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"Air Defence and offensive air missions are interdependent and if executed in isolation, these would not only be disjointed but also ineffective in design or execution of the joint strategy,"

- Air Chief Marshal Vivek Ram Chaudhari PVSM AVSM VM ADC

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Opinions and Analysis

How Prepared is the IAF for a War with China?

Air Marshal Anil Chopra (Redt)
Director General, Centre for Air Power Studies | 23 Oct 2022

Source: IMR | http://www.indiandefencereview.com/news/how-prepared-is-the-iaf-for-a-war-with-china/

Both the Indian Air Force (IAF) and the People's Liberation Army Air Force (PLAAF) have come along way since their early beginnings in the 1950s. The IAF had British and French aircraft in the1950s, but soon both China and India began setting up facilities for manufacturing military aircraftwith the help of the Soviet Union. During the rapprochement years, China also managed to getsome important technologies from the United States (US). Once China's economy began boomingin the 1980s, she could invest much larger sums in Research and Development. India too inductedseveral top-end Russian and Western platforms in the last two decades. China's rising economyand global ambitions in recent years meant high defence budgets that gave a much bigger flip to airand sea power. "The air force is a strategic military service that has a vital position and plays a vitalrole in the overall situation of national security and military strategy," said Xi Jinping in April 2014.Notwithstanding the continuous flood of information that the Chinese State controlled media isreleasing about the new aerial platforms and technologies that are being developed by them, theIAF is fairly well placed against the PLAAF. One needs to remember that China is nearly 2.5 timesthe size if India. The major threat to China's security as well as her strategic and tactical interestslies in the South China Sea (SCS) and the Western Pacific. China has to contend with a much morepowerful US as also several free world countries that are grouping to take her on.

Emerging PLAAF

With the support of the indigenous industry which is producing all genres of aerial platforms, thePLAAF is fast acquiring top-end systems and weapons of global class and reach. There is muchgreater emphasis on modern technologies, including stealth, hypersonic, Artificial Intelligence (AI),cyber, electronic warfare and long range missiles. The PLAAF has also re-oriented its flying trainingand tactics, and there is much greater emphasis on realistic exercises. The PLAAF has made majorchanges in its operational doctrine based on global reach requirements. Air defence of criticalassets, long-range offensive precision strikes, integrated battlefield support missions, IntelligenceSurveillance and Reconnaissance (ISR), information operations and strategic air-transport reachare on priority. Integration of air and space will support both offensive and defensive operations. ThePLAAF is preparing for hybrid network-centric war and is trying to increase exposure to airexercises to compensate for low actual war exposure. The PLAAF is closing the gap with Westernair forces across a broad spectrum of capabilities, such as aircraft performance, command andcontrol and electronic warfare.

Air Assets of the PLAAF

The PLAAF is the largest air force in the region and the third largest in the world, with nearly 1,700combat aircraft of which, nearly 800 are fourth-generation plus. Nearly 50 fifth-generation J-20stealth fighters have been inducted. Development of the J-31, the second stealth combat aircraft isbeing hastened. The PLAAF operates nearly 750 J-7 variants, 100 J-8s, 465 J-10s, 225 J-11 airsuperiority fighter variants, 52 Russian Su-27s, 73 Russian Su-30 MKK multi-role combat aircraft,24 Russian Su-35S and 176 H-6 jet bomber variants. The extended-range H-6K variant can carry six air-launched Cruise missiles. The PLAAF also has 20 IL-76 jet transport aircraft and around 90smaller propeller transport aircraft apart from three IL-78 MD/TD Russian jet aerial tankers and eightTu-154M Jet patrol/ELINT aircraft. The AEW&C aircraft include four propeller KJ-200 and five KJ-500 and four KJ-2000 jets.

The PLAAF has a variety of indigenous and Russian helicopters of Z-8/9/10 and Mi-17 class. Meanwhile, newer Z-18 and Z-20 are under induction. The PLA has a much larger rotary wing force.The PLAAF has approximately 59 fighter/ground attack brigades with operational theatrecommands. Each Brigade reportedly has 24 aircraft. Each bomber regiment has 18 aircraft. ThePLAAF also has a large number of indigenous Unmanned Aerial Vehicles (UAV) of globalstandards. Many of these are now Unmanned Combat Aerial Vehicles (UCAV) as these carryarmaments.

The PLAAF is developing new long-range stealth bomber, the H-20, to strike regional and globaltargets. It will probably reach initial operational capability no sooner than 2025. China has inductedaround 20 Y-20 large transport aircraft that can lift up to 66 tonne. The new variants are planned tosupport airborne command and control, logistics, para-drop, aerial refuelling and strategicreconnaissance operations. The PLA Navy (PLAN) has two operational aircraft carriers and nearly600 aircraft. Two more carriers are under construction and two that are larger, are on the drawingboard. China, thus, has significant air power.

Chinese Aerial Weapons

China is developing a large number of aerial precision munitions. These include, IR/TV guided Air-to-Surface Missiles (ASM) and Anti-Radiation Missiles (ARM), laser and satellite guided bombs. TheBeyond Visual Range (BVR) Air-to-Air missiles (AAM) include the latest PL-12 and PL-21. The PL-15, very long range AAM is equipped with an Active Electronically Scanned Array (AESA) radar.China has around 500 DH-10 land attack cruise missiles with a 1,500-km range and part of these isair-launched. The PLAAF has several advanced long-range SAM systems that include Russian S-300, S-400 and domestically produced HQ-9.

PLAAF Facing Indian Border

The PLAAF's air assets deployed across the Indian border in the Himalayas include one fighterbrigade each of J-11AB, J-7, J-7E, and J-16 aircraft. There is a transport regiment each of Y-8/Y-9and Y-7 aircraft. There is a regiment of helicopters and one SAM brigade at Lhasa. Deeper atUrumqi Base, there is a fighter brigade each of J-8H, J-11A/B and JH-7A. Su-30s, J-10s and J-20have been operating detachments in the area. Fighters carry out regular exercises in the sector.The airfields are being upgraded with hardened shelters and ability to host more assets.

Nearlyeleven airfields in Tibet and Xinjiang can be used for operations against India.

PLAAF Operational Training and Exercises

The PLAAF believes in long range offensive precision-strikes using enablers such as FlightRefuelling Aircraft (FRA) and AWACS. There will be coordination with People's Liberation ArmyRocket Force (PLARF). The PLAAF has multi-layered air defence systems. China's extensiveconstellation of surveillance satellites with short revisit cycles greatly support surveillance andtargeting. The PLAAF gives greater importance to information, electronic and cyber warfare. ThePLAAF also coordinates closely with PLA Strategic Support Force (PLASSF). The PLAAF's regular exercises include large force engagements with the PLA and the PLA Navy. Their exercises in Tibethave increased. The PLAAF has annual Shaheen series exercises with Pakistan Air Force (PAF). With 60 percent of PAF being of Chinese origin, these exercises improve interoperability that will beuseful for coordinated fighting against India.

Current Capabilities of the IAF

The IAF currently has around 32 fighter squadrons against an authorised strength of 42 squadrons.These include two of Rafale, 12 Su 30MKI, four MiG 21 Bison, three each of MiG 29 and Mirage2000, six of Jaguar and two of the LCA. The Rafale aircraft is clearly superior to China's J-10, J-11and Su-27 fighter jets. Armed with long-range Meteor and MICA Beyond Visual Range (BVR) air-to-air missiles, the Rafale fighters are expected to pose a significant threat to Chinese aerial assets.The SCALP cruise missile and Hammer glide bombs have very high accuracy. Rafale also has thebest Electronic Warfare suite in the region. The Sukhoi Su-30MKI is the IAF's primary air superiorityfighter with capability to perform long range air-to-ground strike missions. The Mirage 2000 and theMiG 29 fleet of the IAF have all been upgraded. With 12 C-17 and C-130 each, 17 IL-76 and over100 upgraded An-32 transport aircraft, the IAF has significant global reach and capability to airlifttroops and cargo. Similarly, having inducted 15 Boeing Chinook heavy-lift and 22 Apache AH-64Eattack helicopters, and with already a significant fleet of 240 Mi-17 series medium-lift helicoptersand nearly 100 ALH variants and smaller Chetak/ Cheetah fleets, the IAF is in a good position forrotary wing assets. The IAF has only three large AWACS aircraft and three indigenous DRDOdeveloped AEW&C aircraft. Similarly, the IAF has only six IL-78 Flight Refuelling Aircraft (FRA).Both these fleet need augmentation for a continental size country such as India which has also tocover the Indian Ocean Region (IOR).

India has a good chain of integrated radars to support network centric offensive and defensiveoperations. The IAF's legacy surface-to-air missile systems such as the SAM-3 Pechora and SAM 8OSA-AK are being upgraded. With the induction of a large number of indigenous Akash AD systemsand the five Russian S-400 systems under induction, the AD coverage will be significant. To coverthe large Chinese border, more systems are being inducted. With induction of the MICA, Meteor,Astra, SCALP, BrahMos and Hammer, among others, the IAF has a significant aerial weaponsinventory. The future is unmanned. Artificial Intelligence supported autonomous systems will flyindependently or in conjunction with each other in a swarm or with manned aircraft as a team. TheIAF has Israeli Heron and Searcher Unmanned Aerial Vehicles (UAV) and Harpy and HaropUnmanned Combat

Aerial Vehicles (UCAV). Orders for American Predator MQ-9 Reaper drones areexpected. India needs to develop and acquire many more.

Strategic Reach of the IAF

The IAF is looking at acquiring the reach from the Persian Gulf to the Straits of Malacca and theisland territories up to Mauritius in the Indian Ocean, using long range aircraft supported by FRAand AWACS. More of these are being acquired. More airfields are becoming operational in theSouthern peninsula and in Andaman and Nicobar Islands. This along with in-flight refueling will addto the reach. The Lakshadweep islands are also being developed strategically. The IAF is carryingout regular exercises to increase interoperability with the major air forces of the world.

Operational Capabilities of the IAF across the Himalayas

The IAF is very well placed with nearly 25 airfields close to the Northern borders of the country thatare capable of launching operations against China that effectively has four airfields close to EasternLadakh and around seven in Tibet. China is trying to upgrade infrastructure but has thedisadvantage of very high altitude. The IAF will be able to launch much larger number of missions.For long, India's infrastructure and military assets were Pakistan-border centric. This is fastchanging, for both infrastructure build-up and assets positioning towards China. While border roadsand connectivity are being improved, the IAF has upgraded its Advanced Landing Grounds (ALG)near the border with China. All IAF airfields are getting hardened aircraft and equipment shelters.The IAF now has significant number of Su-30 MKI squadrons facing China. Also, the newacquisitions such as the Rafale, C-130 J, Chinook and Apache helicopters have also been locatedin the Eastern sector. The same is also applicable to air defence systems and weapons positioning.

Air Action Across the Himalayas

Air campaigns can be executed simultaneously against different spread out target systems. China'swar plans are to launch an initial barrage of surface attack missiles to knock of critical Indianinfrastructure including airfields. India would have to defend against such an attack with air defenceweapons. India would then have to achieve local sectoral air superiority. It must be rememberedthat the effect of neutralising just two Chinese airfields in each sector would have much moresevere implications for them than if the same were to happen for India. India should thusconcentrate on neutralising PLAAF airfields using surface and air-launched missiles and buildinventories accordingly.

Interdiction will pay high dividends in the mountains. Destroying a few bridges could throttle logisticschains and supplies. Creating weapons-triggered landslides could block roads. Attacks againstconvoys on the very few roads available would create bottle-necks. Air can provide both kinetic andnon-kinetic options with pin-point accuracy. It will influence outcomes and actions of the surfaceforces. It can simultaneously produce physical as well as psychological effects. Both, the fighteraircraft and attack helicopters will be employed for this. UCAVs would be used for interdiction,battlefield strikes and anti-tank and anti-personal operations. The transport and helicopter fleet ofthe IAF would also provide the capability to airlift of troops and military hardware inter and intrasector. Inter-valley transfers maybe required in changing battle situations. The IAF

has significantreach and capability on this count.

The radar cover has terrain related constraints in the mountains. However, there are also vantagepoints for their positioning. Yet, much greater dependence would have to be on AWACS. Numberswill have to go up. China has recently been experimenting with aerostat balloons for radar cover inthe region. India has been using aerostats for many years and needs to re-assess its employment inLadakh. Meanwhile, the IAF will use satellites and UAVs for ISR. Drones will also be a great assetfor surveillance. India needs to invest more in autonomous aerial systems. Artificial Intelligencesupported autonomous systems will fly independently or in conjunction with each other in a swarmor with manned aircraft as a team.

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 employselectronic warfare and cyber means and tools will have advantage. Securing own networks anddenying the same to adversary will be important. Air and space platforms will greatly support cyberand electronic warfare operations much deeper into the enemy territory.

The Two Front Threat

India has serious boundary issues with both China and Pakistan and has fought wars with them.Today, China and Pakistan have a deep strategic friendship. Nearly 60 percent of the PAF is madeup of Chinese aircraft. The JF-17 'Thunder' is the starship joint programme and the PAF already has130 of these. Eventually, it could have nearly 300. China has recently transferred 25 J-10CE aircraftto the PAF. The PAF does jet training on Chinese design K-8 trainers; their AEW&C and FRA are ofChinese origin. They have commonality in armaments. The PLAAF and the PAF regularly carry outflying training exercises called the Shaheen series. Their interoperability levels are high. Both haveterritorial interests in Jammu and Kashmir, and Ladakh. In case of Sino-Indian conflict, Pakistancould allow the use of its airbases by the PLAAF. It could also open another front. The Indianmilitary will have to factor in this aspect in their operational plans. The IAF will surely require largernumbers of combat aircraft for this scenario.

Rebuilding IAF Numbers

The IAF is likely to have around 38 fighter squadrons by 2030 and the target is to get to 42squadrons by 2038. The end state could be 14 squadrons of Su-30 MKI, two each of Mirage 2000and MiG 29, 12 squadrons of LCA variants, two of Rafale, six of the new fighters to be acquired andfour of Advanced Medium Combat Aircraft (AMCA). Effectively, the IAF may have to stretch the lifeof the Mirage and MiG 29 fleets. These figures are achievable as long as timely decisions are takenand there are no serious development delays in AMCA. The IAF must also target to have eight largeand ten smaller AWACS, at least 12 FRA aircraft by 2030. The IAF requires additional UCAVsincluding the indigenously developed DRDO's TAPAS BH-201 and "Ghatak". To reequip the tendeficient fighter squadrons and nearly 12 more to retire by 2035 will require significant funding.Capital budget would have to increase.

The Way Ahead for the IAF

While the IAF has been modernising steadily, more needs to be done. The IAF must get back to theauthorised force levels of 42 squadrons. Some often suggest that since Rafale and Su-30

MKI canachieve much greater effect than the older MiG 21s, why should the IAF continue to seek 42squadrons? The argument is flawed. India's adversaries are already moving forward to acquire fifth-generation fighters. They are not cutting down numbers. The type of aircraft and weapon platformsmust be comparable to the adversary. The IAF also urgently needs additional AEW&C and FRA.The IAF needs to invest more in combat UAVs. India has also to defend itself against a possiblesizeable Chinese Surface-to-Surface Missile (SSM) attack. The IAF will need more Air DefenceSAM systems of the S-400 and there is a need to accelerate inductions of larger numbers ofindigenous Air Defence systems. It is important to have a larger stock of ammunition and missiles.SSMs and cruise missiles are going to be important. India has a good missile programme. ThePrithvi, Agni, BrahMos, Akash and Astra missiles are a success and the development of newervariants must be hastened.

India needs to invest more in game-changer technologies. These include cyber and electronicwarfare, artificial intelligence, unmanned systems, hypersonic, among others. Hypersonic flight andweapons 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 (DEWs). Lasers that can burn incoming missileelectronics or dazzle electro-optical sensors need to be inducted. For India to have significant airpower, it must also master aircraft engine and AESA radar technologies. Joint venture route is thebest to imbibe high-end technologies. We need very long range weapons, including aerial missileswith around 400 kilometers range. Similarly, air-launched cruise missiles with a range of around1,500 kilometres need to be inducted.

There is a backlog of modernisation. The obsolescence sets in much faster for aerial systems. Tostem the increasing gap with China, India perhaps needs to increase its defence allocations fromcurrent 2.15 percent of GDP to around 2.5 percent. The IAF is well-trained and operationally wellexposed and has the clear advantage in terms of the number of missions it can launch across theHimalayas. The IAF can well match the PLAAF, but once the numbers increase, the IAF will bemuch better placed. The time to act is now.

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Air Power

Russian Aircraft Fired Missile Near British Plane Over Black Sea: UK Minister

20 Oct 2022

Source: Livemint | https://www.livemint.com/news/world/russian-aircraft-fired-missile-near-british-plane-over-black-sea-uk-minister-11666264452510.html

Russia said it was a technical malfunction and Wallace said Britain has now resumed patrols (AFP)

A Russian aircraft released a missile near a British aircraft patrolling in international airspace over the Black Sea on 29 September, defence minister Ben Wallace said on Thursday.

Wallace informed parliament that Britain had suspended patrols following the incident and expressed their concerns to Russia's Defence Minister Sergei Shoigu.

“In light of this potentially dangerous engagement, I have communicated my concerns to Russian counterpart," Wallace said.

However, Russia said that it was a technical malfunction and Wallace said Britain has now resumed patrols.

Russia has acknowledged that the incident took place in international airspace

Meanwhile, British Foreign Secretary James Cleverly will make an announcement later today about taking action using Britain's autonomous sanctions regime concerning Iranian drones.

Russia has launched dozens of "kamikaze" drones on Ukraine on hitting energy infrastructure and killing five people in the capital of Kyiv. Ukraine says they are Iranian-made Shahed-136 attack drones.

Tehran denies supplying the drones to Moscow and the Kremlin on Tuesday denied its forces had used Iranian drones to attack Ukraine. Washington says Iran's denial is a lie.

Britain has condemned what it said was Iran’s decision to supply drones and training to Russia.

"Iran supplying drones is inconsistent with UN Security Council resolution 2231 and is further evidence of the role Iran plays in undermining global security," a foreign office spokesperson said.

There were no further details on how the announcement would be made, or what measures would be taken.

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Ukraine has Shot Down a Quarter of Russia's Best Attack Helicopters

David Axe | 26 oct 2022

Source: Forbes | https://www.forbes.com/sites/davidaxe/2022/10/26/ukraine-has-shot-down-a-quarter-of-russias-best-attack-helicopters/?sh=2397c64f1879

A Ukrainian missile crew fires on a Russian Ka-52. VIA SOCIAL MEDIA

The Russian air force is losing attack helicopters at a rate that should alarm Russian commanders and crews. And it's obvious why.

To use their precision-guided missiles, Russian Kamov Ka-52 gunships must climb and hover, making them visible and vulnerable to Ukrainian missileers from miles away. "Russian attack helicopters have likely suffered particular attrition from Ukrainian man-portable air-defense systems," the U.K. Defense Ministry explained.

The Russian air force began the wider war in Ukraine back in February with around a hundred of the twin-rotor, two-crew Ka-52s. The service has written off at least 23 of the Kamov 'copters that outside analysts can confirm, including at least two—and potentially many more—this month.

The most recent confirmed loss occurred on or around Monday. A video that circulated online depicts a Ukrainian team firing a shoulder-fired, heat-seeking missile at a Ka-52 and reportedly destroying it. With that kill, the Kremlin's Ka-52 inventory is down by a quarter.

To be fair, the Russian air force operates hundreds of other gunships, including classic Mil Mi-24s and newer Mil Mi-28s.

But aside from a few of the latest Mi-28s, the Ka-52s are the only Russian attack helicopters that are compatible with the air force's best anti-tank guided missile, the 90-pound Vikhr. And the Vikhr, for its part, is one of the few reliable precision weapons in the air force's inventory.

So Russian commanders have sent the Ka-52s into combat specifically to fire Vikhrs at Ukrainian tanks and fighting vehicles. But effectively employing the missile is an unhappy experience for a Ka-52 crew.

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How Many Iranian Drones does Russia have left in Its Arsenal Against Ukraine?

Michael Starr \ 16 Oct 2022

Source: Jpost.com | https://www.jpost.com/international/article-719786

A drone is launched during a military exercise in an undisclosed location in Iran, in this handout image obtained on August 25, 2022 (photo credit: VIA REUTERS)

Russia has approximately 300 Iranian drones left in its arsenal but plans to buy thousands more, the Ukrainian Defense Ministry said on Friday evening, even as on Sunday morning Iranian officials continued to deny the sale of any

weapons to Moscow for use in the invasion of Ukraine.

"They [Russia] plan to buy several thousand more," Ukrainian Defense Minister Oleksii Reznikov said according to his ministry. "We know how to shoot them down. We are doing so and studying them."

Iran Denial of Drone Sales

Iran's Foreign Minister, Hossein Amir Abdullahian, spoke to his Portuguese counterpart over the weekend denying claims by Ukrainian, American and British intelligence officials that the Islamic Republic was supplying suicide drones to Russia. Iran has been denying sales of kamikaze drones to Russia since they came into use in August, the UK Defense Ministry has previously noted.

"Approximately 300 Iranian drones remains in the Russian arsenal. They plan to buy several thousand more."

Abdullahian said that Iran did not provide any weapons to either side of the conflict.

"We believe that arming either side will prolong the war, and we do not think that war is the right way; not in Ukraine, not in Yemen, not in Syria, not in Afghanistan," Abdullahian said according to Maariv.

Iran has long been alleged by several states to be arming militant factions in Syria and Yemen.

Ukraine has alleged that Iran is providing more than just the weapon platforms, but has even had Iranian instructors within the Kherson and Crimea areas to launch the kamikaze drones themselves.

"They teach the Russians how to use kamikaze drones, and directly monitor the launch of drones on Ukrainian civilian targets, including strikes on Mykolaiv and Odesa," said the Ukrainian National Resistance Center. "As we can see, Iran helps the aggressor not only with equipment but also with people."

Ukraine Pushes back against Iran

The use of Iranian drones by Russia has become a large talking point in Ukrainian rhetoric to international audiences.

On Saturday the Ukrainian Defense Ministry shared a profile on a pilot, calling him a "Shahed killer" who had shot down five Iranian drones — Referencing one of the most prominent Iranian drones being used by Russia, the Shahed-136.

Ukrainian President Volodymyr Zelensky has directly addressed Iran's denials in speeches, saying that "people see them [Iranian drones] in the sky. We shoot them down. But we are told that there are allegedly no Iranian drones in Ukraine. Well, we'll find ways to ensure that there aren't any left, indeed."

Ukraine Versus Iranian Drones

The alleged impending purchase of thousands of Iranian drones by Russia comes amid reports that Russia is becoming reliant on Iran to fill the gap in its need for loitering munitions and reconnaissance drones. Maariv reported that a Thursday EU report indicated that the Kremlin had a dependence on Iranian drones that indicated the difficulty of Russia's military position. The EU report comes after Russian state media reported that the Russian defense industry was unable to meet the military's tactical and technical requirements for unmanned aerial vehicles (UAV).

However, the UK Defense Ministry has

assessed that the drones have had limited impact as a weapon, having too short of a range and not a large enough payload.

Dozens of Iranian kamikaze drones have been used as part of recent Russian bombardments of Ukrainian infrastructure. In one volley on Monday, 86 drones were launched, the Ukrainian military said, and it claimed to have downed 60% of them.

If true, one factor that may be helping Ukrainian air defenses is intelligence sharing with Israel. On Wednesday, a New York Times report cited a senior Israeli official who reportedly told the Times that Israel has been providing Ukraine with "basic intelligence" on the Iranian drones used by Russia.

Ukraine has reportedly shot down over 1200 drones since the war began in February, according to its defense ministry's figures. Open-source intelligence estimates put the figures lower.

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Eye on China and Pakistan, Army set to Buy Armed-Drone Swarms

Rajat Pandit | 29 Sept 2022

Source: Times of India| https://timesofindia.indiatimes.com/india/eye-on-china-and-pakistan-army-set-to-buy-armed-drone-swarms/articleshow/94522387.cms

(Picture for representation)

NEW DELHI: The Army is slowly but steadily stepping-up the induction of explosive-armed drones. As it gears up to soon induct the first batch of 'loitering munitions' or kamikaze drones, the force on Wednesday also kicked off the acquisition process for 12 sets of armed drone swarms.

Seven of these 12 autonomous surveillance and armed drone swarms (A-SADS), each with 50-75 artificial intelligenceenabled aerial vehicles capable of communicating with control stations as well as among themselves, are meant for high-altitude areas.

"They will boost the Army's `shock and awe' capabilities along the northern borders with China. Explosive-armed drone swarms have proved their sheer utility and lethality in recent conflicts ranging from Armenia-Azerbaijan to Russia- Ukraine," a senior official said.

The other five drone swarms are for defensive and offensive operations in desert areas and plains along the borders with Pakistan "All the 12 sets of swarm drones will be acquiredthrough the Buy-

Indian IDDM (indigenously designed,developed and manufactured) category at an estimated costof Rs 700 crore," he added.

The request for information (RFI) issued for the A-SADS onWednesday specified they will be procured under the Buy-Indian IDDM (indigenously designed, developed andmanufactured) category, and should have an indigenouscontent of at least 50%.

The RFI said the drone swarms for deserts should have anoperating range of at least 50-km one-way, with anendurance of minimum three hours. The high-altitude ones,in turn, should have a 30-km range and two-hourendurance, with the capability to even operate in minus 20degree Celsius.

The A-SADS will carry explosive payloads for anti-personnelas well as "shaped charge top-attack ammunition" for useagainst enemy tanks and armoured columns.

"The drone swarms, which should be capable of verticaltake-off and landing from unprepared areas, should be ableto carry out Kamikaze kinetic attacks on targets like tanks,helipads, air defence equipment, radars, fuel dumps andcommand-and-control centres," another officer said.

The use of drone swarms, robotics, lasers, loitering munitionsand LAWS (lethal autonomous weapon systems) arerelatively new domains of war-fighting for the Indian armedforces.

"China is far ahead in these fields. But a beginning has to bemade. A group of drones operating in conjunction withground manoeuvre forces can provide aerial capability toenhance combat effectiveness," he added.

AI-based swarming algorithms enable the drones toautomatically distribute the tasks among themselves,navigate to the area of interest, ensure collision avoidanceduring movement to the target area, and carry out search ofthe area.

"AI-based automatic target recognition (ATR) featureenables the drones to recognise targets like tanks, artilleryguns, vehicles and soldiers and display it on control stationscreens. This minimizes chances of the operator missing anytarget as well as facilitates use of some other weapon todestroy the targets," he said.

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High-Energy Laser Weapon Tested on a German Navy Frigate

Tamir Eshel | 27 Oct 2022

Source: Defence Update | https://defense-update.com/20221027_high-energy-laser-weapon-tested-on-a-german-navy-frigate.html

The German frigate 'Sachsen' has successfully engaged drones at a short and very short range, using the High Power Laser (HEL) weapon demonstrator, seen in this picture on the vessel's port side.

The German Armed Forces have recently fired a shipboard laser weapon against aerial targets. At the test the German frigate Sachsen successfully engaged drones at a short and very short range. The test took place in the Baltic Sea near Putlos Major Training Area on August 30th, 2022. The high energy laser (HEL) weapon demonstrator paves the way for future naval weapon systems defending ships against drones and drone swarms as well as engaging attacking speed boat swarms at close and very close range. The technology is scalable to deliver higher output power, enabling

it to destroy guided missiles and mortar rounds.

Testing of the high-energy laser weapon will continue until mid-2023. In subsequent test campaigns, new scenarios will challenge the demonstrator's capabilities. The results will determine what still needs to be done on the path to a fully functional, operational laser weapon.

The laser weapon demonstrator was developed by the German 'High-Energy Laser Naval Demonstrator working committee' ("ARGE"), consisting of MBDA Deutschland GmbH and Rheinmetall Waffe Munition GmbH. The work was evenly divided between the two companies. MBDA Deutschland provided the target detection and tracking systems and the operator console and linked the laser weapon demonstrator to the command-and-control system. Rheinmetall was responsible for the high-energy laser source and peripheral systems – turret slewing and beam guidance delivered the demonstrator container and provided the mechanical and electrical integration of the demonstrator onto the deck of the Sachsen.

The integration and test phase started in November 2021 and concluded successfully with a factory acceptance test at Rheinmetall's Unterlüß proving ground. The demonstrator was then installed onboard the frigate Sachsen in Kiel. In July 2022 the first test campaign took place in Eckernförde Bay near the Bundeswehr's Technical Centre for Ships and Naval Weapons, Marine Technology and Research, WTD 71, in Surendorf. These trials verified the system's sensors capabilities including the electro-optical sensor suite from the ARGE and the radar. In addition, the interplay between all the components and procedures in the entire operational sequence from target acquisition to engagement was put to the test. This final phase provided the opportunity to test the entire system, including the HEL, in multiple highly realistic engagement scenarios.

As part of a test campaign in October 2022, proof has now been provided that dynamic targets can be successfully combated under realistic conditions.

"Due to its capabilities, a future system is particularly suitable for combating small and agile targets, such as drones or speedboats, at close and very close range. Defense against mortar shells and guided missiles is also conceivable," says the responsible project manager at BAAINBw. "These tests lay the foundation for the possible development of an operational laser weapon system for the German Navy."

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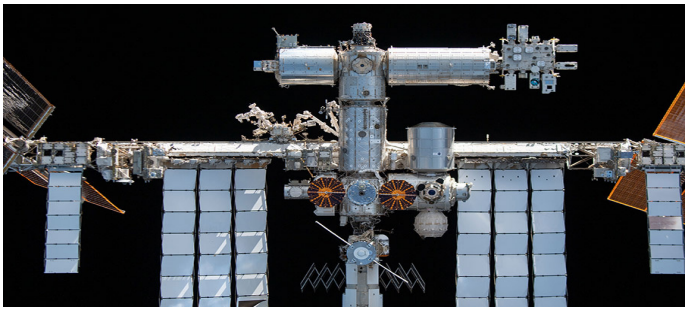
Space

Space Station Maneuvers to Avoid Orbital Debris

Mark Garcia | 24 Oct 2022

Source: NASA | https://blogs.nasa.gov/spacestation/2022/10/24/space-station-maneuvers-to-avoid-orbital-debris/



The International Space Station is pictured from the SpaceX Crew Dragon Endeavour during a fly around of the orbiting lab that took place on Nov. 8, 2021.

This evening, the International Space Station's Progress 81 thrusters fired for 5 minutes, 5 seconds in a Pre-Determined Debris Avoidance Maneuver (PDAM) to provide the complex an extra measure of distance away from the predicted track of a fragment of Russian Cosmos 1408 debris.

The thruster firing occurred at 8:25 p.m. EDT and the maneuver had no impact on station operations. Without the maneuver, it was predicted that the fragment could have passed within about three miles from the station.

The PDAM increased the station's altitude by 2/10 of a mile at apogee and 8/10 of a mile at perigee and left the station in an orbit of 264.3 x 255.4 statute miles.

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ISRO's Heaviest Rocket Successfully Places 36 Satellites in Orbit

Sangeetha Kandavel | 23 Oct 2022

Source: The Hindu | https://www.thehindu.com/sci-tech/science/isros-dedicated-commercial-satellite-mission-lvm3-m2oneweb-india-1-lifts-off/article66046363.ece

The LVM3-M2, ISRO's heaviest rocket, lifts off from the Satish Dhawan Space Centre at Sriharikota in Andhra Pradesh early on October 23, 2022. | Photo Credit: B. Jothi Ramalingam

The Indian Space Research Organisation's (ISRO) heaviest rocket Launch Vehicle Mark 3 (LVM3 or GSLV Mark 3) which took off from the second launch pad (SLP) of the Satish Dhawan Space Centre SHAR, Sriharikota at 12.07 a.m. (IST) has successfully orbited 36 satellites of U.K.-based OneWeb.

This is OneWeb's 14th launch, bringing the constellation to 462 satellites. This launch represents more than 70% of its planned 648 Low Earth Orbit (LEO) satellite fleet that will deliver high-speed, low-latency connectivity worldwide.

The 43.5 metre LVM3 weighing around 644 tonne carried 36 satellites weighing 5,796 kg or about 5.7 tonne. With this launch, LVM3 has made its entry into the global commercial launch service market.

LVM3-M2 is the dedicated commercial satellite mission of NewSpace India Limited (NSIL), a Central Public Sector Enterprise (CPSE) under the Department of Space, Government of

India. This mission is being undertaken as part of the commercial arrangement between NSIL and m/s Network Access Associates Limited (m/s OneWeb Ltd), a U.K. based company. OneWeb is a joint venture between India's Bharti Enterprises and the U.K. government.

With only four more launches to go, OneWeb remains on track to activate global coverage in 2023, while its connectivity solutions are already live in regions north of 50-degrees latitude.This partnership with NSIL and ISRO demonstrates OneWeb's commitment to provide connectivity across the length and breadth of India by 2023. From Ladakh to Kanyakumari and Gujarat to Arunachal Pradesh, OneWeb will bring secured solutions not only to enterprises but also to towns, villages, municipalities and schools, including the hardest-to-reach areas across the country.

Addressing the media an hour after take off, ISRO Chairman S. Somanath said that all the satellites got separated successfully. He mentioned that the satellite separation is a slow process. Noting that this is a historic mission that was executed at the shortest possible time, he said the mission happened exactly as planned. He also mentioned that they would place another 36 satellites in the next M3 mission.

Mr. Somnath further said "The LVM3 was conceived primarily for launching geo-stationary satellites with a payload capacity of 4T, which can be used for launching 6T payloads for LEO." He added, "The mission is very critical to meet the customer's expectations to launch 36 satellites in 9 phases with precision. The mission was designed in such a way that C25 stage was to handle this operation using in-house built inertial navigation systems."

Sunil Bharti Mittal, CEO of Bharti Enterprises, whose company is one of the biggest investors in OneWeb, said that it is a new chapter for India in the space sector. He pointed out that there is a shortage of launch vehicles and this is a great opportunity for ISRO.

Mr. Mittal further added "I am proud to be here in Sriharikota, with our partners, ISRO and NSIL. Today my dream of having an Indian element in the OneWeb constellation has been realized. This launch with ISRO and NSIL opens up the space sector in India with the possibility of billions of dollars flowing into the country."

D. Radhakrishnan, Chairman-cum-Managing Director, NewSpace India Limited, said, "We worked closely with the OneWeb team to support this milestone launch, which has been accomplished in a record time of a few months, while also illustrating the opportunities for satellite connectivity in India. We look forward to strengthening our partnership with OneWeb and utilizing the potential that LEO connectivity has to deliver broadband services across India."

PM Congratulates ISRO

Prime Minister Narendra Modi congratulated ISRO, NewSpace India Ltd. (NSIL) and IN-SPACe after the rocket successfully placed 36 satellites into the intended orbits.

"Congratulations @NSIL_India @ INSPACeIND @ISRO on the successful launch of our heaviest launch vehicle LVM3 with 36 OneWeb satellites meant for global connectivity. LVM3 exemplifies Atmanirbharta & enhances India's competitive edge in the global commercial launch service market," he said.

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ISRO Developing New Rocket to Replace PSLV

13 Oct 2022

Source: India Express | https://www.newindianexpress.com/states/kerala/2022/oct/13/isro-developing-new-rocket-to-replace-pslv-2507752.html

ISRO chairman S Somanath

THIRUVANANTHAPURAM: The Indian Space Research Organisation (ISRO) is developing a rocket named Next Generation Launch Vehicle (NGLV) to replace its ageing workhorse the Polar Satellite Launch Vehicle (PSLV) that was developed in the 1980s.

This was announced by ISRO chairman S Somanath at a press conference on the sidelines of the 'Engineers Conclave 2022' at the Liquid Propulsion Systems Centre (LPSC) at Valiyamala here on Thursday.

"PSLV was developed in the 1980s and it does not serve the needs of the 2020s. There needs to be an evolution," Somanath said. While refusing to give an exact time frame for retiring PSLV, he said that ISRO will stop using the rocket after completing the remaining launches approved by the government.

Asked specifically about propulsion technology to be used in the NGLV, Somanath said it will use 'semi-cryogenic' technology which is both efficient and cost-effective. He hinted that the new rocket could also be 'reusable'. "A reusable rocket will have a smaller payload than an expendable one. If it is reusable, the payload will be around five tonnes and if it's expendable, it will go up 10 tonnes," he added. Somanath said the payload parameters were arrived at after analysing the current market requirements.

Somanath said the participation of the industry was essential right from the beginning of the new rocket's development. This would ensure that capability is created outside ISRO to build, operate and launch it on a commercial basis. "It is possible for the industry to support and create this rocket (NGLV) as a national asset that can be operated for a sufficient period of time," he said earlier while speaking at the conclave.

Somanath said ISRO is also engaged in discussions with the Union Agriculture Department to develop a 'Bharat Krishi satellite' to study the growth pattern of crops, identify irrigation deficiencies and provide information that will help in pest-control and verification of farm insurance claims besides many other applications.

"We will give support to the Agriculture department. The satellites will be owned and operated by them. A minimum of two satellites will be needed to ensure proper re-visit capability," he added.

The ISRO chairman said the space agency is exploring the possibility of increasing civilian use of the country's indigenous satellite navigation system NaVIC. However, he admitted that the efforts have not given any tangible outcome.

"It is penetrating slowly into the civilian sector. But the primary goal of NaVIC continues to remain as a service to the strategic sectors," he reminded.

Eutelsat Says Satellite Jammers within Iran are Disrupting Foreign Channels

Jason Rainbow | 07 Oct 2022

Source: Space News | https://spacenews.com/eutelsat-says-satellite-jammers-within-iran-are-disrupting-foreign-channels/

Eutelsat says its Hot Bird 13C and Eutelsat 7B satellites are being jammed by signals originating from within Iran. Credit: Eutelsat/Philippe Stroppa

TAMPA, Fla. — Signals originating within Iran have been jamming two Eutelsat satellites that provide foreign broadcasts in the country since Sept. 26, the French operator said Oct. 7.

"The interferences harmfully affect the transmission of several digital TV and radio channels broadcasting in Persian from outside of Iran, as well as other channels," the company said in a news release.

The jamming is disrupting services from the operator's Hot Bird 13C and Eutelsat 7B satellites in geostationary orbit, Eutelsat external communications director Anita Baltagi told SpaceNews.

Baltagi declined to specify the channels involved, but said "Eutelsat is a target because it broadcasts Farsi channels that are based abroad and therefore not under the control of IRIB," or Islamic Republic of Iran Broadcasting, the country's state-owned media organization.

The jamming comes amid weeks of protests in Iran following the death of a woman while in police custody.

Iran's supreme leader Ayatollah Ali Khamenei said the protests were part of a foreign plot to destabilize the country during his first public comments on the unrest Oct. 3, reported the Associated Press.

The Iranian government has not commented on Eutelsat's jamming issues.

According to Eutelsat, it used a "specially designed interference detection system" to conclude that all uplink transmissions interfering with the two satellites originate within Iran.

The operator said its technical experts "have been working around the clock with affected customers to mitigate the impact of the interference" on its services as much as possible.

"Eutelsat has immediately notified the relevant authorities in the Islamic Republic of Iran, demanding that the harmful jamming operations be immediately and permanently stopped," the company said.

It has also reminded Iranian authorities that intentional jamming is "explicitly prohibited" by radio regulations under the International Telecommunication Union (ITU), a United Nations agency.

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ISRO to Replace Defunct NavIC Satellites, Plans to Launch New Satellites to Expand the System

27 Oct 2022

Source: ABP live News | https://news.abplive.com/science/isro-to-replace-defunct-navic-satellites-plans-to-launch-new-satellites-to-expand-the-system-s-reach-1560245

Since several satellites belonging to the NaVIC constellation have outlived their lives, ISRO plans to replace at least five of them with the improved L-band. This would enable the satellites to offer better global positioning service (GPS) to the public. (Representative photo) (Image Source : Getty)

India aims to expand the Indian Space Research Organisation's (ISRO's) regional navigation satellite system NaVIC (Navigation with Indian Constellation) in order to increase the use of the system in the civilian sector and by ships and aircraft travelling at large distances from the country's borders, news agency PTI reports.

NaVIC, earlier known as the Indian Regional Navigation Satellite System (IRNSS), is designed with a constellation of seven satellites, three of which are placed in geostationary orbit, and four are placed in an inclined geosynchronous orbit. The system also includes a network of ground stations operating 24x7.

NaVIC offers Standard Positioning Service (SPS), a real-time positioning and timing service, to civilian users, and 'Restricted Service' (encrypted services) for authorised users, including the military. The coverage area of NaVIC includes India and a region up to 1,500 kilometres beyond the country's boundary.

ISRO Plans To Replace At Least Five NaVIC Satellites

Since several satellites belonging to the NaVIC constellation have outlived their lives, ISRO plans to replace at least five of them with the improved L-band. This would enable the satellites to offer better global positioning service (GPS) to the public.

"We have five more satellites in production, they have to be launched periodically to replace the defunct satellites. The new satellites will have L-1, L-5 and S Band," S Somanath, Chairman of ISRO, was quoted as saying on the sidelines of an event in a PTI report.

On the sidelines of the India Space Congress 2022 organised by the SatCom Industry Association (SIA-India), Somanath said the NaVIC system was not in a "full-fledged operational regime" as some of its seven satellites have stopped working.

ISRO Aims To Launch New Satellites To Expand The Reach Of NaVIC

He also said that ISRO has approached the government for permission to launch an additional 12 satellites to Medium Earth Orbit (MEO) to expand the reach of NaVIC.

The ISRO Chief added that a regional to 'global' changeover will be very fast if one has a GEO-MEO constellation.

The current constellation of satellites which are a part of NaVIC operate in the L-5 band and S band, which are used for the transportation and

aviation sectors.

New Satellites Will Be Equipped With L-1 Band

Somanath said that the new satellites need to be equipped with the L-1 band, which is a typical GPS band for public use, and which is not currently there in NaVIC. He explained that this is the reason why NaVIC has not penetrated into the civilian sector easily.

He further said that the new satellites being built for NaVIC will have better features for the safe transmission of signals for different purposes, particularly for the strategic sector.

Role Of Satellite Manufacturing Services And Satellite Services In Indian Space Economy

Satellite manufacturing services and launch services are projected to play a major role in boosting the Indian space economy by 2025. Somanath said that currently, all satellites required by the government are manufactured by ISRO. He proposed the idea that if the government needs a satellite, it could be manufactured by a private supplier and launched by an ISRO launch vehicle. This is the concept of an anchor customer, he explained.

The ISRO Chief added that there is a need to create industry capacity in the satellite manufacturing segment of the Indian space sector, and that ISRO becoming an anchor customer could be a step in that direction.

He said there was a need to create industry capacity in the satellite manufacturing sector and ISRO becoming an anchor customer could be a step in that direction.

The Indian space segments which contribute to the country's space economy are satellite manufacturing, launch services, ground segment and satellite services. Satellite manufacturing is projected to have a market value of $3.2 billion by 2025, ground segment a market value of $4 billion, launch services a market value of $1,046.6 million, and satellite services a market value of $4.6 billion, a joint report by Ernst & Young (EY) and the Indian Space Association (ISpA) states.

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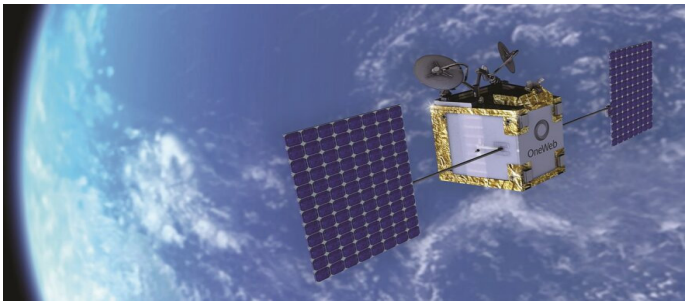
Global Aerospace Industry

UK Defense Committee Calls for Thorough Eutelsat/Oneweb Review

Jason Rainbow | 19 Oct 2022

Source: Space News | https://spacenews.com/uk-defense-committee-calls-for-thorough-eutelsat-oneweb-review/



Eutelsat says integrating its geostationary broadband network with OneWeb's low Earth orbit satellites is the best way to meet future global connectivity needs. Credit: OneWeb

TAMPA, Fla. — Eutelsat and OneWeb's planned merger requires the "strictest possible scrutiny," a cross-party group of British government officials said in a report warning the U.K has become a "third-rank" power in space post-Brexit.

Combining U.K.-based OneWeb with France's Eutelsat poses "serious questions about the handing over of critical technology to foreign powers and the need for sovereignty," said Tobias Ellwood, chair of the U.K's Defence Select Committee.

In a report published Oct. 19 for the U.K.'s Ministry of Defence, the committee called for a thorough review of the deal under the country's National Security and Investment Act.

The committee also called for creating a high-level government post to provide clear centralized "direction and accountability" for the U.K.'s civil and defense ambitions in space.

Their report took aim at an "unacceptable" amount of progress in developing an independent satellite navigation system almost four years after the country left Europe's Galileo program.

One option under consideration is to add position, navigation and timing (PNT) capabilities to OneWeb's second-generation constellation, which the operator expects to enter service in 2028.

However, despite spending tens of millions of dollars on exploring options over the last several years, Ellwood said the U.K. is no closer to developing a replacement PNT network.

The lack of progress means the country risks "falling further behind both our peers and our adversaries," Ellwood said in a statement.

He added: "Over this inquiry we heard that the UK is, at best, a third-rank space power, lagging behind Italy.

"And while Government has recognised there is work to do, the Whitehall machine is not moving fast enough."

The committee's report did not mention U.S.-based Viasat's plan to acquire British satellite operator Inmarsat, which received national security clearance from the U.K. in September.

Viasat's deal still requires other regulatory approvals, including from the U.K.'s competition watchdog which launched a lengthy investigation process Oct. 14.

The U.K.'s Ministry of Defence plans to spend £1.4 billion ($1.6 billion) on developing new space capabilities over the next decade.

On Oct. 17, the UK Space Agency announced a new 15 million pound fund to support British

businesses developing satellite communications technology.

The fund is being distributed via a competitive process that runs until spring. The government anticipates it will catalyze further investments into the U.K.'s space sector, which employs about 47,000 people.

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Embraer Signs Mous for Cooperation with the Aerospace Industry in South Korea

27 Oct 2022

Source: EDR Magazine | https://www.edrmagazine.eu/embraer-signs-mous-for-cooperation-with-the-aerospace-industry-in-south-korea

The UAE Space agency says Sirb will be a constellation of smallsats with X-band SAR payloads, but disclosed few other details about the constellation. Credit: UAE Space Agency

Seoul, South Korea, October 27, 2022 – Embraer announced today that it has signed several Memorandums of Understanding (MoUs) with the aerospace companies ASTG (Aerospace Technology of Global), EMK (EM Korea Co.) and Kencoa Aerospace, from South Korea with the objective of strengthening collaboration with Korean defense industry partners for the future supply of parts for the C-390 Millennium aircraft. The C-390 Millennium aircraft is competing in the Large Transport Aircraft (LTA) II Program being run by the Defense Acquisition Program Administration (DAPA).

The potential supply of South Korean manufactured parts will contribute to the offset requirements of the LTA II Program. The MoUs intend to create long-term business relationships between the parties which will endure for the LTA II Program and beyond. Local industry capabilities can also be part of future developments within Embraer's existing platforms such as the C-390 Millennium as well as new aircraft, vehicles, and systems.

"Embraer is very confident on the mutual benefits to be gained from this collaboration, thus creating a sustainable and growing relationship between Embraer and the partners in South Korea", said Jackson Schneider, President & CEO, Embraer Defense & Security. "By offering more than 50 years of experience in aviation, technology and innovation, Embraer is looking to establish meaningful partnerships in South Korea to create new businesses and solutions."

The C-390 Millennium and its aerial refueling configuration, the KC-390, are the new generation of multi-mission military transport delivering unrivaled mobility and cargo capacity, rapid re-configuration, high availability, enhanced comfort, as well as optimal management of reduced operational costs throughout its lifecycle, all on a single platform.

Since the first delivery to the Brazilian Air Force (FAB), the KC-390 Millennium has proven its capability, reliability, and performance. FAB's current fleet of KC-390 stands at five units. The fleet has already exceeded 7,000 flight hours in operation, with a 99% mission completion rate, demonstrating excellent availability and productivity in its category.

In June 2022, the Netherlands Ministry of Defense announced the selection of the C-390

Millennium to replace the current fleet of C-130 Hercules. The Portuguese Armed Forces and the Hungarian Defense Forces will begin operations with the KC-390 in 2023 and 2024, respectively. The three European countries' fleets will be capable of performing aerial refueling and be fully NATO compatible.

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Lockheed, Verizon Testing 5G-Linked Drone Swarm for Intel Collection

Keoni Everington | 31 August 2022

Source: C4ISR Net | https://www.c4isrnet.com/battlefield-tech/it-networks/5g/2022/09/28/lockheed-verizon-testing-5g-linked-drone-swarm-for-intel-collection/

Concept art from the U.S. Air Force Research Lab depicting a drone swarm that the service could potentially employ in the future. (Air Force Research Lab)

WASHINGTON — Lockheed Martin and Verizon are experimenting with 5G-enabled drones and intelligence, surveillance and reconnaissance payloads in an effort that could ultimately enhance U.S. military command and control and in-the-field targeting abilities.

The two companies on Sept. 28 said they were able to securely share and analyze real-time data and other intel captured by a swarm of drones via fifth-generation wireless networks, both private and public

The tests, conducted in May and September, and their results have significant battlefield implications, according to Dan Rice, the vice president of 5G.MIL programs at Lockheed.

"We demonstrated that 5G technology can help the DoD better detect and target adversarial assets in a military environment," he said. "This technology detected and geolocated low-power RF signals that adversaries could use to communicate, sense or jam."

Army, Air Force and Pentagon representatives, among others, attended the demonstration in May.

Rice sees the pairing of nimble drones, 5G connectivity and ISR capabilities as something that could be used in most any fight.

"I think nearly every branch of service is flying drones today and using technologies like this to do electronic support measures and help identify potential targets in their particular domain," he said. "So I think it's applicable across all branches of service, the technologies we've demonstrated."

Additional, increasingly complex trials are expected as soon as November. While previous testing focused on ground targets, Rice said, the goal is to transition to an air-to-air scenario, where mobile airborne assets are discovered and tracked.

Fifth-generation wireless technologies promise significantly faster speeds and higher capacities to accommodate more and more-advanced devices. There are also worries, however, like privacy, digital weakness and expensive infrastructure costs.

The Defense Department has for years studied 5G; its 2020 strategy described the generation as "far more disruptive" than its predecessors, such as 4G, and noted that high-speed connectivity will "transform the way militaries operate."

The department has since invested in test beds at a dozen military installations, including sites in California, Nevada, Utah and Washington.

It is also studying 5G networking for overseas operations at a new open-air facility at Idaho National Laboratory, a sprawling Department of Energy nuclear reserve.

"We've seen the United States Department of Defense taking historic action to advance 5G communications," said Srini Kalapala, Verizon's senior vice president for technology and product development.

The Pentagon secured nearly $338 million for 5G and microelectronics in fiscal 2022. It requested $250 million for fiscal 2023.

Lockheed in February won a $19.3 million contract with the Defense Department to create a 5G communications test bed, known as OSIRIS, for the Marine Corps and others. Earlier this month, the Maryland-based defense giant and AT&T said they used 5G networks to securely download and distribute Black Hawk helicopter flight data in a fraction of the time it would usually take.

"We're excited about that," Rice said this week. "I think we're looking to move 5G closer and closer to that tactical edge."

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Indian Aerospace Industry

Hindustan Aeronautics Chooses GE Engine for India's Tejas Fighter

Vivek Raghuvanshi | 18 Aug 2021

Source: Defence News | https://www.defensenews.com/industry/2021/08/18/hindustan-aeronautics-chooses-ge-engine-for-indias-tejas-fighter/

A pair of Tejas aircraft take off during a display on the second day of the Aero India exhibition at Yelahanka Air Force Station in Bangalore on Feb. 15, 2017. (Manjunath Kiran/AFP via Getty Images)

NEW DELHI — India's state-owned Hindustan Aeronautics Limited on Tuesday signed a $716 million contract with GE Aviation for F404-GE-IN20 engines for the homemade LCA Mk1A Tejas light combat aircraft.

HAL ordered 99 of the engines as well as support services from GE Aviation, the Indian firm said in a statement.

"This is the largest-ever deal and purchase order placed by HAL for LCA," said HAL Chairman and Managing Director Ramakrishnan Madhavan.

A senior executive at HAL, speaking on condition of anonymity because he was not authorized to talk to the media, said the contract does not include technology transfer of the engines and that deliveries will start after two years.

"GE Aviation is proud of the 16-year-long partnership with HAL and we have committed

to deliver all 99 engines and support services by 2029," said Chris Cyr, GE Aviation's vice president for business development and sales.

In February this year, HAL secured a $6.5 billion order from the Indian Air Force for the supply of 83 Tejas fighters.

The first two aircraft will be delivered in 2024; eight in 2025; and the remaining in batches (16 to 18 aircraft each year) by 2029, the HAL executive said.

The basic version of 40 LCA fighters are also powered by the F404-GE-IN20 engine. HAL had acquired about 45 of the engines.

Madhavan said HAL is working closely with GE Aviation to boost the export potential of Tejas and to supply spares to the global supply chain of F404 engines.

A HAL news release said GE-made F414 engines will be manufactured in India for the upcoming LCA Mk2 program.

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Navic, India's Own GPS, to Make Greater Inroads

M Ramesh | 09 Oct 2022

Source: The Hindu Business Line | https://www.thehindubusinessline.com/opinion/navic-indias-own-gps-to-make-greater-inroads/article65973039.ece

For global reach, more satellites will need to be launched | Photo Credit: PTI

What is NaVIC?

NaVIC, which stands for Navigation with Indian Constellation, is India's own satellite navigation system, like the GPS, which is of the US.

The heart of the system is seven satellites — the 8th will join them soon — positioned above India. These satellites form 'Indian Regional Navigation Satellite System' or IRNSS.

Why is NaVIC in the news?

NaVIC has been in operation since 2018 (after a seven-year delay from the original target date). But it is in the news now because the Indian government is asking for all smartphones sold in India to feature the NaVIC app (like Google Maps). As this entails a little tweaking of some phone hardware, particularly the chipsets, which will make the phones a little costlier.

Smartphone manufacturers such as Apple, Samsung, Xiomi and Readmi are not happy, but will comply.

Is NaVIC as good as GPS?

In some respects, better. GPS can take you within 20 meters of your target, while NaVIC is more precise — it will take you within five meters of the target. This may not be a big deal for individual users, but for military stuff, like guided missiles, it is very important. On the other hand, while GPS is global — you can use it anywhere in the world — NaVIC regional and can be used in India and up to 1,500 km from India's borders.

However, India desires to make NaVIC global, which will happen if more satellites, say around 30, are sent up for this purpose. For now, NaVIC is regional.

How come NaVIC is more precise than GPS?

That's a bit technical, but it is essentially because NaVIC uses two frequencies instead of one — the L5 (1176.45 MHz) and S band (2492.028 MHz). This improves accuracy by enabling the receivers on the satellites to correct any atmospheric errors through simultaneous use of the two frequencies.

Further, the uptime of the system is better than GPS because, as a government's press release said, "either frequency can serve the positioning requirement equally well."

Have the smartphone manufacturers been given a deadline to make their phones NaVIC-compatible?

There is no deadline. The government wants it ASAP; smartphone manufacturers want time — at least till 2025.

They are saying that if L1 frequency is used instead of L5, it would be easier and cheaper because L1 is already in use and the chipsets won't need to be modified. However, a Reuter report has quoted ISRO as saying that switching to L1 is not possible.

Why do we need NaVIC when Google Maps is there for free?

Google Maps runs on GPS, which is American. Depending upon another country is never good, for they can easily switch off service at any time. In 1999, during the KargilWar, India requested the US to give data about enemy locations, which the US refused. That made India realise the criticality of an India-owned navigation system.

Which other countries have their own navigation systems?

Apart from the US' GPS, there are Europe's Galileo, Russia's GLONASS, China's Beidou and Japan's QZSS.

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CFDS Develops Drone Detection and Drone Jammers, Anti-Drone Command and Control System, that will Help Armed Forces; Field Trials to be Held Soon

Vipul Rajput | 13 Oct 2022

Source: Ahemabad Mirror | https://ahmedabadmirror.com/nfsu-creates-drone-tech-achieves-aatmanirbharta/81846007.html

Drones, also referred to as Unmanned Aerial Vehicles (UAVs), enhance the capabilities of security forces to contain terror and to counter the challenges in defence. To achieve self-sufficiency in this technology, the Centre for Futuristic Defence Studies (CFDS) at the National Forensic Sciences University (NFSU) in Gandhinagar has undertaken development of Combat Applications, Drone Platforms, Anti-Drone Technologies & Systems, 3D Scanning Sensors etc that are being offered to our armed forces and security agencies.

Laboratory testing of this technology has been completed and in the coming days, it will be field tested by armed forces and security agencies. Top officers from different armed forces branches have visited the NFSU in the last couple of days.

Whether it's the Ukraine-Russia war or terrorist activities carried out by India's neighbouring country, from weapons to drugs and attacks, drone technology is being deployed everywhere. To counter this, the armed forces have had to rely on foreign technology until now. With CFDS developing this state-of-the-art drone technology, these will soon be inducted into the defence sector following field trials.

Ajay Purandare, head of CFDS, said, "Across the world, drones are being employed for various uses. Instead of relying on foreign technology for our needs, NFSU has been working on the integrated anti drone command and control software under the Aatmanirbhar Bharat Mission."

He added, "There are three main factors here: Drone Detection, Drone Jammers and Anti Drone Command and Control (C2) system. Currently, this technology is being developed in many forms at various places, but CFDS has developed a combined technology."

For the integrated drone forensic technology, NFSU carried out deep research into commercial databases and developed combat application, drone platform, anti-drone technology and system, 3D scanning centre. The lab testing has been completed.

Purandare said, "Drone technology is state-of-the-art, but keeps on upgrading. NFSU technology will help Indian forces become aatmanirbhar.

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India to Export Pinaka Rocket Launchers, Ammunition to Armenia in $250m Deal: Report

C Krishnasai | 29 September 2022

Source: Wio News | https://www.wionews.com/india-news/india-to-export-pinaka-system-other-ammunitions-to-armenia-under-250m-deal-report-520819

India to send rocket systems to Armenia Photograph:(Agencies)

India has reportedly signed a $250 million deal to export arms and ammunition to Armenia, which is currently engaged in a tense stand-off with its neighbour Azerbaijan.

According to the Economic Times newspaper, India will be sending indigenously developed multi-barrel Pinaka launchers, anti-tank rockets, and other range of ammunitions to the former Soviet region.

The Pinaka system has been developed by Defence Research and Development Organisation (DRDO) and is manufactured by Indian private firms.

The rocket system, which is currently in service with the Indian Army, can fire a salvo of 12 rockets in 44 seconds.

Though this is the first time that India is exporting Pinaka missile system to another country, the south Asia nation has already exported weapons to Armenia.

In 2020, India had bagged a $43 million deal to supply four Swathi radars to Armenia.

These are weapon locating radars that can track incoming artillery projectiles and pinpoint the location of enemy gun positions for counter-action.

India has been looking to boost its arms exports and has taken various measures to enhance domestic production under its 'Make in India' policy. The Centre has set a target to sell weapon systems worth Rs 35,000 crore overseas by 2025.

Notably, there has been an exponential increase in defence exports. In 2020-21, India exported equipment worth $90 million compared to $23 million in 2014-15.

In January this year, India inked a $375 million deal with the Philippines to provide the BrahMos cruise missile to the country's navy.

The Philippines navy will use this as an anti-ship shore-based missile that has a range of 290-km.

BrahMos missile was jointly made by India's DRDO and Russia's NPO Mashinostroyeniya.

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Transport Aircraft for Indian Air Force to be Made in India by Airbus Defence & TATA Consortium

Ministry of Defence | 30 Oct 2022

Source: Ministry of Defence | https://pib.gov.in/PressReleasePage.aspx?PRID=1871267

In a major boost to 'Make in India' and domestic aviation manufacturing, Prime Minister Shri Narendra Modi will lay the foundation stone of a transport aircraft manufacturing project for the Indian Air Force (IAF) at Vadodara, Gujarat on October 30, 2022. Raksha Mantri Shri Rajnath Singh, Minister of Civil Aviation Shri Jyotiraditya M Scindia and Gujarat Chief Minister Shri Bhupendrabhai Patel are among those who will attend the function.

It may be recalled that the Cabinet Committee on Security had, on September 08, 2021, approved the procurement of 56 C-295MW transport aircraft from M/s Airbus Defence and Space S.A., Spain. On September 24, 2021, Ministry of Defence signed a contract with M/s Airbus Defence and Space S.A. for acquisition of the aircraft with associated equipment.

Addressing a press conference in New Delhi on October 27, 2022, Defence Secretary Dr Ajay Kumar said, as part of the contract, 16 aircraft will be delivered in flyaway condition and 40 will be manufactured in India by the Indian Aircraft Contractor, TATA Consortium of Tata Advanced Systems Limited (TASL) and Tata Consultancy Services (TCS) led by TASL. This is the first project of its kind in which a military aircraft will be manufactured in India by a private company. The total cost of the project is Rs 21,935 crore. The aircraft can be used for civilian purposes as well.

Delivery schedule

The first 16 fly-away aircraft are scheduled to be received between September 2023 and August 2025. The first Made in India aircraft is expected from September 2026.

Aircraft capability

C-295MW is a transport aircraft of 5-10 tonne capacity with contemporary technology that will replace the ageing Avro aircraft of IAF. It has a rear ramp door for quick reaction and para dropping of troops and cargo. Short take-off/land from semi-prepared surfaces is another of its features. The aircraft will strengthen the logistic capabilities of the IAF.

Aatmanirbharta

The project offers a unique opportunity for the Indian private sector to enter into technology intensive and highly competitive aviation industry. It will augment domestic aviation manufacturing resulting in reduced import dependence and expected increase in exports.

Also, 96% of the total man hour work per aircraft that Airbus employs at its manufacturing facility at Spain will be undertaken in India by the TATA Consortium. Manufacturing of over 13,400 Detail Parts, 4,600 sub-assemblies and all the seven Major Component Assemblies will be undertaken in India, along with tools, jigs and testers. Various systems such as engines, landing gear, avionics, EW suite etc. will be provided by Airbus Defence & Space and integrated on the aircraft by the TATA Consortium. The aircraft will be tested as an integrated system by the TATA Consortium. The aircraft will be flight tested and delivered through a Delivery Centre at the TATA Consortium facility.

All 56 aircraft will be fitted with indigenous Electronic Warfare suite of Indian DPSUs – Bharat Electronics Ltd and Bharat Dynamics Limited. After completion of delivery of 56 aircraft to IAF, M/s Airbus Defence & Space will be allowed to sell the aircraft manufactured in India to civil operators and export to countries which are cleared by the Government of India.

Employment Generation

The TATA Consortium has identified more than 125 in-country MSME suppliers spread over seven states. This will act as a catalyst in employment generation in the aerospace ecosystem of the country and is expected to generate 600 highly skilled jobs directly, over 3,000 indirect jobs and an additional 3,000 medium skill employment opportunities with more than 42.5 lakh man hours of work within the aerospace and defence sector of India. Nearly 240 engineers will be trained at Airbus facility in Spain.

Officer on Special Duty, Department of Defence Shri Aramane Giridhar, Vice Chief of Air Staff Air Marshal Sandeep Singh, DG (Acquisition) Shri Pankaj Agarwal and other senior officials of Ministry of Defence & IAF were present during the press conference.

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How Engine Development is Holding Up India's Fifth-Generation Stealth Fighter Jet

Pradip R. Sagar | 25 Oct 2022

Source: India Today | https://www.indiatoday.in/india-today-insight/story/how-engine-development-is-holding-up-indias-fifth-generation-stealth-fighter-jet-2289359-2022-10-25

IAF aircraft performing a fly-past at the 89th Air Force Day parade at Hindon Air Force Base in Ghaziabad; (Photo: ANI | Rahul Singh)

The Prime Minister's Office (PMO) is in favour of the project and assures all necessary approvals. However, it has some concerns over the engine development roadmap for Indian fighter jets. The PMO believes that India's fighter jet programme cannot remain dependent on foreign-made engines. The PMO's apprehensions were addressed last month by the Aeronautical Development Agency (ADA), which is developing the AMCA.

ADA is making efforts to join hands with at least three foreign players—France's Safran, US's GE and the British Rolls Royce—to co-develop fighter jet engines in India. The first 40 jets of AMCA would fly on GE-414 engines. The next version of the aircraft, AMCA Mark 2, will fly on an engine co-developed in India.

India has plans to locally develop a new engine, with 110kN Class thrust, for the AMCA Mark 2, which is expected to go into production from 2035. This is to meet the requirement of

super-cruise.

The GE-414 engine can achieve up to 95-98kN thrust. The same engine has been selected for the indigenous LCA Mk 2. In September, the CCS had approved Rs 6,500 crore in additional funds to fast-track the development of an upgraded version of the LCA Mk2. While India has shown its mettle in developing nuclear submarines, aircraft carriers or even fighter jets, an indigenous combat jet engine remains elusive.

Defence scientists are awaiting a green signal from the CCS as the AMCA project is behind schedule. The jet is in an advanced stage of development with the critical design review completed.

Stealth aircraft are designed to avoid detection by enemy radars or their air-defence systems. Their 'First Look, First Kill' concept will allow AMCA pilots to spot an enemy plane first, fire a missile and destroy the target without the adversary ever knowing about it or being able to react.

Fifth-generation aircraft are designed for 'low observability', a feature not available in any aircraft of the Indian Air Force (IAF), including the Rafales. The feature makes the aircraft difficult to detect, and the enemy gets no reaction time even when it becomes close.

In 2009, the Union government had given a meagre Rs 90 crore for a feasibility study—followed by an additional Rs 447 crore—for designing India's future fighter jet. The AMCA has a budget of Rs 15,000 crore for development of the prototype. Even after the CCS nod, it will take at least four years to manufacture the first aircraft under the AMCA programme. ADA has a 10-year roadmap for making the first five prototypes and flight testing.

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NASA Tests System to Fling Satellites into Sky Using Huge Centrifuge

Noor Al-Sibai | 07 Oct 2022

Source: Futurism.com | https://futurism.com/the-byte/nasa-slingshot-startup-test

NASA may soon be slingshotting its satellites into low-Earth orbit, thanks to its newly-tested partnership with a startup working on a giant centrifuge for that very purpose.

In a press release, the SpinLaunch company trumpeted its recently completed tenth successful flight test of its Suborbital Accelerator. During this demonstration, it carried payloads for NASA (with which it inked a deal in April), Airbus, Cornell University, and others.

During the late September test out of the Spaceport America base located in New Mexico's Jornada del Muerto desert, the startup's 11-month-old mega-slingshot launched a capsule containing five payloads, including a camera, tens of thousands of feet into the sky — a demonstration that helps illustrate the ways "alternative" launch technology, such as the mass accelerator's rapidly-rotating arm, may be able to hurl satellites and other objects into low earth orbit or beyond.

He's Not Heavy

Along with this tenth successful demo showcasing the capabilities of the mass accelerator, this test also indicates that SpinLaunch customers' payloads can survive the massive G-forces — up to 10,000 times the force

of Earth's gravity — generated by the rapidly-rotating arm hidden within the large contraption, which flung them out faster than the speed of sound.

Indeed, during both pre-flight tests and in the demonstration's aftermath, the customer payloads survived intact, SpinLaunch's press release notes.

Though the company's technology is obviously not ready to launch larger payloads or send smaller satellites further out than the 25,000 feet it's achieved so far, SpinLaunch has still done a ton since its founding in 2014, and especially in the year since the mass accelerator has been online.

While SpinLaunch has ruled out any would-be fatal crewed launches, these tests are nonetheless an incredible advent demonstrating that small payloads can survive such intense G-forces — and the possibilities for where it could go next are super fun to consider, too.

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Commentary

1. Why the Famed Russian Air Force Failed in Ukraine and the Vital Lessons IAF Can Draw from it - https://theprint.in/defence/air-denial-over-dominance-democratised-technology-lessons-for-iaf-from-russia-ukraine-war/116754/
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3. F-35 might not ever reach $80M target again, Lockheed exec says - https://breakingdefense.com/2022/10/f-35-might-not-ever-reach-80m-target-again-lockheed-exec-says/
4. China seeks new partners for lunar and deep space exploration - https://spacenews.com/china-seeks-new-partners-for-lunar-and-deep-space-exploration/
5. New report raises questions on DoD's multi-orbit plan for space sensors - https://spacenews.com/new-report-questions-dods-multi-orbit-plan-for-space-sensors/

6. A frightening fighter gap in the IAF - https://www.deccanherald.com/specials/indian-air-force-high-on-josh-low-on-jets-1149899.html

7. China's Space Station Prepares For New Frontiers Of Science With Launch Of Mengtian Module - https://www.scmp.com/news/china/science/article/3195718/chinas-space-station-prepares-new-frontiers-science-launch

"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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