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"Without reference to the extension of air power to space power, and the proper integration of missiles, ballistic and airborne, into the arsenal of the Air Force, any modern definition of air power is meaningless".

- Alexander P. de Seversky

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Fast Growing Chinese Air Power: India Urgently Needs Fighter Squadrons

Air Marshal Anil Chopra (Retd)
Director General, Centre for Air Power Studies |

20 Nov 2022

Source: News18 | https://www.news18.com/news/opinion/fast-growing-chinese-air-power-india-urgently-needs-fighter-squadrons-6426679.html

The Rafale aircraft is clearly superior to China's J-10, J-11, and Su-27 fighter jets. (Photo: IAF Twitter)

Emphasising induction of modern aircraft to sustain and enhance the Indian Air Force's (IAF) combat potential, Air Chief Marshal VR Chaudhari has said that force urgently needs 5-6 squadrons of 4.5 generation aircraft. Air power remains the most potent means of prosecuting war. It provides long range, precision, and flexibility. Modern fighters are omni-role, thus can do multiple missions in a single sortie. The ranges have been extended with aerial refuelling. The AEW&C gives cover deep in enemy territory.

India is one of the most threatened nations in the world. It has two nuclear weapon-possessing neighbours. With both there are serious boundary disputes, wars and border skirmishes. For long it is very clear that for ground or sea war to be won there is a need for dominance in the air. The fighter aircraft remains the most potent platform for both offensive and defensive operations. While many are predicting the future to be unmanned, practically all the fifth and sixth generation fighters that will see the world through this century are evolving as manned fighters.

To stem the increasing gap with China, India needs to increase its defence allocations, from current 2.15 percent of GDP to around 2.5 percent.

The IAF today is at an all-time low of 30 fighter squadrons. The government has already announced that the four remaining MiG-21 Bison squadrons will be retired by 2025. In this period, only around two squadrons of LCA, at best, will induct. This would mean further depletion of the squadron strength. At the same time Pakistan Air Force (PAF) currently has over 450 fighter aircraft in 22 fighter squadrons. China has nearly 59 fighter brigades in the theatre commands with each having 24-28 aircraft. Additional 20 plus Brigades are with the PLA Air Force (PLAAF) HQ at Beijing. China also has additional air power with the PLA Navy (PLAN) with nearly 500 aircraft and an expanding number of aircraft carriers. Clearly India's neighbours are expanding air power. Significant part of the PLAAF may be committed on China's Pacific front, but air power's speed and flexibility allows forces to be brought to bear in other sectors in a short period.

Growing PLAAF: Know the Adversary

With the support of indigenous industry which is producing all genres of aerial platforms, PLAAF is fast acquiring top-end systems and weapons of global class and reach. There is much greater emphasis on modern technologies, including stealth, hypersonic, Artificial Intelligence (AI), cyber, electronic warfare, and long range missiles. PLAAF also reoriented its flying training and tactics, and there is much higher emphasis on realistic exercises. The PLAAF has made major changes in its operational doctrine

based on global reach requirements. Air defence of critical assets; long-range offensive precision strikes; integrated battlefield support missions; intelligence surveillance and reconnaissance (ISR); information operations; and strategic air-transport reach are on priority. Integration of air and space will support both offensive and defensive operations. PLAAF is preparing for hybrid network-centric war. The PLAAF is trying to increase exposure to air exercises to compensate for low actual war exposure. The PLAAF is closing the gap with Western air forces across a broad spectrum of capabilities, such as aircraft performance, command and control, and electronic warfare.

The PLAAF is the third largest in the world, and of its nearly 1,700 combat aircraft, 900 are 4th generation-plus. Nearly 150 fifth-generation J-20 stealth fighters have been built. Second stealth aircraft, J-31 development is being hastened. PLAAF also operates nearly 170 H-6 jet bomber variants. The extended-range H-6K variant can carry six air-launched Cruise missiles. They have significant AEW&C and Flight Refuelling Aircraft (FRA) and numbers are going up. PLAAF also has a large number of indigenous unmanned aerial vehicles (UAV) of global standards. Many of these carry armaments (UCAV). They are developing new long-range stealth bomber H-20 to strike regional and global targets. It is expected to be ready by 2025. PLAAF is also inducting state of the art long range aerial missiles with ranges up to 300 kilometres.

The PLAAF believes in long range offensive precision-strikes. There will be coordination with People's Liberation Army Rocket Force (PLARF). It has multi-layered air defence systems. China's extensive constellation of surveillance satellites with short revisit cycles greatly support surveillance and targeting. The PLAAF gives greater importance to information, electronic and cyber warfare. The PLAAF also coordinates closely with the PLA Strategic Support Force (PLASSF). The PLAAF's regular exercises include large force engagements, with PLA and PLA Navy. Their exercises in Tibet have increased.

IAF Current Broad Capabilities

IAF is down to 30 fighter squadrons. These broadly include two of Rafale, 12 Su 30MKI, four MiG 21 Bison, three each of MiG 29 and Mirage 2000, six of Jaguar, and two of LCA. The Rafale aircraft is clearly superior to China's J-10, J-11, and Su-27 fighter jets. Armed with long-range Meteor and MICA beyond visual range (BVR) air-to-air missiles, the Rafale fighters. The SCALP cruise missile and Hammer glide bombs have very high accuracy. Rafale also has the best Electronic warfare suite in the region. The Sukhoi Su-30MKI is the IAF's primary air superiority fighter with capability to perform long range air-to-ground strike missions. Mirage 2000 and the MiG 29 have all been upgraded. IAF has only three large AWACS aircraft and three indigenous DRDO developed AEW&C aircraft. Similarly IAF has only six IL-78 Flight Refueling Aircraft (FRA). Both these fleets need augmentation for a continental size country like India which has also to cover the Indian Ocean Region (IOR).

India has a good chain of integrated radars to support network-centric offensive and defensive operations. The IAF's legacy surface-to-air missile systems like the SAM-3 Pechora and SAM 8 OSA-AK are being upgraded. With the induction of a large number of indigenous Akash AD systems, and the already inducting five Russian S-400 systems from Russia, the AD

coverage will be significant. To cover the large Chinese border, more systems are being inducted. With the induction of the MICA, Meteor, Astra, SCALP, BrahMos and Hammer, among others, IAF has a significant aerial weapons inventory. IAF already has the reach from the Persian Gulf to the Straits of Malacca. From the island territories it can reach parts of the South China Sea with inflight refueling. IAF is regularly exercising and increasing interoperability with major air forces of the world. But the IAF needs numbers.

IAF Operational Capabilities Across Himalayas

The IAF has a clear advantage in numbers of airfields most of which are at lower altitude vis-à-vis China. But China is upgrading infrastructure and bringing in more assets. IAF airfields need more hardened shelters. More radars and air defence systems need to be positioned. Any air campaign would have to be aggressive, and executed simultaneously against different spread out target systems. China's war plans are to launch an initial barrage of surface attack missiles to knock off critical Indian infrastructure including airfields. India would have to defend against such an attack with air defence weapons. India would then have to achieve local sectorial air superiority. It must be remembered that the effect of neutralizing just two Chinese airfields in each sector would have much more severe implications for them than if the same was to happen for India. India should thus concentrate on neutralising the PLAAF airfield using surface and air-launched missiles, and build inventories accordingly.

Interdiction will pay high dividends in the mountains. Destroying a few bridges could throttle logistics chains and supplies. Creating weapon triggered landslides could block roads. Attacks against convoys on the very few roads would create bottle-necks. Air can provide both kinetic and non-kinetic options with pin point accuracy. It will influence outcomes and actions of the surface forces. It can simultaneously produce physical as well as psychological effects. Both the fighter aircraft and attack helicopters will be employed for this. UCAVs would be used for interdiction, battlefield strikes and anti-tank and anti-personnel operations. The transport and helicopters would also provide the airlift of troops and military hardware inter and intra sector. Inter-valley transfers may be required in changing battle situations. The IAF has significant reach and capability on this count.

Due to limitations of ground radars in the mountains, greater dependence would have to be on AWACS. Numbers will have to go up. Satellites and UAVs will be required for ISR. Numbers would have to go up to reduce revisit time. The IAF will have to continue to transform from just being platform-based to being capability-based. Effects based, network centric operations would be employed. The side that better employs electronic warfare and cyber means and tools will have advantage. Securing own networks and denying the same to adversaries will be important. Air and space platforms will greatly support cyber and electronic warfare operations much deeper into the enemy territory.

Two-Front Threat

Today China and Pakistan have deep strategic friendship. Nearly 60 percent of Pakistan Air Force (PAF) is made up of Chinese aircraft. PAF already has nearly 130 JF-17 'Thunder'. 25 J-10CE aircraft are under supply. PAF AEW&C and FRA are of Chinese origin. They have commonality in armaments. PLAAF and PAF

regularly carry out flying training exercises called the Shaheen Series. Their interoperability levels are high. Both have territorial interests in Jammu and Kashmir and Ladakh. In case of Sino-Indian conflict, Pakistan could allow use of its airbases to the PLAAF. It could also open another front. The Indian military will have to factor this aspect. IAF will surely require a larger number of fighter aircraft.

Rebuilding IAF Numbers

Considering just the Chinese threat, India needs to rebuild the authorised 42 fighter squadrons. To rebuild IAF fighter numbers, many approaches are required on priority. Only the seven two-seater are left to be delivered among the ordered 40 LCA Mk 1. On 20 June 2022, the Tejas Mark 1A prototype completed its first flight. LCA Mk 1A deliveries are planned to start in early 2024. Some delays are already being projected. The 83 aircraft will be delivered by 2029. Effectively that would mean just 16 aircraft a year. That is too less to make good numbers. LCA production must go up to 24 a year, Even if it means IAF placing more orders. Notwithstanding the 'aatmanirbharta' push, India would have to make a one-time purchase of the 114 fighter aircraft from abroad. The Request for Information (RFI) for MRFA Tender has had responses from eight global aircraft manufacturers. The release of Request for Proposal (RFP) has been overdue. Even if it was issued today, it would take 5-6 years to select and induct the first fighter. It must be hastened. The second option is to make a follow-on order of Rafale.

Infrastructure on two airbases exists. We have already paid for the India specific modifications. Overall cost would be lesser this time. The third activity is to hasten development of the LCA Mk2 by pumping in more funds and increasing the team size. Next is to give early CCS clearance for Advanced Medium Combat Aircraft (AMCA). There should be a dedicated team and management of the AMCA project. Private sector will be brought in at a very early stage.

Induction of eight LCA Mk1 and Mk1A squadrons and 114 new fighters by 2030 could take the IAF to around 37-38 fighter squadrons by 2030. The target is to get to 42 squadrons by 2038. The end state could be 14 squadrons of Su-30 MKI, two each of Mirage 2000 and MiG 29, 12 squadrons of LCA variants, two of Rafale, six of the new fighter, and four of Advanced Medium Combat Aircraft (AMCA). Effectively IAF may have to stretch the Mirage and MiG 29 fleets. If AMCA could come faster the Mirage 2000, and MiG 29 could be retired faster. These figures are achievable as long as timely decisions are taken, funds allotted, and there are no serious development delays in LCA Mk 2 and AMCA. IAF must also target to have 8 large and 10 smaller AWACS, at least 12 FRA aircraft by 2030. The DRDO project for these must be hastened with foreign support. Till then, it is best to take a few on lease. The 12 deficient fighter squadrons and the nearly 12 more to retire by 2038 will require significant funding. Capital budget would have to increase.

Some often suggest that since Rafale and Su-30 MKI can achieve much greater effects than the older MiG 21s, why IAF should continue to seek 42 squadrons. The argument is flawed. India's adversaries already have fifth generation fighters. They are not cutting down numbers. Type of aircraft and weapon platforms must be comparable to the adversary.

India also needs to invest more in game-

changer technologies. These include cyber and electronic warfare, artificial intelligence, unmanned systems, hypersonic, among others. Hypersonic flight and weapons will be difficult to engage. They will act as force multipliers against high-value targets. There is a lot of action in Directed Energy Weapons (DEW). Lasers that can burn incoming missile electronics or dazzle electro-optical sensors.

For India to become significant, it must also master aircraft engine, and AESA radar technologies. Joint venture route is the best to imbibe high-end technologies. We need very long range weapons, including aerial missiles with around 400 kilometres ranges. Similarly, air-launched cruise missiles with ranges of around 1,500 kilometres.

There is a backlog of modernisation. The obsolescence sets in much faster for aerial systems. To stem the increasing gap with China, India perhaps needs to increase its defence allocations, from current 2.15 percent of GDP to around 2.5 percent. IAF is well trained and operationally well exposed. The IAF will be much better placed against the PLAAF once numbers are rebuilt. It has to be a whole of the nation approach. Time act is now.

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Yes, the Indian Air Force Needs a New Doctrine

Manmohan Bahadur | 19 Nov 2022

Source: The Hindu | https://www.thehindu.com/opinion/op-ed/yes-the-indian-air-force-needs-a-new-doctrine/article66154209.ece

At the Ambala air base | Photo Credit: R.V. MOORTHY

There is a deafening crescendo around the pitch for aatmanirbharta in the field of the defence inventory and not a day passes without the media featuring stories on some breakthrough or the other about indigenisation. Things have improved vastly but what is debatable is whether these events are being guided by some long-term institutionalised thinking and planning — another term for which is doctrinal guidance.

A layman's definition of doctrine is that it is 'the best way of doing a thing'. It is developed with many inputs, the important ones being ideas influenced by past experience, present capability and capacity of technological research and development and manufacturing, human resource availability and an organisational environment that encourages free thinking and a deliberation of fresh ideas. An aatmanirbharta campaign that is not based on a foundation of doctrinal thought is on a shaky wicket. And as we debate (unfortunately) whether air power is a support force (an abominable thought), some recent writings have tended to downplay its vital importance in any future conflict.

It is time that the doctrine of the Indian

Air Force (IAF) — it is of 2012 vintage — is reviewed and made public to guide the future development and application of India's air power. Doctrine drives technology and given the ongoing advancements, the IAF doctrine would have to spell out the following to meet the challenges of the mid-century.

Technology has progressed exponentially. Artificial intelligence and machine learning are being refined to mimic human cognitive abilities and intuition. Their incorporation, despite monies remaining elusive for another decade or so, would be a challenge that needs doctrinal analysis.

A roles and missions of the IAF would have to be re-assessed since space will be a major, if not a central, player in future conflicts. The weaponisation of space must be accepted, the Outer Space Treaty notwithstanding. Conflicts down centuries have shown the advantage that accrues to the force that occupies the 'high ground.' Hence, an emphasis on unmanned platforms and space assets, including a capability for satellites on call would be necessary. That this would be an inter-ministerial endeavour is indeed true, but this has to be institutionalised through a published doctrine.

The loss of air superiority has, and will, spell doom for a nation that chooses to neglect it; the IAF's doctrine must expound on this aspect as an imperative despite the high financial commitment required.

A call on how air power, with its niche strike, Airborne Intelligence, Surveillance and Reconnaissance (ISR) and precision attack capabilities would be merged in the drive towards jointness would be an imperative. While the Department of Military Affairs and institution of the Chief of Defence Staff (CDS) are new, the IAF's future 'flight plan' would need a doctrinal foundation; this should not be confused with the ongoing clamour for theaterisation!

Given the two-front threat (China and Pakistan) that India faces, would we be forced into a coalition? While this would be a political call, 'joint operations with friendly nations' could certainly be addressed, including commitments in partnerships such as the Quad.

It is a fact of history that when a nation's economy improves, it has to look for raw materials beyond its borders to fuel its advancement, putting it in an adversarial mode against other powers which would be doing the same. This means that a doctrinal alignment for expeditionary movements must find a place in the document.

New Technology, Stress and Human Resource

The world has already graduated to multi-domain operations where cyber, space, electromagnetic spectrum, influence operations et al. have been activated together or in stages to get a whole of government approach towards meeting national objectives. The IAF will be just one, albeit an important, cog in the multi-domain power synchronisation for which doctrinal guidance would be a must.

For acceleration of fresh thought, personnel have to feel secure — they have to have the psychological high ground in order to be vocal with their ideas. The IAF's new doctrine must accept this, even as it acknowledges that new technology would result in an information overload which actually accentuates stress in human resource.

Keep out the Political Prism

America's nuclear asymmetry, post the Second World War was lost when the USSR was

on a par. To counter this, the U.S. brought in the Revolution in Military Affairs, seen so vividly in the 1990-91 Gulf War. This turnaround took dedicated research teams under programmes that had continuity from 1965, and political backing under different Presidential administrations. The IAF doctrine must underscore that 'national defence' is a national endeavour and should not be filtered through a prism of the political dispensation at the helm. This is vital.

An air force is not about fighter aircraft alone. Combat enablers such as aerial refuellers, Airborne Warning and Control System, transport and helicopter fleets, radars, communication systems, etc. are vital in operations. Their obsolescence in the coming years would land them in the same state as the fighter aircraft inventory now (30 squadrons). With India trying to cement its place as a regional power of reckoning, these combat support assets are also vital for humanitarian assistance and disaster relief that are important cogs in military diplomacy and foreign policy. Neglecting them would be to India's disadvantage, more so because they are critical too in sustaining kinetic power. The new IAF doctrine must cater to these aspects for the guidance of policymakers.

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Air Power

Japan Missile Defense Flight Test Successful

24 Nov 2022

Source: Space War | https://www.spacewar.com/reports/Japan_missile_defense_flight_test_successful_999.html

The Japan Maritime Self-Defense Force (JMSDF) and the United States Missile Defense Agency (MDA) announce the successful completion of a two-week missile defense event incorporating two live fire exercises.

The event, designated Japan Flight Test Mission-07 (JFTM-07) was held in cooperation with the U.S. Navy.

The first live fire event demonstrated a successful engagement of a Standard Missile 3 (SM-3) Block IIA fired from the JS Maya (DDG 179) against a medium range ballistic missile T4-E target. The JS Maya tracked and fired on the target successfully destroying it over the Pacific Ocean. This is the first time a Japanese Maya-class destroyer has fired a SM-3.

The second live fire exercise demonstrated a successful integrated air and missile defense scenario using SM-3 Blk IB and a SM-2 Blk IIIB missiles fired from the JS Haguro (DDG-180) against a short range ballistic missile (SRBM) target and an Anti-Air Warfare engagement

against a BQM-177.

"The success of this joint test marks a critical milestone in demonstrating, for the first time, a live fire of an SM-3 Blk IIA from a Japanese ship," said MDA Director Vice Adm. Jon Hill.

"The cooperative development of the SM-3 Blk IIA by the Japanese government, U.S. government and industry team, and the integration with the Aegis Weapon System on Japan's Ballistic Missile Defense-capable ships, is a remarkable achievement and vitally important in defending against an ever-increasing threat. I congratulate the Japan Maritime Self Defense Force, U.S. Navy, MDA team, and our industry partners on this accomplishment."

JFTM-07 is a significant milestone in the cooperation between Japan and the U.S. in the area of missile defense. JFTM-07's goal was to support the JMSDF ballistic missile defense modernization and certification of the Japanese Aegis Weapon System Baseline J7 and Maya class destroyer deployment.

It also demonstrates the capability of the SM-3 Block IIA, being developed cooperatively by Japan and the United States, to defeat medium- and intermediate-range ballistic missiles. The SM-3 Block IIA interceptor operates as part of the Aegis Ballistic Missile Defense system and can be launched from Aegis-equipped ships or Aegis Ashore sites.

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Taiwan to Develop 100-Plus 'Radar-Killing Suicide Drones' by 2025

20 Nov 2022

Source: First Post | https://www.firstpost.com/world/taiwan-to-develop-100-plus-radar-killing-suicide-drones-by-2025-11662241.html

Chien Hsiang suicide drones. Twitter/@SiteTaiwanInfo

The Taiwanese military has teamed up with a state-run weapons developer to produce 104 suicide drones by 2025, the National Chung-Shan Institute of Science and Technology (NCSIST) official said.

The truck-launched drones are designed to detect airborne, waterborne, grounded radar, and electromagnetic systems through their emissions and strike.

According to the news outlet Focus Taiwan, NCSIST official Chi Li-ping said that the drone's production and delivery are on schedule. However, he did not how many drones the military has ordered.

The NCSIST first displayed the Chien Hsiang anti-radiation drone in the year 2017, drawing comparisons with the Israel Aerospace Industries' Harpy anti-radiation weapon system.

Taiwan Military Invests $2.57 Billion In Drones

In 2019, the Taiwanese military confirmed its plans to invest $80 billion New Taiwan dollars ($2.57 billion) into the drone's development over five years. The military had claimed that the cost of building an anti-radiation UAV would be lower than that for the TC-2A anti-radiation missile, or US-made AGM-88A/B HARM anti-radiation

missile.

Taiwan to Aim at China?

The truck-launched drones are designed to detect airborne, waterborne, grounded radar, and electromagnetic systems through their emissions and strike.

Chi said that the anti-radiation suicide drone had a maximum flight time of over five hours and will be able to strike targets 1,000 kms away. He added that its range allows it to target seaborne, coastal, and inland Chinese radar systems.

According to Alert 5, the drone weighs 6 kgs (13 pounds) and is 1.2 meters (4 feet) long and 2 meters (6.56 feet) wide. It finds the target with an electro-optical or infrared payload and selects them via an 'intelligence object detection system'.

Focus Taiwan reported that the drone hovers over a target for several hours until it is activated, swooping down at a speed of 600 km (373 miles) per hour to crash into it. Chi believes that it is possible to deploy 12-drone clusters of the Chien Hsiang, which can take flight without a runway.

Chi said that the NCSIST is developing two versions of the drone- one for the attack while the other one as a decoy to protect essential systems from attacks by enemy anti-radiation missiles or UAVs. He further introduced the NCSIST's rotary-wing unmanned aerial reconnaissance vehicle, which is capable of withstanding strong breezes of up to 50 km per hour.

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Shahpar-2 Combat UAV: Know About the New Addition to Pakistan's Arsenal that Can Fly Up to 1,000 Kms to Hit its Target

24 Nov 2022

Source: News9live | https://www.news9live.com/knowledge/shahpar-2-combat-uav-know-about-new-addition-to-pakistans-arsenal-209864

Pakistan shows domestic Shahpar-2 Combat UAV. (Photo credit: Twitter/@KanaanAhmed5)

New Delhi: Recently, Pakistan presented its homegrown combat UAVs at the 11th edition of its biennial arms exhibition, the International Defense Exhibition and Seminar (IDEAS 2022). As per reports, it was held in Karachi between November 15-18 and showcased some of the advancements made by Pakistan's defence industry in unmanned combat aerial vehicles (UCAVs) that play an increasingly important role in warfare, as demonstrated in the ongoing Ukraine war. Among them was the Shahpar-2 UCAV, a medium-range tactical UAV System with autonomous take-off and landing. It can carry various types of payloads integrated for reconnaissance and day and night surveillance.

The Shahpar-2 Medium Altitude Long Endurance (MALE) drone is produced by Global Industrial and Defense Solutions (GIDS), a Pakistani state-owned defence conglomerate.

What is Shahpar-2 UCAV?

The Shahpar-2 Medium Altitude Long Endurance (MALE) drone produced by Global Industrial and Defense Solutions (GIDS), a

Pakistani state-owned defence conglomerate and the country's largest defence manufacturer, was showcased at IDEAS 2022.

The Shahpar-2 is an improvement on the Shahpar-1 drone commissioned into the Pakistan Army and Air Force in November 2013 for intelligence, surveillance, and reconnaissance (ISR) missions and assistance in disaster management.

It is attack-capable and can fly up to 1,000 kilometres to hit its target. It locks onto its target with a laser and then strikes it with a missile. The drone can fly at a maximum speed of around 222 kilometres per hour (kph). Its take-off speed ranges roughly between 148 to 158 kph, similar to its cruising speed. Its maximum range is around 1,050 kilometres, and the data link range is 3,00 kilometres.

The Shahpur-2 can restart its engine during flight and contact satellites in any campaign, day or night. The drone has already entered service with Pakistan's Army, Navy and Air Force, and it was publicly displayed for the first time during the Pakistan Day parade on March 23, 2021.

According to the BBC, Asad Kamal, CEO of GIDS, has said that the government told him that the technologies for which Pakistan depends on foreign countries should be gradually developed in the country. He said, "After that, we started working on our next plan. Our Army needed a system that could not only see the target but surround it; if required, it could also destroy it. After that, we researched and worked on the Shahpar-2 drone."

Main features at a glance

- Autonomous take-off and landing.
- Various types of payloads integrated for reconnaissance and day and night surveillance.
- Accurate lateral and longitudinal trajectory control.
- Mission planning, management and control.
- Built-in data exploitation and dissemination. Full mission debriefing and simulation.
- Military standard hardware (Environmental Standard 810F).
- Geo referencing and geo pointing for terrestrial targets.
- MISB-compliant video format.

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Russia Swarms Ukraine with 'Moskitos' to Jam its Communication; Could be Moscow's First EW Drone

Parth Satam | 25 Nov 2022

Source: Eurasia Times | https://eurasiantimes.com/miniature-irritant-power-packed-mosquito-bites-as-russias/

Russia appears to have upped its electronic warfare (EW) game by publicizing a hitherto unknown small drone-based system derived from the Orlan-10 in a recent video. Russian defense watchers maintain that the drone has been active in the war zone for quite a while.

Anticipating the war to extend into the winter and possibly next year if diplomacy with the United States (US) or Ukraine fails, this rapidly introduced system could accrue the Russian Army significant tactical battlefield benefits, assuming it has already been produced in large numbers and received by all forward units.

The 'Moskit,' 'Moskito,' and even 'Mosquito' has been reported to be primarily based on the Orlan-10 unmanned aerial vehicle (UAV).

The lightweight drone has been claimed to have successfully jammed Ukrainian communications and is also being introduced to the 300,000 under-training newly mobilized recruits.

The Russian MoD had recently mentioned electronic warfare and electronic engineering as areas to train recruits in, besides radio communications, mechanical repairs, and drone operations.

A video shows a pair of soldiers setting up a ground-based launcher and pulling a thick rope meant for the catapult launch system. A brief shot reveals the dish antennae, presumably for controlling the drone and transmitting and receiving data.

The Moskit has a two-blade front propeller and appears highly portable and lightweight.

The soldiers assemble the drone by fastening its fuselage and attaching the other half of each wing. The drone has antennas all over its body, typical of airborne EW platforms. Another shot shows soldiers in a separate command center in radio communication with the drone's field operators.

One of the drone's operators is seeing wheeling back the catapult that finally launches the drone. The Moskit then flies overhead and descends vertically by releasing a parachute, landing on inflatable airbags on the side fuselage that have cushioned its fall.

Lightweight & Versatile

The drone has been hailed as a success in the miniaturization of electronic warfare (EW) systems. "Russia's Moskit drones began to jam the communications of the Armed Forces of Ukraine at the forefront of the Special Military Operation (SMO) and caused absolute chaos and confusion in their operations. Our troops didn't waste time exploiting that," said a comment on one page. The claim could not be verified.

The drone has modules to suppress and jam electronic communication and data transmission channels. The UAVs can jam communications up to a range of five kilometers, making it difficult for forward enemy units to interact with their headquarters or command and control centers deployed in the rear.

But more importantly, the Moskit is also equipped with electro-optical systems to perform intelligence-surveillance-reconnaissance (ISR) roles, which the operator can easily switch from its core EW orientation.

It also permits simultaneous EW and ISR tasks, revealing enemy positions and radio emissions sources. "Previously, the Ministry of Defense did not demonstrate the combat work of the Mosquitoes," the comment on the page said.

The claim is true since no press release or publicity material on the drone from Russia's MoD, its Krasnaya Zvezda news channel, news services like TASS, Interfax, RIA Novosti, or channels like Russia TV (RT) or Sputnik was found.

It is nevertheless unusual to hide the existence of an otherwise inexpensive system like a lightweight drone when Russia has been actively publicizing its military operations and weapons systems throughout the war.

At best, it could be concluded that the drone just escaped the eyes of its publicity department. Its revelation was pushed by one of the several leading Soviet-era military technical institutes or the slew of private Russian firms which developed it!

An Addition To Russia's Diverse EW Systems

Russia has long led an extremely capable EW, which is considered a legion of its own, perfecting its doctrines and systems since Syria, where its bases and troops faced constant attacks from the Islamic State (IS) groups opposed to President Basher al-Assad.

Krasukha-4 is one of Russia's most advanced EW platforms, capable of jamming signals from adversary's air and space-based assets. Another advanced airborne EW system is the Su-34 fighter bomber, which has one Khibiny pod on each wing tip.

The Mi-8MTPR-1 EW helicopter is another platform that EurAsian Times reported in October. It is an upgraded version of the standard Mi-8MTV-5-1 outfitted with the Richag-AV EW system. Moscow is believed to have employed this helicopter to conduct electronic warfare against Ukrainian air defense systems.

Equipping small-sized drones with an electronic warfare system indicates specific successes in what Russian commentators believe has long been a weakness for the Russian defense industry.

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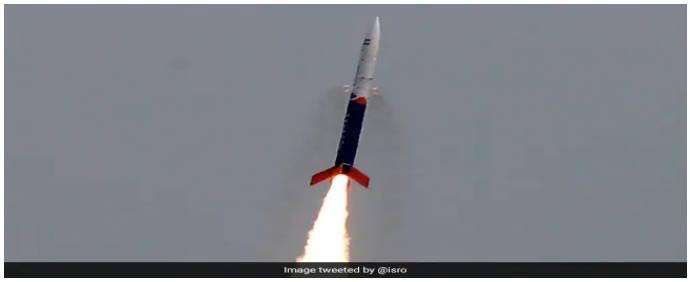
Space

India's First Private Rocket Launch is a Turning Point for the Space Industry

Group Captain T H Anand Rao

Senior Fellow, Centre for Air Power Studies | 23 Nov 2022

Source: CAPS India | https://capsindia.org/indias-first-private-rocket-launch-is-a-turning-point-for-the-space-industry/



NDTV.com

The launch of India's first privately owned and developed rocket has opened new avenues for the commercial space sector. Skyroot Aerospace, a space tech start-up, launched India's first private rocket, named Vikram-S, on November 18, 2022, from the space launch centre of Indian Space Research Organisation (ISRO) at Sriharikota. The rocket took-off at an elevation of 80 degrees and an azimuth of 100 degrees to achieve an altitude of 89.5 km at a range of 121.2 km from the launch pad. The rocket reached peak velocities beyond hypersonic flight, and the total flight lasted for 280.87 seconds until splash down. The launch was a suborbital test and demonstration flight to showcase the capabilities of the company. The rocket met all the planned parameters for flight and also carried three payloads. The mission, aptly named 'Prarambh,' is the first from Skyroot Aerospace, and a first of its kind from a private operator.

The maiden launch proved the technological

prowess of Skyroot Aerospace. The company was not only able to reassure its investors, but also light the pathway in this sphere. Vikram-S is a six-metre tall, single-stage, spin-stabilised solid-propellant rocket that was developed in just two years. The rocket used 3D-printed solid thrusters for spin stability. With a weight of 545 kg and a diameter of 0.375 metres, Vikram-S is one of the most affordable rockets in its category, globally. Vikram-S also boasts cutting-edge avionics and a carbon fibre core structure. Skyroot Aerospace claims that the technology architecture of the Vikram Launch Vehicle offers special capabilities like multi-orbit insertion as well as customised and dedicated ride-share options that can be used to meet a variety of small satellite customers' needs.

Of the three payloads carried, two are Indian and one is from a foreign customer. These payloads were built by the Andhra Pradesh-based N Space Tech, the Chennai-based start-up Space Kids, and the Armenian BazoomQ Space Research Lab. The payloads were not released from the rocket's nose cone for orbit insertion; instead, they were exposed after the payload fairing separated, and they remained with the rocket as it splashed into the sea. This could be because of the sub-orbital apogee, which is insufficient to achieve orbit but sufficient to test the payloads at altitude.

Skyroot Aerospace is a Hyderabad-based space start-up. Skyroot Aerospace has been developed by a team of 200 engineers in a record time of two years. The start-up plans to manufacture a series of launch vehicles to be named after the founder of India's space programme, Dr. Vikram Sarabhai. The start-up has raised US $68 million in total, including US $51 million in a Series B round led by a Singapore-based company, and has a valuation of US $165 million. In 2021, it became the first start-up in the country to sign a memorandum of understanding (MoU) with ISRO in 2021 to launch its rockets. ISRO and IN-SPACe (Indian National Space Promotion and Authorisation Centre) have provided all assistance in the development and launch of the Vikram-S rocket from the Sriharikota Rocket Launch Station. Skyroot Aerospace is known to be working closely with other global space companies. It has agreements with Innova Space of Argentina, Ride and ConnectSAT of France, and Hex20 of Australia, among others.

The launch has generated a favourable environment for private operators in the space sector. It has kicked off a new phase of activity for the private space industry, and it is an important milestone in the journey of India's space growth. According to Skyroot Aerospace, the rocket launch has validated most of the technologies to be used in their Space Launch Vehicles, as well as those sub-systems that will be used in the pre-lift off and post-lift off phases of the launch. This includes telemetry and tracking, avionics systems, inertial measurement, GPS systems, onboard cameras, data acquisition, and propulsion systems. The Vikram series of launchers from Skyroot Aerospace would offer the fastest and the most affordable rides to space. These rockets could be assembled and launched in a matter of 24 to 72 hours from any site. This gives it great potential to be used as a 'responsive launch' or 'launch-on-demand' option for the armed forces.

India's space sector was opened to the industry in 2020 for the participation of private players in the space sector. Since then, the government has been making efforts to attract commercial launch service providers to launch from India. The Skyroot Aerospace launch will create an ecosystem for the growth of commercial space

launch activities, which are now a global trend. India's own Space-X phenomenon may become a reality in the near future. The ultimate goal is to provide options for cost-effective satellite launch services within the country by removing entry barriers. This will make spaceflight affordable and accessible for domestic space activity. To make things better, the government is in the advanced stages of releasing a new space policy to increase private participation and encourage investment in the space sector. The space policy is expected to address most issues being faced by private players. Some of the initiatives include a single window clearance system, spectrum allocation for various space applications, a revision of foreign direct investment policy, and incentives on taxes and import duties.

The future of indigenous space launch vehicles is promising. We are heading into a new phase in India's space journey, where private space launch providers will be the key to India's space development. The path has been set for bigger rockets, more launches, and a lower turnaround time for satellites to orbit, which are provided by the commercial launch providers. While Skyroot Aerospace may be the first to launch a private rocket into space, they are certainly not the only start-up on the scene. Chennai-based launch vehicle start-up Agnikul Cosmos is scheduled to test launch its rocket, Agnibaan, in December this year. Both of these start-ups will soon be seen launching satellites into space, which is something to look forward to. The trend is clearly towards smaller and cheaper rocket options for accessing the Low Earth Orbit region. The armed forces too can explore these emerging options for putting military satellites into orbit.

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China's Quantum Satellite

Gp Capt Puneet Bhalla | Nov 2022

Source: CENJOWS | https://cenjows.in/wp-content/uploads/2022/11/Tech_Scan_China_Quantum_Satellite_Nov_2022.pdf

Ukrainian Quantum communication is a field of applied quantum physics closely related to qantum information processing and quantum teleportation. A quantum key network uses entangled particles to encrypt a message. The most well-known and developed application of quantum cryptography is quantum key distribution (QKD). QKD describes the use of quantum mechanical effects to perform cryptographic tasks or to break cryptographic systems. Any attempt to steal or decode will alter the message physically and alert the receiver, thanks to the law of quantum physics. Ranges of QKD links can be significantly increased with satellites to allow intercontinental key exchanges. The most important job of a quantum satellite is to generate entangled particles to be used as quantum keys between pair of connected nodes. These keys could then be stored in a quantum key pool to be utilised when required. Use of satellite enable QKD is a challenge owing to the complexity of quantum mechanics, divergence of the laser beam and atmospheric attenuation and propagation errors. On 27 Jul 2022, China launched a micro-nano quantum satellite named Jinan1 atop a Lijian-1 quick response carrier rocket from the Jiuquan Satellite Launch Centre in northwest China. This is the second such satellite launched by China and its weight is about one-sixth of

Micius, the world's first quantum satellite that was made operational in August 2016.

Micius had conducted record-breaking experiments in quantum physics, including proving the feasibility of quantum communication from one continent to another (Beijing to Vienna). However, it can only establish a stable link with the ground at night because the sun produces so much noise that the light signals are drowned out. Also, the bandwidth for quantum key distribution is low, thus restricting communication to voice or low-resolution videos. Efforts have been on to find solutions to these issues an developing new technologies to maintain quantum communication during the daytime and in bad weather. This includes developing more accurate targeting systems and larger receiving mirrors.

Jinan1, placed in the Low Earth Orbit (LEO) has been designed to conduct real-time quantum key distribution experiments between the satellite and ground station, and to carry out technical verification. The key distribution experiments are expected to be conducted after a month of testing. The new satellite has been jointly developed by Chinese universities and institutions such as the USTC, the Chinese Academy of Sciences and the Jinan Institute of Quantum Technology and is expected to have the capability to generate quantum keys at speeds two or three magnitude higher.

China intends to put more such satellites into orbit, both LEO and Geosynchronous Orbit (GEO), towards creating a high-speed, stable and ultra-secure communications network with global coverage. LEO satellites have the advantages of small channel loss and low latency, whereas GEO based satellites provide wider coverage. Reportedly, China has been testing quantum telecommunication technology on GEO based Shijian 20, an advanced communication satellite. The aim is to support more than 100 users around the globe with secure communications powered by laws of quantum mechanics, unmatched by classical cryptographic methods.

China remains the only country in the world to deploy quantum communication satellites. This type of secure communication has potential strategic implications. While other countries have woken up to this advanced technology and would want to replicate it, none is even close to demonstrating equivalent terrestrial quantum communication capabilities. India has taken initial steps in achieving terrestrial quantum communication and has demonstrated it over small distances. The Chinese demonstrations have spurred the interest and efforts in this technology application.

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ISRO: PSLV-C54 Successfully Places Oceansat into Orbit

26 Nov 2022

Source: The Telegraph India | https://www.telegraphindia.com/india/polar-satellite-launch-vehicle-c54-successfully-places-oceansat-into-orbit/cid/1900379

PSLV-C54 carrying earth observation satellite along with eight other co-passenger satellites lifts off from the Satish Dhawan Space Centre in Sriharikota, Saturday, November 26, 2022.

A Polar Satellite Launch Vehicle of ISRO on Saturday successfully placed earth observation satellite (Oceansat) into a sun-synchronous orbit, Indian Space Research Organisation said on Saturday.

The 44.4 metre tall rocket lifted off at a prefixed time at 11.56 am from Satish Dhawan Space Centre at this spaceport at the end of a 25.30 hour countdown.

After reaching the intended orbit nearly 17 minutes after PSLV-C54 lifted off, the Earth Observation Satellite or the Oceansat successfully separated from the rocket.

In a tweet, ISRO said, "PASLV-C54/EOS-06 Mission: EOS-06 spacecraft separation is successful. The spacecraft's health is normal. The mission is continuing."

Scientists would perform lowering of the rocket to place the other co-passenger satellites into a different orbit which is expected to take place in a two-hour duration.

In his address at the Mission Control Centre, ISRO Chairman S Somanath said, "I am really happy to announce the successful accomplishment of injecting the EOS-06 (Earth Observation satellite) into the intended orbit very precisely."

"We also observed that the performance of the rocket in this mission in all stages and functions was exceedingly good. And congratulations to the entire team of PSLV for making yet another successful mission in the series of its long journey," he said.

Scientists had actually planned to launch the Earth Observation Satellite at 1,032 seconds after lift-off at 11.56 am.

The rocket successfully placed the satellite at 1,033 seconds at an altitude of about 742 kms, he added."The mission is not completed and we are waiting for the change of orbit of the upper stage along with the remaining eight satellites.

"Mission Director S R Biju said the EOS-6 satellite has been injected into precise orbit "as precisely as possible"..it is because of the excellent team effort put in by all the team members and that is 'Team ISRO'.

Team ISRO always delivers and that is again proven here," he said.

The Earth Observation Satellite-6 is the third-generation satellite in the Oceansat series.

This is to provide continuity services of Oceansat-2 spacecraft with enhanced payload specifications as well as application areas.

The mission objective is to ensure data continuity of ocean color and wind vector data to sustain the operational applications.

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Global Aerospace Industry

Northrop Grumman's C-UAS System of Systems Architecture Excels During Complex Live Fire Tests

23 Nov 2022

Source: Space War | https://www.spacewar.com/reports/Northrop_Grummans_C_UAS_system_of_systems_architecture_excels_during_complex_live_fire_tests_999.html

The U.S. Army's live fire test evaluated the latest C-UAS system of systems performance prior to deploying systems for operational use. FAAD C2's successful completion allows Northrop Grumman to release a new software baseline which includes new C-UAS capabilities.

Northrop Grumman Corporation's (NYSE: NOC) short range Counter Unmanned Aerial Systems (C-UAS) command and control (C2) system successfully completed its most complex system of systems test to date. The Forward Area Air Defense Command and Control (FAAD C2) served as the C2 system for all C-UAS assets used to detect and intercept a variety of weapons during live fire trials during recent tests at the Yuma Proving Ground in Arizona.

"Our combat-proven Counter UAS C2 system is constantly adapting to meet current and future threats," said Christine Harbison, vice president and general manager, combat systems and mission readiness, Northrop Grumman. "As we demonstrated, our open architecture can quickly integrate new capabilities from across the battlefield."

The assessment included several complex tests with live fire scenarios using FAAD C2 integrated with eight sensors and six effectors simultaneously to defend against coordinated rocket, artillery and mortar and unmanned aircraft systems (UAS) attacks. FAAD C2 provided a complex single integrated air picture with multiple threats to provide situational awareness, identifying and evaluating threats, and defeat hostile targets with multiple effector types.

The U.S. Army's live fire test evaluated the latest C-UAS system of systems performance prior to deploying systems for operational use. FAAD C2's successful completion allows Northrop Grumman to release a new software baseline which includes new C-UAS capabilities.

FAAD C2 is deployed in several theaters of operation simultaneously conducting short range air defense, C-UAS and counter-rocket, artillery and mortar missions. Its open, multi-domain, system-of-systems architecture enables easy integration with available and future sensors, effectors and warning systems to launch rapid, real-time defense against short-range and maneuvering threats. FAAD C2 will integrate into the Integrated Battle Command System, the Army's contribution to the U.S. Department of Defense Joint All-Domain Command and Control initiative..

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Switzerland Requests Sale of PAC 3 MSE Missiles from US

16 Nov 2022

Source: Army Technology | https://www.army-technology.com/news/switzerland-requests-sale-of-pac-3-mse-missiles-from-us/

A soldier performs a maintenance check on a PATRIOT missile. Credit: US Army/commons.wikimedia.org.

The US Defense Security Cooperation Agency (DSCA) has notified Congress of a potential sale of PATRIOT Advanced Capability (PAC) 3 Missile Segment Enhanced (MSE) missiles to Switzerland.

The estimated cost of the missiles and associated equipment is valued at $700m. The defence articles are being obtained through the US Foreign Military Sale route.

Lockheed Martin has been appointed as the prime contractor for the proposed sale.

Approved by the US State Department, the proposed sale package includes 72 PAC 3 MSE missiles, PAC-3 MSE missile rounds and empty round trainers, PAC-3 missile skid kits, classified and unclassified PAC-3 concurrent spare parts, and PAC-3 MSE canister consumables.

The Government of Switzerland has also requested to purchase telemetry kits, launcher station heater controls, classified missile repair and return, technical assistance, and other logistics and programme related support.

Lockheed Martin in Dallas, Texas, will act as the prime contractor.

Approximately five US Government and five contractor representatives will be assigned to Switzerland to provide equipment de-processing/ fielding, and technical and logistics support.

According to the US Army, PAC-3 MSE is a high velocity, hit-to-kill, surface-to-air missile that employs kinetic energy to intercept and destroy tactical ballistic missiles, air-breathing threats, and evolving targets.

With this capability, Switzerland will increase the performance of its PATRIOT missile defence system and can better defend territorial integrity and maintain stability regionally.

The PATRIOT system and missiles will also enhance the country's 'interoperability with US and NATO forces'.

In a statement, the DSCA said: "This proposed sale will support the foreign policy and national security objectives of the United States by helping to improve the security of a friendly European nation that continues to be an important force for political stability and economic progress within Europe."

Last year, Lockheed Martin delivered the first PAC-3 MSE missiles to Sweden.

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Elbit Systems secures $72M Contract to Supply Hermes 900 UAS to an International Customer

Meghavi Singh | 14 Nov 2022

Source: Seeking Alpha | https://seekingalpha.com/news/3906813-elbit-systems-secures-72m-contract-to-supply-hermes-900-uas-to-an-international-customer

- Elbit Systems (NASDAQ:ESLT) has secured a contract valued at $72 million to supply Hermes™ 900 Unmanned Aircraft Systems and training capabilities to an international customer.
- The contract will be performed over a two-year period.
- Per the terms, Elbit Systems will supply Hermes 900 UAS equipped with the SkEye™ Wide Area Persistent Surveillance system, SPECTRO™ XR multi-spectral Electro-Optical payload, Satellite Communication, Signal Intelligence (SIGINT) payloads and additional capabilities.

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Elbit Systems secures $200M contract to supply helicopter self-protection suits to a country in Asia-Pacific

Meghavi Singh | 17 Nov 2022

Source: Seeking Alpha | https://seekingalpha.com/news/3909006-elbit-systems-secures-200m-contract-to-supply-helicopter-self-protection-suits-to-a-country-in-asia-pacific

- Elbit Systems (NASDAQ:ESLT) has secured a contract of $200 million to supply Electronic Warfare and airborne laser technologies to protect military helicopters of a country in Asia-Pacific.
- The contract will be executed over a four-year period.
- Per the terms, Elbit Systems will supply self-protection suites comprised of the Infra-Red Passive Airborne Warning Systems (PAWS IR) and the Mini-MUSIC Direct Infra-Red Counter Measure (DIRCM) Systems.
- The protection suites to be supplied will be installed aboard both attack and utility helicopters.

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Final IAF Rafale in Sight, India Squeezes in More Enhancements

12 Nov 2022

Source: Live Fisrt Defence | https://www.livefistdefence.com/exclusive-final-iaf-rafale-in-sight-india-squeezes-in-more-enhancements/

A 36th Rafale fighter jet, the last airframe of an Indian order placed in 2016, will be delivered to the Indian Air Force a month from now, completing what France hopes is only the first order for the jet. The final airframe, actually the first to be built for India, has remained in France ever since deliveries to the IAF began in October 2019. The specimen has been a testbed for a list of India-specific software, electronic warfare and sensor enhancements that needed to be certified alongside proprietary software on the jet.

Livefist can confirm that the India-specific enhancements have in fact grown beyond the list of enhancements originally agreed upon. These mostly pertain to advanced communication systems, at least two additional custom sensor modes and the installation of Indian electronic warfare equipment. The Indian Air Force's request for additional enhancements was accepted since they melded seamlessly into the testing that was already underway and did not present a procedural, cost overrun or time delay. It is understood that the additional enhancements flowed, at least in part, from the IAF's use of Rafale fighters starting mid 2020 in the Ladakh sector amidst a large — and ongoing — military standoff with China.

A senior IAF officer associated with the Rafale program tells Livefist, "The Rafale is fully operational now in Indian service. The last couple of years have presented fresh perspective on the jets and how we use them. There were a handful of tweaks we wanted in the final retrofit of enhancements, which we wanted to effect without delay. The partnership has proven very effective in quickly accepting and including those enhancements. The 'Rafale-I' will therefore be an even more enhanced version of the fighter that we finalised."

The process of updating the existing Rafales has begun, and will continue into 2023.

Dassault and the French Government have pushed hard for the Indian Air Force to quickly double its order of 36 Rafales since 2019 when deliveries began, but a combination of factors has meant the IAF is faced once again with a contest where it must choose (or rather the Government of India must choose) which path to take.

Indian Air Force Rafales were first spotted with SCALP load-outs in October last year, weeks after the weapon system achieved operational status in the fleet.

The two IAF Rafale squadrons — one in north India's Ambala and the other in eastern India's Hasimara — have been in a fully operational state for over a year now. With the India-specific enhancements now tested and validated, they will be retro-fitted across the fleet of 35 jets in service. You can read all about the specifications of the IAF Rafale in this detailed piece here.

While the Rafale in Indian service is a modified version of the F3R standard, the spirally improved F4 standard with India-specific enhancements is on offer to the Indian Air

Force for its multi-role fighter aircraft (MRFA) program, which envisages buying and locally building 114 jets. In that veritable re-play of the troubled and finally aborted medium multirole combat aircraft (MMRCA) program, the Rafale goes up theoretically against the jet it outplayed for the 2016 order — the Eurofighter Typhoon — but more realistically is in a face-off with two American jets, the F-15 Eagle II and the latest modified version of the F-16, recast for the Indian contest as the F-21 Super Viper.

You can read about Boeing's twin fighter pitches in India here, a story first detailed by Livefist, and Lockheed Martin's continued push to create unignorable sourcing and manufacturing capacity in India. Lockheed Martin held its 9th annual Indian suppliers conference in Bengaluru earlier this month. Both U.S. companies have steadily boosted local production of an escalating complexity of systems and subsystems for global defence products, a thrust unlikely to slow down as the MRFA, in a matter of speaking, heats up.

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Indian Aerospace Industry

Bharat Electronics Signs Licensing Agreement with CASDIC, DRDO

18 Nov 2022

Source: Business Standard | https://www.business-standard.com/article/news-cm/bharat-electronics-signs-licensing-agreement-with-casdic-drdo-122111800674_1.html

The Bharat Electronics has signed a Licensing Agreement for Transfer of Technology (LATOT) with Combat Aircraft Systems Development and Integration Centre (CASDIC), DRDO, for transfer of technology of Digital Radar Warning Receiver.

This is a state-of-the-art, airborne Electronic Warfare system which would provide versatile Situational Awareness to a fighter platform in a dense signal scenario, offering excellent sensitivity, good parameter measurement accuracy and high Probability of Intercept against dense signal.

The LATOT will enable BEL to manufacture and supply Digital Radar Warning Receivers to the Indian Armed Forces. Through this, CASDIC will transfer complete details of the technical know-how, testing and maintenance method for quality assurance to BEL with requisite data on the functioning of the product.

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PM Modi Lays Foundation Stone for C-295 Transport Aircraft Manufacturing Facility in Vadodara

Dinakar Peri | 30 Oct 2022

Source: The Hindu | https://www.thehindu.com/news/national/pm-modi-lays-foundation-stone-for-c-295-transport-aircraft-manufacturing-facility-in-vadodara/article66073316.ece

Prime Minister Narendra Modi during the foundation stone-laying ceremony of C-295 transport aircraft manufacturing plant in Vadodara on October 30, 2022. Photo: PIB via PTI

Prime Minister Narendra Modi, on October 30, 2022, laid the foundation stone for the C-295 transport aircraft manufacturing facility at Vadodara to be set up by Tata Advanced Systems Ltd (TASL) and Airbus Defence and Space. The C-295 will replace the Avro aircraft in service with IAF.

The C-295 Transport aircraft manufacturing facility will be set up by Tata Advanced Systems Limited and Airbus Defence and Space.

After laying the foundation stone, Mr. Modi said "Today we have taken a major step towards making India into an aircraft manufacturing hub. Today, India manufactures fighter planes, tanks, and submarines. Besides, Indian medicines and vaccines are saving the lives of millions across the globe. Now India will become a big manufacturer of transport aircraft."

The Prime Minister added that "This is the first time that such a huge investment is taking place in India's defence aerospace sector. Transport aircraft to be built in Vadodara will not only give strength to our armed forces but will also develop a new ecosystem for aircraft manufacturing."

Mr. Modi said, "We have carried out several economic reforms over the years. These reforms have hugely benefitted the manufacturing sector and given it a boost."

The Prime Minister said "Our policy is stable, predictable and futuristic. Through PM Gati Shakti National Master Plan and National Logistics Policy, we are trying to bring changes in the logistic system of the country."

"In the coming years, the defence and aerospace sectors will be two important pillars for making India Aatmanirbhar. We have a goal of exceeding $25 billion in defence manufacturing by 2025. Besides, our defence exports would be more than $5 billion," the Prime Minister said.

The IAF has 56 Avro transport aircraft procured in the 1960s and in urgent need of replacement. The Request For Proposal (RFP) was issued to global firms in May 2013 and the sole bid by Airbus and TASL with the C-295 aircraft was approved by the Defence Acquisition Council (DAC) in May 2015. In September 2021, the Ministry of Defence (MoD) signed a ₹21,935 crore deal with Airbus Defence and Space, Spain for the procurement of 56 C-295MW aircraft. This is the first project of its kind in which a military aircraft will be manufactured in India under technology transfer by the private sector.

The C-295 is an aircraft of 5-10 tonne capacity used for tactical transport of up to 71 passengers or 50 paratroopers, and for logistic operations to locations that are not accessible to current heavier aircraft and has a proven capability of operating from short or unprepared airstrips, said N.

Chandrasekaran, chairman of Tata Sons speaking at the event.

Of the 56 aircraft contracted, 16 will come in fly-away condition between September 2023 and August 2025. The first of 40, Made in India aircraft is expected from September 2026 and completed by 2031 at the rate of eight aircraft per year.

With 285 aircraft ordered and 38 operators in 34 different countries, the C295 has achieved more than 5,00,000 flight hours. India will become the 35th C295 operator worldwide.

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Indian Air Force (IAF) Set to Place Rs 1,400 Cr Order for New Age Missiles to Destroy Enemy Radars

25 Nov 2022

Source: Sentinel Assam | https://www.sentinelassam.com/national-news/indian-air-force-iaf-set-to-place-rs-1400-cr-order-for-new-age-missiles-to-destroy-enemy-radars-625032

NEW DELHI: In a major push to induct indigenously developed weapon systems, the Indian Air Force has moved a proposal worth over Rs 1,400 crore to the government for acquiring Rudram next-generation anti-radiation missiles (NGARM) to search and destroy enemy radar locations, informed defence officials. "

A proposal for acquisition of advanced missiles developed by the Defence Research and Development Organisation is with the Defence Ministry and a high-level meeting would soon be taking a call on it," defence officials told ANI. The next-generation anti-radiation missiles have already been tested by the Indian Air Force from its Sukhoi-30 fighter aircraft fleet and can destroy enemy radar locations during conflicts, they said.

The NGARM can be fired from IAF fighters like the Sukhoi-30 and the Mirage-2000. It is accurate and has been developed with the capability to even track a radar system even if it is not operating.

NGARM is India's first indigenously developed anti-radiation missile that has a speed of Mach two or twice the speed of sound.

The tactical, air-to-surface anti-radiation missile is equipped with a passive homing head that tracks sources of radiation of a wide range of frequencies. It can lock into a target not only before launch but also after it has been launched. (ANI).

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Technology Development

China to Use Space Station to Test Space-Based Solar Power

Andrew Jones | 23 Nov 2022

Source: Space War | https://spacenews.com/china-to-use-space-station-to-test-space-based-solar-power/

A pair of Shenzhou 14 astronauts outside Tiangong during the mission's third EVA on Nov. 16, 2022. Credit: CMSA

HELSINKI — China intends to use its newly-completed Tiangong space station to test key technologies required for space-based seeolar power, according to a senior space official.

Robotic arms already operating on the outside of Tiangong will be used to test on-orbit assembly of modules for a space-based solar power test system, Yang Hong, chief designer of the Tiangong space station said in a presentation at the ongoing China Space Conference.

The test system will then orbit independently and deploy its solar arrays and other systems. It is likely to test and verify capabilities such as power generation, conversion and transmission.

The test will be designed to "promote breakthroughs in individual technologies, accumulate on-orbit experimental data, and make contributions to the realization of carbon peak and carbon neutrality," Yang told CCTV.

In 2020 China announced targets of peak carbon emissions by 2030, and carbon neutrality in 2060.

Yang noted that SBSP is one pathway to new, green energy, but that such a project still faces many technical challenges. Work is underway however.

The China Academy of Space Technology (CAST), the country's main, state-owned spacecraft maker which made the modules for Tiangong, earlier stated that it plans to conduct a "Space high voltage transfer and wireless power transmission experiment" in low Earth orbit in 2028.

This first phase test is to be followed by a second phase experiment conducted in geostationary orbit, requiring accurate energy transmission over a distance of 35,800 kilometers to Earth, according to earlier presentations.

Phases 3 and 4, in 2035 and 2050 respectively will aim for energy generation of 10 MW and 2 gigawatts, requiring leaps in capabilities in power transmission, orbital assembly capabilities, beam steering accuracy and transmission architecture.

Long Lehao, chief designer of China's Long March rocket series and a SBSP advocate, said in June 2021 that the potential project would use the in-development Long March 9 super heavy-lift rocket to send the requisite infrastructure into geostationary orbit.

China recently apparently scrapped plans for an early, expendable Long March 9 concept, instead looking to transition to a reusable version.

China's Xidian University in June completed a 75-meter-high steel structure facility which it calls the world's first full-link and full-system ground test system for SBSP.

In another possibly related development,

research into construction of kilometer-scale objects in orbit received funding last year. Such work could help to address the major challenge of assembling the giant arrays needed for solar power collection and transmission arrays.

Space-based solar power faces major challenges including economic feasibility and manufacturing costs, cheap and reliable launch services, and efficient and safe energy transmission.

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Commentary

1. India's fifth-generation combat aircraft programme has to succeed if it wants be part of the big league - https://www.firstpost.com/opinion-news-expert-views-news-analysis-firstpost-viewpoint/indias-fifth-generation-combat-aircraft-programme-has-to-succeed-if-it-wants-be-part-of-the-big-league-11206121.html
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2. Private sector can boost ISRO's space growth story - https://www.moneycontrol.com/news/opinion/private-sector-can-boost-isros-space-growth-story-9583481.html
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4. Boeing's Starliner charges approach $900 million - https://spacenews.com/boeings-starliner-charges-approach-900-million/

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

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