trials using its new flying testbed with that capacity, a modified Dornier 228.

Those test flights will follow an earlier programme using a modified two-seater Piper Malibu Mirage, which provided a first insight into hydrogen fuel-cell-powered flight. The flights from Cranfield Airport in Bedfordshire

"really demonstrated the feasibility of fuel-cell technology for flight," said Coertze. "We have learnt a lot from that – we have implemented those learnings already into the testbed that we are going to fly now."

The modified Piper crashed during testing on 29 April 2021 after power to the electrical motors was lost when onboard batteries were switched off, with the intention of handing over to the fuel cells. The windmilling propeller generated a voltage high enough to operate the inverter protection system, an Air Accidents Investigation Branch report found, locking out power to the motors.

"While the report does not make specific recommendations for ZeroAvia within its conclusions, many of the issues identified in the report were similarly noted in our internal investigation and have been addressed robustly," said a company statement. Changes included the establishment of a safety and security review board, and a safety management system based on a 'just culture,' including occurrence reporting, investigation and corrective actions.

Takeaways from the initial test programme included a focus on validation of simulation to understand flight behaviours, such as effects of altitude, and integration of the hydrogen and electric propulsion systems, said Coertze.

Unlike the earlier testbed, commercial hydrogen-powered aircraft will not include battery packs. "The energy density of batteries is quite a big disadvantage for flight, this is where hydrogen-electric powerplants give you a big advantage in terms of overall energy density. In the end, hydrogen-electric is still the only one that really gives us the cleanest solution."

Horizontal Satellite Launch

US Air Force C-17s have been safely airdropping troops, supplies and vehicles around the world for decades. What if they could launch satellites into orbit as well?

That is the plan at British-American commercial space launch company Astraius, which aims to avoid the challenges of conventional vertical launch by instead loading smaller launch vehicles into the back of C-17s. After launching from Prestwick Airport in Glasgow and reaching the optimal altitude and position, the rear cargo doors would open and 'drogue' parachutes would deploy from the pallet holding the rocket. Extraction chutes would follow, pulling the pallet out of the plane, before further chutes slow its fall and correct its orientation. The launch vehicle would then separate and ignite its solid rocket motor in the first stage, heading towards orbit.

The system will have a payload capacity of 800kg to low Earth orbit or 380kg to Sun-synchronous orbit – more than horizontal launch pioneer Virgin Orbit, which has capacity for 300kg and 500kg respectively.

Unlike Virgin Orbit, Astraius launches will not need a modified carrier aircraft. The company instead plans to lease C-17s and crew from the USAF, avoiding purchase and operations costs.

Similar missions have already launched rockets to exercise satellite defence systems, so Astraius is confident in its approach. "Airdrop via parachute has been occurring for decades on a variety of platforms," said CTO Shane Clark. "This method that we're using for Astraius is something that the US government has been using for dozens of years."

Flying taxis prepare for take-off

After years of hype, eVTOLs – commonly referred to as flying taxis – also appeared closer to take-off. Bristol firm Vertical Aerospace, which has more than 1,000 pre-orders, wowed the Farnborough crowds with a life-size model of its electric VX4 aircraft – but a real 1:1 aircraft was also nearing a summer test flight campaign.

The company is also part of the Future Flight Challenge, run by UK Research and Innovation and involving partners including Virgin Atlantic, Atkins, infrastructure developer Skyports, and Warwick Manufacturing Group at the University of Warwick. The two-year project will cover aspects such as drone flights, charging technology and software protocols, and will include two VX4 flights, between Bristol Airport and an airfield in South West England, and Heathrow airport and a new Skyports 'vertiport'.

"The focus of the project really is to demonstrate that the UK has all of the constituent pieces to allow advanced air mobility to take off and flourish in both an urban and a regional environment," said Dominic Jackson, market development manager at Vertical Aerospace.

"There are no fundamental technologies that need to be developed in the next couple of years before we fly," he said. "A lot of the technology we use is already off-the-shelf… you're never going to be able to go to the Civil Aviation Authority with an experimental, R&D, lab-based technology and then expect that you'll be able to deploy that in civil aviation within a three-year timeframe."

Underlying technologies include battery cells from Molicel in Taiwan, engines, electric motors and inverters from Rolls-Royce, and wings and fuselage developed with GKN and Leonardo respectively. The main challenge now, said Jackson, is integration and certification.

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Commentary

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

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

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