

CURRENT AFFAIRS



India Successfully Launches Earth Observation Satellite



INS 'Vishal' – India's Next Aircraft Carrier



Publisher

Journal of Aerospace Sciences
And Technologies
Aeronautical Society of India
Bangalore Branch Building
New Thippasandra Post
Bangalore 560 075
Karnataka, INDIA
Telefax: +91 80 25273851
Email: editoraesi@yahoo.com
Website: www.aerjournalindia.com

Publication Team

Dr R Balasubramaniam
Dr S Kishore Kumar
Dr P Raghothama Rao
Mrs Chandrika R Krishnan
Mr Hemanth Kumar R
Mr Kumaran A KM

Advertisement – Tariff

A4 – 1 Full Page : Rs. 2000
Draft Drawn in Favour of
"Journal Office, The Aeronautical
Society of India" Payable at
Bangalore

Head Quarters

The Aeronautical Society of India
13-B, Indraprastha Estate
New Delhi 110 002, India
Tel: +91 11 23370516
Fax: +91 11 23370768

DRDO conducts successful flight test of ABHYAS drone



The Defence Research and Development Organisation (DRDO) conducted successful flight test of ABHYAS – High-speed Expendable Aerial Target (HEAT) drone, from Interim Test Range (ITR) in Odisha's Chandipur. "The flight test was tracked by various RADARS and Electro Optic Systems and proved its performance in fully autonomous way point navigation mode," the DRDO said in a statement. ABHYAS is drone involving designed for autonomous flight with the help of an autopilot. "The configuration of ABHYAS is designed on an in-line small gas turbine engine and uses indigenously developed MEMS based navigation system for its navigation and guidance. The performance of the system was as per simulations carried out and demonstrated the capability of ABHYAS to meet the mission requirement for a cost effective HEAT," DRDO said. The concept of ABHYAS was proved and pre-project details were completed on January 2013. The first experimental launch (minus the engine) was conducted in 2012. The project was sanctioned with an initial funding of Rs 15 crore. The fuselage for the Abhyas was designed by adopting the DRDO Lakshya tow body (not the main fuselage). The fuselage consists of five sections, namely the nose cone, equipment bay, fuel tank bay, air intake bay and tail cone. Abhyas's radar cross-section (RCS) as well as its visual and infrared signatures can be augmented to simulate a variety of aircraft for air-defense weapon practices. It can also function as a jammer platform and decoy. The HEAT system is utilized to do away with the post-launch recovery mode, which is time-consuming and difficult in a scenario as the sea. The project picked up pace after three services floated a global tender for procurement of 225 HEAT drones.

Source: Times Now News

CURRENT AFFAIRS

Second unmanned mission: July 9-16 is Chandrayaan-2 launch window

The Indian Space Research Organisation (ISRO) will launch the country's second unmanned mission to the moon, the indigenously developed Chandrayaan-2, between July 9 and July 16 2019 this year on board a powerful Geosynchronous Satellite Launch Vehicle (GSLV)-Mark III rocket from Satish Dhawan Space Centre, Sriharikota, 80 km north of Chennai. The Rs 800 crore mission's lander is expected to make a soft-landing on the lunar surface on September 6 2019 on a high plain between two craters, Manzinus C and Simpelius N — only the second mission so far by any country to land a rover near the Moon's south pole. This will be India's first mission to the moon wherein a lander will soft-land on the lunar surface. The October 2008-launched India's first unmanned mission to the moon, Chandrayaan-1's only contact with the moon was to shoot one of its payloads, the Moon Impact Probe (MIP), into the lunar surface to raise a lunar dust from its surface — leading to the discovery of water molecules on surface of Earth's only natural satellite, which caused much excitement among the world's space scientists. ISRO has explained that Chandrayaan-2, has three modules — an orbiter, a lander (named 'Vikram' after ISRO's first chairman, the visionary space scientist Dr Vikram Sarabhai), and a rover (named Pragyan). The orbiter and Vikram modules will be interfaced mechanically and stacked together as an integrated module and accommodated inside the GSLV MK-III launch vehicle. The rover Pragyan will be housed inside Vikram. ISRO scientists explained that after launch into an initial orbit around earth by GSLV MK-III, the integrated module will reach the moon's orbit using the orbiter's propulsion module. Subsequently, the lander Vikram will separate from the orbiter and soft-land at the predetermined site close to lunar south pole. Once landed, Pragyan will roll out of Vikram to carry out scientific experiments on the lunar surface. Instruments are also mounted on Vikram and Pragyan for carrying out scientific experiments. The payloads will collect scientific information on lunar topography, mineralogy, elemental abundance, lunar exosphere and signatures of hydroxyl and water-ice.

Source: <http://www.newindianexpress.com/>

Chandrayaan-2 Will Land On Moon On Sept 6 As ISRO Hopes To Make India Only 4th Country To Do So

India is likely to have a date with history and destiny on September 6 2019, when Chandrayaan-2 will land on Moon. The Indian Space Research Organisation (ISRO) said it's mulling to launch Chandrayaan-2, India second lunar mission between 9 and 16th of July. The sources, however, hinted that a lot of work is still pending before the project can be taken for the launch. "All the modules are getting ready for **Chandrayaan-2 launch** during the window of July 09 to July 16, 2019, with an expected Moon landing on September 06, 2019 9 (sic)," ISRO said in a statement. The orbiter, lander (Vikram) & rover (Pragyan)-Chandrayaan-2 has three modules, "The orbiter and lander modules will be interfaced mechanically and stacked together as an integrated module and accommodated inside the GSLV MK-III launch vehicle. The rover is housed inside the lander," ISRO said. ISRO chairman Dr K Sivan told, "Once Vikram lands on the lunar surface on September 6, rover Pragyan will come out of it and roll out on the lunar surface for 300-400 metres. It will spend 14 earth days on the moon for carrying out different scientific experiments. Altogether, there will be 13 payloads in the spacecraft. Three payloads in rover Pragyan and the other 10 payloads in lander Vikram and orbiter." The rover will send data and images back to the Earth after analyse the content of the surface of the Moon through orbiter with 15 minutes, ISRO chairman, Dr K Sivan added. India's lunar mission was planned in April 2018, but ISRO kept extending the deadline because of the several factor involved in the mission including the problem the erupted in lander Vikram during a test earlier this year. India was eyeing to become to fourth nation in the world after Russia, US and China to land spacecraft on the Moon and it almost lost to Israel, but Israel's Beresheet failed to land on the Moon on April 12 and if India successfully lands Chandrayaan-2 on the lunar surface, it will become the fourth country to do so. However, it won't be easy as a 3,290 kg Chandrayaan-2 because Beresheet tried to land on a plain made after solidification of lava called the Sea of Serenity. It's a flattened surface with more exposure to Sun, but Chandrayaan-2 will land on south pole and no country except for China has tried landing there. China in January landed its Chang'e 4 spacecraft on the far side known as the dark side. It's called dark side because it faces away from the earth and is comparatively unknown.

Source: <https://www.indiatimes.com/>

India's first solar mission in 2020: ISRO chairman

Kanyakumari: India's first mission to study the sun, Aditya-L1, will be launched in the first half of next year, chairman of Indian Space Research Organisation (ISRO) Dr K Sivan told reporters at Sarakkalvilai in Kanyakumari district. "There are still a lot of things that are to be learnt about the sun," Sivan said. According to ISRO, Aditya-L1 mission is expected to be inserted in a halo orbit around the Lagrangian point 1 (L1) – which is 1.5 million km from the earth – so that there is a major advantage of continuously viewing the sun without any occultation/ eclipses. Aditya-L1 was meant to observe only the solar corona. When asked about ISRO's contribution at the time of Fani, Dr Sivan said that satellite images helped in the accurate prediction of the cyclone. "It helped in more efficient evacuation and potentially reduce the loss of life as much as possible," he added. The ISRO chairman also stated that the whole world was eagerly waiting to see Chandrayaan 2 land at the predetermined site close to the south pole, which had not been explored by anyone before. He added that so far only Rovers used to land in the equator region. Chandrayaan 2 is set to be launched between July 9 and 16 and the expected moon landing is on September 6. Dr K Sivan added that the design phase for India's human spaceflight mission, Gaganyaan has been completed and is set to be launched before 2022. Dr K Sivan also spoke about ISRO's programme Yuvika 2019 through which school students would be taken to ISRO for a two-week stint and how it will benefit them. "We're planning to conduct it every year," he said. Dr K Sivan said that ISRO has also so far given Tamil Nadu a total of 250 NavIC devices that provides information about weather and real-time updates for fishermen.

Source: <https://timesofindia.indiatimes.com/>

Young Scientist Programme (Yuvika-2019) Inaugurated

Dr K Sivan, Chairman, ISRO inaugurated the Young Scientist Programme (Yuvika-2019) through video mode from ISRO Headquarters, Bengaluru on May 13, 2019. A total of 110 students representing every State and Union Territory of India are participating in this programme. The participating students will attend the two weeks residential training programme at four centres/units of ISRO/DOS, namely, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram; U R Rao Satellite Centre (URSC), Bengaluru; Space Applications Centre (SAC), Ahmedabad and North Eastern Space Applications Centre (NESAC), Shillong. The participants will also be visiting Satish Dhawan Space Centre (SDSC), Sriharikota, the spaceport of India, during this programme. Yuvika Program is primarily aimed at imparting basic knowledge on Space Technology, Space Science and Space Applications to the younger ones with the intent of arousing their interest in the emerging areas of Space activities. The two week long residential training programme will cover invited talks and experience sharing by the eminent scientists, facility and lab visits, hands on training, exclusive sessions for discussions with experts and a feedback session. While inaugurating the programme, Chairman, ISRO, mentioned that it is a very important science programme for students. He said that this programme would help in inculcating scientific temper of the student. He reiterated that Science and Technology is an essential component for the development of any country and plays a major role for improving the quality of life including safety and security of human beings. Dr. Sivan also touched upon the applications of Space technology and how this technology is helping in the day to day activities of common man besides ensuring safety of life and property during disaster situations. Chairman, ISRO also said that programmes like this will lead to national integration and nation building. He wished that YUVIKA programme should produce a good number of scientists every year. Dr. Sivan wished all the students good luck and promised to meet them during "YUVIKA-SAMWAD" session at SDSC SHAR, Sriharikota on May 17, 2019.

Source: <https://www.ISRO.gov.in/>

India Successfully Launches Earth Observation Satellite

India's Polar Satellite Launch Vehicle (PSLV-C46) successfully launched its RISAT-2B Earth Observation (EO) satellite from Satish Dhawan Space Center (SDSC). PSLV-C46 lifted-off at 5:30 IST from the First Launch Pad and injected RISAT-2B into an orbit of 556 kilometers (km), about 15 minutes and 25 seconds after lift-off. After separation, solar arrays of RISAT-2B were deployed automatically and ISRO Telemetry Tracking and Command Network (ISTRAC) at Bengaluru assumed control of the satellite. In the coming days, the satellite will be brought to its final operational configuration. RISAT-2B is a radar imaging EO satellite weighing about 615 kilograms (kg). The satellite is intended to provide services in the fields of agriculture, forestry, and disaster management. ISRO Chairman Dr K Sivan congratulated the launch vehicle and satellite teams involved in the mission. "With this launch, PSLV lofts 50 tonnes to space by launching 354 satellites, including national, student and foreign satellites."

Source: <https://www.satellitetoday.com/>

Largest liquid Hydrogen storage tank flagged off

Indian Space Research Organisation (ISRO) Secretary, DOS & Chairman, Dr. K Sivan, flagged off the shipment of India's largest liquid Hydrogen storage tank at VRV Asia Pacific production plant at Sri City in Chittoor district. Addressing the gathering, Dr. Sivan congratulated the VRV and other teams for indigenously realising such an advanced version of the liquid hydrogen storage tank. "I consider this as only a beginning for our cooperation, and suggest to VRV to come forward to undertake the fabrication works of onboard tanks of rockets," he said. S Pandian, Director, SDSC SHAR, said that event stands out as a typical example for ISRO-Industry cooperation for realising import substitutes indigenously. VRV Asia Pacific manufactured the storage tank with a Liquid Nitrogen (LIN) shield, in a collaborative effort with Satish Dhawan Space Centre (SDSC) SHAR, under the Make in India initiative. The storage capacity of the tank is 120 kilo litres. Liquid hydrogen is used as fuel for satellite launch vehicles. Earlier, on behalf of Sri City, Mr Ramesh Subramaniam, president, Sri City Foundation, greeted the visiting dignitaries. Welcoming the guests, G L Ranganekar, Managing Director, VRV, summarised the technical intricacies of the tank and its realisation process, and thanked ISRO teams for extending full cooperation. He also took them round the plant.

Source: <http://www.newindianexpress.com/>

India's largest ever 'eye in the sky' will take on its neighbours

India is upgraded its spy satellite system by launched another 'eye in the sky' on May 22. The South Asian country's new addition will be able to pierce through clouds, and capture 'the real picture' of its borders, amidst intensifying geopolitical tensions. The Radar Satellite (RISAT) 2BR1 is the latest addition to the RISAT series of India's defensive satellites. This is an upgrade over its predecessors and adds to India's surveillance capabilities. On one side, India will be able to monitor the Indian Ocean for Chinese naval ships more efficiently and, on the other, keep an eye on the Arabian Sea for Pakistani warships. Even Pakistan-occupied Kashmir and the Line of Control (LoC) that runs between Pakistan and India will be under surveillance — day and night. RISAT 2BR1 is first of the five planned military satellites that Indian Space Research Organisation (ISRO) has planned for 2019. This is an impressive record for ISRO, which launches one or two military satellites a year. RISAT-1 was successfully launched on 26 April 2012 for a period of five years. It is first indigenous microwave remote sensing satellite designed and developed by ISRO. It was launched by PSLV-C19 into sun's synchronous orbit at an altitude of 536 km. It was *not designed as a surveillance satellite* as it relied on the C-band. Its data was extensively used for applications like natural resources management, in areas of agriculture planning, mainly paddy monitoring in kharif season, forestry surveys and disaster management support, during natural disasters like floods and cyclones. About to be deployed RISAT-2BR1 satellite uses same SAR band and will further improve India's imaging reconnaissance (surveillance) abilities.

Piercing the Clouds

RISAT 1 and RISAT 2 are strong surveillance satellites in their own right. But RISAT 2BR1's X Band synthetic aperture radar (SAR) can pierce through the clouds, and has a resolution of up to one meter. Increased resolution means, it can decipher between different objects on the ground provided they're at least a meter apart. RISAT 2, launched in 2009, was India's first reconnaissance satellite, also known as spy or intelligence satellites. The original X Band SAR on board was a military grade sensor radar from Israel Aerospace Industries (IAI). It was actually launched before RISAT 1, officially an agricultural satellite, in lieu of the 2009 Mumbai terror attacks which called for increased vigilance along the borders. Striking resolution Images from RISAT 2 are known to have played a role in conducting the surgical strikes along India's LoC in 2016, as well as the 2019 Balakot airstrike. The indigenously manufactured X Band SAR on RISAT 2BR1 uses the motion of the radar's antenna to scan over the area where the target is assigned. So, rather than use conventional beam scanning to capture an image, X Band SAR uses radar pulse calculations to create a spatial resolution. Larger the aperture, or longer that radar pulses take to return, the higher the image resolution. The RISAT 2BR1 will launch from Sriharikota in Andhra Pradesh aboard one of the variants of the Polar Satellite Launch Vehicle (PSLV).

Source: Business insider

Indian Navy's 'INS Vela' of Project 75 Submarine Launched

Indian Navy's fourth stealth Scorpene class Submarine Vela of Project 75 was launched at the Kanhoji Angre Wet Basin of Mazagon Dock Limited (MDL) here. Post the launch, the submarine is set to commence sea trials. The submarines are being built at Mazagon Dock Limited, with the main collaborator being M/s Naval group, France. The Scorpene is a 2000-tons conventional-propulsion submarine designed and developed for all types of mission, such as

surface vessel warfare, anti-submarine warfare, long-range strikes, special operations or intelligence gathering. Extremely stealthy and fast, it has a level of operating automation that allows a limited number of crew members, which reduces its operating costs significantly. Its combat edge is highlighted by the fact that it has 6 weapon launching tubes, 18 weapons (torpedoes, missiles, mines). The Scorpene submarines can undertake multifarious types of missions i.e., anti-surface warfare, anti-submarine warfare, intelligence gathering, mine laying, area surveillance etc. The submarine is designed to operate in all theatres, with means provided to ensure interoperability with other components of a Naval Task Force. It is a potent platform, marking a generational shift in submarine operations. Secretary (Defence Production) Ajay Kumar was the chief guest for the launch ceremony and Veena Ajay Kumar was the lady dignitary who performed the ceremony. "The submarine has been named 'Vela' after an earlier submarine, which was the lead submarine, of the erstwhile Vela class, the second batch of the Foxtrot class submarines acquired from USSR," according to a statement. The steel cutting for this submarine commenced in July 2009. The submarine has completed joining of all its sections. This submarine would be using Indigenous developed batteries by M/s Exide, India. "The launch ceremony also signifies that four submarines of this project would be afloat and soon joining the Indian Navy's submarine fleet," the statement added. The INS Vela is the fourth of the six submarines of Scorpene class that has completed its out fittings at Mazagon Dock Limited (MDL) Mumbai. Vagir and Vagsheer are the remaining two submarines in the country's Scorpene Submarine programme are in the advanced stages of manufacturing at MDL. A contract was signed in 2005, between French DCNS, and Mazgaon Dock Limited under Indian Navy's Project-75 for the supply of six submarines. The first submarine INS Kalvari was commissioned in December last year while two other submarines—INS Khanderi and INS Karanj—are in the advanced stages to join the Navy fleet.

Source: <https://defenceupdate.in>

Indian Air Force plans to buy advanced 'bunker buster' version of Spice-2000 bombs

The Indian Air Force (IAF) is planning to buy an advanced version of the Spice-2000 bomb, which can be used to reduce enemy buildings and bunkers to rubbles in no time. It is to be noted that Spice-2000 bomb was used by IAF's Mirage-2000 fighter jets in the airstrikes on Jaish-e-Mohammad terror camp at Balakot in Pakistan. However, the penetrator version of Spice-2000 bombs was used by the IAF in the Balakot airstrikes which made holes in the concrete rooftops of the buildings in the Jaish camp but did not destroy the buildings. The bombs, however, exploded inside the building killing those who were present inside the building. It's been widely reported that the Indian Air Force Mirage 2000 jets used SPICE-2000 bombs during the mission to destroy Jaish-e-Mohammad's Balakot terrorist training camp. Well, it turns out that the SPICE-2000 is not a bomb at all. It in fact is a 'guidance kit' that is attached to a standard warhead or bomb. In this case, the actual bombs used during the February 26 2019 Balakot bombing were likely Indian-made warheads manufactured by one of our ordnance factories. What the SPICE-2000 did was turn the bomb into a smart device with the ability to glide in the air and make minor adjustments to precisely hit its target. We'll explain how. SPICE, manufactured by the Israeli defence technology company Rafael, is short for 'Smart, Precise-Impact and Cost-Effective'. The SPICE guidance kit consists of two pieces — one is attached to the bomb's head and the other is attached at the end. "The IAF is now planning to acquire the bunker buster or the building destroyer version with Mark 84 warhead which can decimate targeted buildings," government sources told ANI. It is expected that the acquisition of an advanced version of Spice-2000 would be done through the emergency powers granted to the three services. The emergency powers give the three services authority to buy any equipment of their choice worth up to Rs 300 crore. Sources said that the Army has decided to use this power to buy Spike anti-tank guided missiles deployment to tackle any possible armoured threat posed by the enemy troops. The IAF is planning to acquire an advanced version of Spice-2000 bomb from Israel which is one of the main weapon and ammunition supplier of the Air Force. A SPICE bomb has a standoff range of 60 kilometres and approaches the target as its unique scene-matching algorithm compares the electro-optical image received in real-time via the weapon seeker with mission reference data stored in the weapon computer memory and adjusts the flight path accordingly. SPICE 2000 consists of an add-on kit for warheads such as the MK-84, BLU-109, APW and RAP-2000. The IAF had conducted the Balakot airstrikes on February 27 2019 in response to the terrorist attack on a CRPF convoy in Pulwama which resulted in the martyrdom of 40 CRPF personnel.

Source: Zee Media

Hyper-sonic BrahMos 2 is becoming a distant dream for Indian Armed forces?

Russian-Indian joint venture Brahmos Aerospace was supposed to work on the development of hypersonic BrahMos 2 cruise missile which was later renamed as BrahMos 2K, K standing in memory for Kalam but the program development

which has been in talks from 2011 onwards is yet to see the light of the day, makes many wonder, why the program is yet to take off and remains only to be seen at defense expo. BrahMos 2K missile was capable of flying at speeds of Mach 5-Mach 7 and according to then BrahMos chief in 2012, they had carried out series of lab tests at the speed of 6.5 Mach and first fully-functional prototype of the missile was supposed to make its debut by 2017-18 which has long gone. Hypersonic weapons are missiles and aircraft capable of reaching speeds of Mach 5 and more – or five times the speed of sound. They are extremely difficult to intercept due to their overwhelming speed and manoeuvring capabilities. BrahMos-II will confer on India a major strategic advantage in mountain warfare against China. The missile is designed to select targets hidden behind a mountain range. The hypersonic weapon's immense destructive power will result from kinetic energy. An object striking a target at 6 Mach will generate 36 times the force of an object of the same mass striking the target at 1 Mach. This phenomenon makes hypersonic weapons well suited to attacking hardened or deeply buried targets such as bunkers or nuclear and biological-weapon storage facilities. While the US, China, and Russia have joined the Elite Hypersonic club, entry of India into it has been denied or refused to maintain elitism of the Hypersonic club, since it clearly seems that Russia is reluctant to transfer Hypersonic weapons system or is simply asking for too much money to develop BrahMos 2K with India. Like seen in the ASAT program, India will need to develop its own Hypersonic missile system to enter into this Elite Hypersonic club or be ready to be left out behind. since the Hypersonic missile system are considered as Game changer in any war, for now, Russia is holding the high bargaining chip and might have agreed to increase range of current BrahMos from Mach 2.9 to 3.5 only as interim measure to satisfy current need to modernize BrahMos system. At Aero India 2015, the new CEO of BrahMos Aerospace, Mr Sudhir Mishra said that scientists had quietly begun work on the hypersonic version of the supersonic BrahMos missile. He expressed the view that the India may be the first country in the world to field a hypersonic missile "in the next 7-12 years". This pushed the timeline for the BrahMos II back to 2022-2027. But in 2016, the marketing director of BrahMos Aerospace, Mr Praveen Pathak, suggested that this was not true in an interview with the Russian TASS news service. He said that work on the hypersonic BrahMos would begin in 2022, and that a prototype would be ready two years later in 2024. At this point, it's likely that earlier work on the hypersonic missile was wiped clean, since Mr Pathak suggested that the missile's shape and design were not known. During the interview, he stated that "the preliminary design is now being developed." In 2018 this was pushed back further. Mishra told that "We will require seven to ten years from now to become a hypersonic missile system," suggesting that the hypersonic BrahMos would only reach service between 2025 and 2028. So where does the BrahMos II stand in 2019? In a report about the BrahMos at Aero India 2019, it was simply said that the hypersonic version would exist "in a few years." While this is far more realistic, given that Russia has nearly completed development of its own missiles, time will tell if the BrahMos II is delayed yet again. The BrahMos II project may suffer the same fate as many other Indian defense projects if a rapid need for a hypersonic missile is revealed in the region. While the original BrahMos project was a successful joint venture between India and Russia, it largely proceeded on schedule. BrahMos II has not.

Source: <https://defenceupdate.in>

India Faces Hard Choice: US THAAD v/s. Russian S-400 Triumph

US has suggested that Delhi choose Terminal High Altitude Area Defence (THAAD) and Patriot Advance Capability (PAC-3) anti-aircraft missile systems over Russia's S-400s, the Indian newspaper Hindustan Times reports. If India went ahead with the purchase, it could face sanctions from the US under a 2017 federal law that targeted Russia (as well as North Korea and Iran) with sanctions and prohibited any other nation from negotiating defence deals with these countries. Moscow has slammed the law as a declaration of "all-out trade war". US is understood to have pledged to grant a sanctions waiver to India last September despite its plans to buy the S-400s; however, the waiver expired in early May. It comes after an official with the US Department of Defence said in March that the US was working on an "alternative choice" for India. The S-400 is touted as one the most advanced air defence missile systems in the world, capable of firing three different types of missiles at a short-to-extremely-long range. The missiles can tackle a variety of targets, including aircraft jammers, reconnaissance aircraft, cruise missiles and short-range ballistic missiles. S-400 is an anti-aircraft weapon system which is capable to shoot down any manoeuvrable fast moving aircrafts close to a range of 400km and also has capabilities to bring down cruise missile and Ballistic missiles but Terminal High Altitude Area Defense (THAAD) is specially designed to intercept long-range missiles (IRBMs or ICBMs) at either before or during the early phase of their reentry, which means their radar systems and system controls should be able to detect targets from long distance (1,200 kilometers for objects with 1 square meter RCS). This forced the size of such system to be relatively large. Also, with such a specific goal, there are other missiles and fighter aircrafts enlisted to provide anti-aircraft fire, there is no need for THAAD to worry about airborne threat. Therefore, it cannot intercept anything other than ballistic missiles, and relies entirely on friendly units for protection. The THAAD is good against

high altitude missiles. But the after defense requires the capability to take down targets at low altitude, not in space. The S400 is a single jack of all trades system that is designed to provide formidable air and missile defense over a wide area at an affordable cost. The S-400 is also highly flexible when it comes to engagement ranges. The system uses multiple types of interceptors based on the targets range. The S-400 command node can use one of the following interceptors to bring down its target: The insane 40N6 (~ 400 kms) , the very long range 48N6 (~250 kms), the long range 9M96E2 (~120 kms) and medium range 9M96E (~ 40kms). The big interceptors (which are understandably harder on the pockets) need not be used on targets flying closer and can be reserved to harass slow moving, high value targets (like AWACS, Fuel tankers, transports etc). The Russians find this approach of arming a single system with multiple interceptors most suitable for their needs. The US-built THAAD can hit targets only at very high altitudes (minimum 40-50 km) due to which it is useless against fighter jets or long-range tactical aircrafts, making it strictly an anti-missile defense system. Whereas, S-400 can target aircrafts as well as cruise missiles and ballistic missiles which makes it more effective than THAAD. Moreover, THAAD has never been used in actual warfare, whereas, S400 is time-tested in the actual operational environment in Syria. THAAD: India already has Anti-ballistic missile (ABM) capabilities and will be soon deploying its Phase-I Interceptor batteries to protect crucial cities like Delhi and Mumbai soon and procurement of THAAD could only strengthen India's Anti-ballistic missile (ABM) capabilities with the local system. Technological advancement of THAAD could actually help India plan its Phase-II Interceptor batteries but nowhere it can substitute them, recent ASAT Missile system test showcases India's technological advancement to create building blocks to commence development of Phase-II Interceptor missiles which will be highly effective against a missile launched from over 5000km range. India is also developing its own very long range Anti-aircraft missile system called XRSAM with a range of 250km and with additional funding can develop a 400 or 500 km range Anti-aircraft missile in the same league as S-400 and S-500 systems but the call can be only taken by gauging available capabilities at hand and India has to decide which one they want to develop on their own and which one they want to buy off the shelf. As one can see, the S-400 has many advantages over the THAAD, including a broad greater range, a lower price, and a wider range of targets to knock down, but it's not about comparing specifications or costs. Saudi Arabia wants to have both systems in the inventory, India could do it too. What really matters is that Russia attaches no strings to the deal. Unlike the US, it exerts no pressure and makes no threats. It treats India with respect and does not hurt its national pride by trying to impose its weapon systems instead of winning in a fair contest. Moscow does not threaten New Delhi with sanctions and other things if it buys the American THAAD. That's the main difference between the two deals India has to consider. China is already operating S-400s, Turkey has concluded a deal. Saudi Arabia and Qatar are engaged in negotiations over the purchase while many more nations are considering such a possibility. India will not make a mistake if it buys the Russian system. With the deal going through, it'll get a bigger bang for its buck and protect its sovereignty demonstrating the determination to resist pressure. Great nations cannot be dictated the terms of decisions they are going to make. The Indian government knows better what weapon its military needs to defend the country.

Source: <https://defenceupdate.in>

MWF Tejas :-Why Tejas Mk2 (MWF) Will Be Important

With the Indian Air Force's (IAF's) MMRCA program getting serially delayed and recast more than once, there was a feeling in various quarters that the Tejas Mk2 design should perhaps evolve further than what was initially envisaged to provide an indigenous option for the IAF's requirements. Thus, the IAF and the Aeronautical Development Agency (ADA) sat down to redefine the Tejas Mk2 with more elaborate modifications such that it could function as a medium weight fighter for ground attack roles while continuing to be nimble in the air to air (A2A) role. In fact, the version of the Tejas Mk2 currently envisaged has been rebadged as the Medium Weight Fighter or (MWF) and is being designed as a replacement for the Mirage 2000 with a view to surpassing its capabilities in almost every respect Tejas Mk2 also known as Medium Weight Fighter (MWF) looks very much similar to Tejas Mk1. However the main differences are prolonged fuselage. The overall length of Tejas Mk2 is 14.7 meter from increased from 13.2 meter in Tejas Mk1. While studying the aerodynamics and its constrains in Tejas Mk1, it was observed that it was unable to comply to Area ruling because of short length. So it was decided to take care of this concern of Tejas Mk1 by increasing the length. Other aerodynamic issues such as elevating canopy, redesigning pylon, putting short range missile on wing tip etc is freezed in Mk2 design. All this will reduce aerodynamic drag and will improve transonic acceleration by a very good margin. Mark-2 MWF will continue to have the legacy LCA-Tejas Mk1 and Mk1A design elements which will be powered by single F414-GE-INS6 engine supplied by General Electric which has already started to arrive in India from 2017 onwards. MWF will exceed the performance of Upgraded Mirage-2000 when Inducted into air force but actually will replace Mig-29 first. MWF will also be replacing Jaguar fighter-Bomber which are due to be retired from service

from 2034 onwards Development of MWF was convinced only in 2014-15 period and the whole platform was redesigned and the previous Mk-2 design concept which was just Mk1 air frame with 0.5m fuselage plug has been discarded to allow the platform to be classified as a Medium class aircraft. Since the 5th generation AMCA program was unofficially commissioned way before MWF was conceived, designers were able to feature in a lot of Radar cross-section (RCS) reduction measures in the air frame design to reduce electromagnetic and infrared signatures of the aircraft with use of carbon composite and thermoplastic composites at the frontal section of the aircraft to achieve better RCS reduction. Another big issue which is addressed is increasing fuel capacity from 2.5 tons to 3.3 ton which will give it a big boost in ferry range and combat radius. Supersonic fuel tanks are also developed. It offers a big fuel capacity with minimum addition of drag. This will further add to range and mission capability to carry out operation in large geographical area.

Canard

It is not only a betterment but was necessary. In fact, ADA had considered canard in LCA Tejas as one the short-selected design concepts in the 1980s. Later the idea was dropped because that was the first time India was developing a Flight Control System (FCS)- that too for a highly unstable aircraft like Tejas; so adding canard i.e. an extra control surface would have increased the complexities and risk with no significant aerodynamic advantage relative to the complexity. Now that a robust FCS has been developed, adding canard is an incremental development challenge that ADA can handle.

The canard is 'close-coupled' (meaning it is located just above and forward of the wing)

A close-coupled has many positive aerodynamic effects like:

- i) It increases wing lift. For Delta wing design aircraft (like Tejas), close-coupled canard benefits even more- increases lift both in low speed flight and high (transonic) speed flight.
- ii) It creates better aerodynamic stability of wing vortices
- iii) It reduces wing-loading
- iv) It gives an extra control surfaces for pitch and roll control, and on the ground, as air-brakes.
- v) It reduces take-off distance.
- vi) A good area ruling that includes the canard helps to reduce various aerodynamic drag (wave drag, trim drag etc.) hence enhancing its performance.
- vii) Compensation for shift of CG with respect to CL (as said in 1st point)

Stealth

At least Four RCS reduction measures will be incorporated in the air frame design so that " Semi Stealth " can be achieved with help from the use of fully internal electronic warfare system to defuse radar frequency (RF) and infrared (IR) threats while on the mission.

MWF will also get a stealth coating paint which has been developed specifically for the AMCA program but only at certain sections to manage absorption of all radar frequencies. Critical RCS reduction measures in the air frame will be

- 1) Wing and Canard edge alignment to reduce drag and also reduce friction heat and improve RF deflection,
- 2) Air intakes ducts will have twisted design so that engine blades can be carefully hidden inside the intake duct.
- 3) Radar-absorbent materials on the critical sections of the fuselage will be used
- 4) Sharp edges at front fuselage will also help reduce radar cross-section.

MWF fighter jet program will be replacing entire Mirage 2000, MiG-29 and Jaguar fighter fleet from Indian air force inventory of nearly 200 jets and since it will need to be operated in contested environments where stealth features will come in handy to improve the survivability of the platform and the pilot. MWF cannot be classified as a stealth aircraft but measures to reduce its RCS will ensure its survivability. MWF will be getting new AESA Radar, on-board oxygen-generating system, Internal advanced electronic warfare (EW) suite, larger Multi-functional displays, the upgraded digital flight control computer (DFCC), Infra-Red Search and Track (IRST). Missile Approach warning system (MAWS) and Higher thrust engines which makes it distinctively class apart from the baseline LCA-Tejas fighter jets. After building huge inventory of heavy category fighter like SU 30 MKI and developing light weight Tejas MK1, Entire focus of India is now centered on acquiring medium weight fighter like Rafale or other MMRCA. Tejas Mk2 is a surprising sweet option which has emerged for Indian air force.

Radar, Infrared track and search system and electronic warfare:

This area is also got a big boost. New Uttam AESA radar will have much higher range than current MMR and it will virtually be Jam proof. It will replace Israeli ELTA 2052 radar in Tejas Mk2. BEL has started work on development of Infrared track and search system which will go into Tejas Mk2. This will give Tejas a great capability to see enemy even without putting its AESA radar on to keep its presence secrete. An Israeli company is already short listed to co-develop electronic warfare suite. Same suite for Mig 29 is already been developed. Development of EW suite for Tejas Mk2 is unlikely to face any challenge. Missile approach warning system is already been developed which will go into Mk2. Sensor fusion is a grey area and yet much clarification has not come.

Weapons:

Tejas Mk2 will come with huge weapon load of 6.5 tons. Designers have already surpassed all expectation of IAF by providing 11 hand points and some of them may be used with multiple hangers carrying two missile of each one. This is a combination of huge payload and huge number of hand point will give this plane an extraordinary flexibility to carry any sort of mission with missiles or bombs and strike a target far away. R 73 and derby missiles are already tested from Tejas Mk1. Python was also tested from Tejas Mk1 but it was found a bit unsuitable. Home grown Astra Mk1 with 80 KM range is already been tested and integrated with Sukhoi 30 MKI. This will go into Mk1 as well as Mk2. There are in talks with France to integrate Meteor with Tejas. France is ready to do that provided the Radar is Indian and not Israeli. With arrival of desi Uttam AESA radar, the way to integrate Meteor will clear. Meanwhile India has done few successful tests of her indigenous solid fuel duct ramjet engine missile which will have about 130 to 150 KM range some 30 KM lesser than meteor. If either of the two goes into Tejas Mk2, they will be more than a match for enemies of India for decades to come. Meanwhile Israel has offered I derby, the upgraded version of Debby. India is already using Mica of France on Mirage 2000. So India has a great flexibility and multiple options to integrate missile and other weapons on Tejas Mk2 like no other nation has with options of Russian, Israeli, European, French and Indian weapons. DRDO has already tested anti-radiation missile with more than 100 KM range so as SAAW. This will give Tejas MK2 an additional punch which its competitors are lacking. Tejas will have enviously high weapon choices not available to any of the plane of its class. It will simply outsmart any other plane in the area of weapons.

Conclusion:

Tejas Mk2 is an upgraded version of Tejas MK1 . All shortcomings of Tejas Mk1 are addresses in Tejas Mk2. It will have a very high ferry range, combat radius and a very decent payload. It is designed for High manoeuvrability unlike some bomb trucks. Tejas Mk2 can do 9/-3.5 g with high AOA. Mark-2 MWF will continue to have the legacy LCA-Tejas Mk1 and Mk1A design elements which will be powered by single F414-GE-INS6 engine supplied by General Electric which has already started to arrive in India from 2017 onwards. MWF fighter jet program will be replacing entire Mirage 2000, MiG-29 and Jaguar fighter fleet from Indian air force inventory of nearly 200 jets and since it will need to be operated in contested environments where stealth features will come in handy to improve the survivability of the platform and the pilot. MWF cannot be classified as a stealth aircraft but measures to reduce its RCS will ensure its survivability.

Source: Defence Forum India

Indian Navy Demonstrates 'MRSAM 'Cooperative Engagement' capability

The Indian Navy announced that it had achieved a "significant milestone" in its anti-air warfare capabilities by having one of its warships control missiles fired from two ships . The Indian Navy announced that, with the test of this cooperative engagement system, "it has become a part of a select group of navies that have this niche capability. This capability significantly enhances the combat effectiveness of the Indian Navy, thereby providing an operational edge over potential adversaries." A press release by the Indian Navy described the test as its "maiden cooperative engagement", for which the Medium-Range Surface-to-Air Missile (MRSAM), co-developed with Israel, was used. Israel Aerospace Industries refers to the MRSAM as the Barak-8 missile. The Indian Navy statement said the test was "carried out by the Indian Navy, DRDO and Israel Aerospace Industries". The test was conducted on the Western Seaboard and involved the warships, INS Kochi and INS Chennai. Both INS Kochi and INS Chennai fired their MRSAM missiles, which were controlled by one of the ships to "intercept different aerial targets at extended ranges". Both the INS Kochi and INS Chennai are ships of the Kolkata class of destroyers and are equipped with the Israeli-origin ELM-2248 MF-STAR radar system and MRSAM missiles. According to an Israel Aerospace Industries brochure, the MF-STAR radar can track a large number of targets over 450km away. The new engagement capability derives from the network-centric architecture of the Barak 8 system and its MF-STAR 360° radar system that harness multiple sensors, launch platforms, and effectors into a single air defense system. By fitting a data-link to each interceptor, missiles can be updated via data-link after launch by any network member. With this capability, Barak-8 missiles can receive target updates on their mid-course, with updated target information, retasking the highest priority target, until the missile enters the terminal engagement. This capability maximizes missile utilization and battle economy. It enables a single ship to orchestrate the air defense mission or allocate missions to other vessels when required. MRSAM Surface to Air Missiles (also known as Barak 8) are fitted onboard the Kolkata Class Destroyers (Kolkata, Kochi, and Chennai) and would also be fitted on all future major warships of the Indian Navy. Cooperative engagement involves using data-links between ships and platforms to have a "common picture" of a battle situation and taking control of weaponry on multiple platforms. A cooperative engagement system allows navies to respond more rapidly to 'saturation attacks' involving large numbers of low-flying anti-ship missiles. Cooperative engagement revolves around maximising the advantages offered by sophisticated radars such as the MF-STAR. The US Navy has developed a Cooperative Engagement Capability (CEC) for decades, which it describes as a "real-time sensor netting system that enables high-quality situational awareness and integrated fire control capability." The US Navy explains CEC involves the "netting of

geographically dispersed sensors to provide a single integrated air picture, thus enabling integrated fire control to destroy increasingly capable threat cruise missiles and aircraft.” In addition to data from warships, the US Navy’s CEC also collates information from aircraft, satellites and other sensors. The US Navy, the Royal Australian Navy and Japanese Maritime Self-Defense Force are navies that are known to have adopted the CEC. These navies use the US-developed Aegis battle management system and Standard Missile series of missiles. The US Navy has also tested CEC for use in ballistic missile defence roles.

Source: The Week

INS ‘Vishal’ – India’s Next Aircraft Carrier

Reports in media indicate UK is in talks with the Indian government on building a new state-of-the-art aircraft carrier on the lines of Britain’s HMS ‘Queen Elizabeth’ as part of ongoing ‘Make in India’ negotiations. The report says that talks are underway for the Indian Navy to ‘buy’ detailed plans for the 65,000-ton British warship to build what is described as “copycat super-carrier”, to be named INS ‘Vishal’ in 2022. The design of HMS ‘Queen Elizabeth’ is jointly owned by BAE and Thales – British and French aerospace giants. In 1987, India had procured British aircraft carrier HMS ‘Hermes’ which was renamed INS ‘Virat’, which was de-commissioned two years ago on May 12, 2017. HMS ‘Hermes’ had participated in operations in the Falklands. An Indian delegation has reportedly already visited Rosyth Dockyard in Scotland where HMS ‘Queen Elizabeth’ was built and where Britain is building its next aircraft carrier, HMS ‘Prince of Wales’. Mr Stuart Andrew, Britain’s Defence Minister declined to comment on this specific issue saying, “We have regular discussions with India on a range of equipment and capability issues. It would be inappropriate to comment further.” But media quoting a BAE spokesperson confirms that BAE has begun discussions with India and that the design can be modified to meet Indian Navy and local industry requirements. If the deal comes through, the new warship could be built in India under ‘Make in India’ with many parts possibly supplied by British companies. INS ‘Vishal’ would serve alongside India’s 45,000-ton aircraft carrier INS ‘Vikramaditya’ purchased from Russia in 2004 and the 40,000-ton first indigenous aircraft carrier INS ‘Vikrant’, which is undergoing outfitting at Kochi Shipyard Limited. In case of INS Vikrant, Navy is looking for 57 multi-role fighter jets because naval version of indigenous Light Combat Aircraft (Tejas) cannot operate from its deck. Sea acceptance trials of INS Vikrant are to commence in latter half of this year and the carrier is to be delivered to the Navy by 2021, as stated Admiral Sunil Lamba, Chief of Naval Staff on April 20, 2019. News of the third aircraft carrier has set off the debate whether India needs a third aircraft carrier and whether it would not be better to arm its islands, particularly the Andaman and Nicobar Group of Islands (ANI) – getting islands ready not only to defend India’s exclusive economic zone (EEZ) but preparing them as jump off points for launching offensive operations, when required. Induction of a Chinese CBG in the India Ocean Region (IOR) may be some years away but China is already building its third aircraft carrier (displacement of about 80,000 tons) and indications are China will have minimum four carrier battle groups (CBGs) in service by 2030. Some reports indicate China’s fourth aircraft carrier will be nuclear with displacement of 110,000 tons, making 30 knots and accommodating over 70 next generation fighter aircraft and drones – matching super-carriers of the US. For ground support of CBGs, China has militarized the SCS and plans to build 18-19 bases in the IOR under pretext “Overseas Strategic Support Bases”. China has invested in 95 ports worldwide and debt-trapped Sri Lanka in handing over Hambantota port for 99 years. Chinese naval bases in Djibouti and Gwadar (Pakistan) are home to PLA marines. No doubt INS Vishal will be expensive, taking into account the overall cost of a CBG, but the carrier versus island debate must be viewed in the backdrop of what extent of sea control would India require in the future. India strategically juts into the Indian Ocean, through which two-third of world’s oil shipments, one-third of bulk cargo traffic and half the world’s container traffic transit. This translates into some 90,000 ships of world’s commercial fleet (9.84 billion tons) annually. India’s international trade (95% by volume and 70% by value) moves by sea, including large amount eastward with China, ASEAN countries and Southeastern nations. India needs to protect its coastline (7,863 km), EEZ (1.02 million sq km) and 17,000 sq km of offshore assets. India’s cargo traffic handled by ports is expected to reach 1,695 million MT by 2021-22, as against 643 million MT 2014-15. That is why India’s naval plans always catered for both eastern and western flanks, even though existing single aircraft carrier in western naval fleet may give impression of western bias. Importantly, there is no denying that CBGs are best for sea control thousands of kilometers away from own shores. As part of RMA, China did initially invest in massive infusion of submarines but is now concentrating on CBGs because submarines are good for sea denial, not sea control. Also, submarines cannot achieve three-dimensional control over a large expanse of ocean, far from own shores. INS Vishal is still in planning stage and would perhaps be operationalised by 2025-2020 or so. China could have more than four CBGs in service by then. Will India need power projection capabilities beyond its immediate neighbourhood by then including for guarding SLOCs? The answer should be in the affirmative.

Why do we need INS Vishal?

Unless India stands up to the world, no one will respect us. In this world, fear has no place. Only strength respects strength. – **A. P. J. Abdul Kalam**

Source: Indian Defence Review

TECHNOLOGY

GE Aviation brings advanced avionics computing to unmanned vehicles

GE Aviation has introduced a new advanced avionics computer specifically built for military and commercial unmanned vehicles. This new computer provides an open architecture design that integrates vehicle management and advanced mission processing into a compact, lightweight design. GE Aviation made the announcement at AUVSI Xponential, taking place April 29-May 2 in Chicago. “Our customers have told us that they require an integrated vehicle and mission processing solution that is secure, rugged, low size, weight and power and capable of meeting the needs of demanding autonomous platforms,” said Mr Alan Caslavka, president of avionics for GE Aviation. “This new system hits it out of the park in this regard and then builds from there in terms of bringing new capabilities to the next generation of unmanned systems.” This new system incorporates the processing power required for mission functions such as sensor processing at the edge and hosting autonomy enabling algorithms and then also embeds an inertial/GPS package, software defined radio, datalink and an optional solid-state storage device. Mr Caslavka added, “The new system incorporates diverse processing that’s capable of performing safety critical and non-critical functions while bringing a new level of security to legacy and future platforms.” The system integrates the functionality traditionally provided by up to six separate electronic units into a single package which drives out weight, power, and cost while meeting the security, exportability, ruggedness and processing needs of our customers. GE’s advanced avionics computer has undergone flight testing and is in use by a number of military and civil customers. The computer incorporates a hardware and software open architecture approach that offers flexibility and scalability. This design also provides the capability to host GE, customer and third-party software applications to maximize its versatility.

Source: <https://www.gpsworld.com/>

Most of debris generated from India’s anti-satellite test has decayed, says DRDO Chairman

DRDO Chairman Dr G Satheesh Reddy has said that most of the debris generated from the anti-satellite test conducted by India in March have decayed and rest of it will dissipate in a “short period of time”. He said this in response to a question after delivering a talk on ‘Technology for National Security’ at the Institute for Defence Studies and Analyses (IDSA), a city-based think tank. “As I had mentioned on April 6 2019 , the debris were to decay in a few weeks time. As per the information that we have already got, most of the debris have decayed. And, whatever, couple of pieces are there, they will be decaying in a short period of time,” Dr Reddy said. The Defence Research and Development Organisation chief said the continuous information being received is monitored and “I don’t think there are any issues”. “It is extremely difficult to predict as to how many days it would take...But, as I had said that day, that they would decay in a few weeks, and majority of them have decayed,” he added. On April 6 2019 at a press conference at DRDO Bhawan here, Dr Reddy had said India chose a much lower orbit of less than 300 km during ‘Mission Shakti’ for “capability demonstration” and to avoid threat of debris to global space assets. His remark had come days after the National Aeronautics and Space Administration (NASA) raised concerns about the spread of debris from India’s anti-satellite test conducted on March 27 2019. India’s Ministry of External Affairs, too, has said the test was done in the lower atmosphere to ensure that there is no space debris. On another question on leakage of defence know-how-related data, he said, “We haven’t seen cases as such, but we are careful”. “There are no serious issues as such, but of late, because of the apprehensions of cyber attacks and cyber-related issues, we are sensitising people in the industry and also in our own laboratories on it,” he said.

Source: <https://www.thehindubusinessline.com/>

Boeing India launches innovation programme to develop aerospace entrepreneurs

Aerospace major Boeing announced the launch of a programme for Indian university students, faculty and early stage start-ups to help innovators convert their ideas into viable business offerings that have the potential to shape the future of aerospace and defence. Applicants can submit their ideas in the fields of aerospace, autonomous vehicles, advanced manufacturing, augmented and virtual reality, analytics (artificial intelligence and machine learning), materials, robotics

and the Internet of Things. “Boeing is committed to nurturing innovation and skill development in India. We believe that a close partnership with India’s academia and growing entrepreneurial ecosystem has the potential to reimagine the future of aerospace for the world,” said Boeing India President Salil Gupte. “With Boeing University Innovation Leadership Development (BUILD) programme, we are creating a platform for students and entrepreneurs to not only benefit from our vast experience and partner networks, but also develop their ideas into path-breaking innovations,” he said in a statement. Boeing has partnered with seven incubators: IIT Delhi, IIT Gandhinagar, IIT Bombay, IIT Madras, IISc Bangalore, T-Hub Hyderabad and KIIT Bhubaneswar to select finalists for the BUILD boot camps. The shortlisted teams will compete at a regional level and the finalists will then pitch their ideas to a selection panel of subject-matter experts on Boeing Innovation Day, to be held in September. The winners stand a chance to win cash prizes. All through the programme, Boeing mentors and industry experts will interact with the finalists to refine ideas and develop their entrepreneurial skills. Over the years, Boeing has strategically invested in developing talent for the Indian aerospace sector. Boeing, through its programmes like HorizonX India Innovation Challenge and the Accelerated Aircraft Maintenance Engineers Apprenticeship, has made a significant impact in creating a skilled frontline workforce and empowered entrepreneurs in India, according to the statement.

Source: <https://www.business-standard.com/>

MIG-21 v/s. TEJAS :- Can Tejas replace MIG-21 and is it better than it?

Back in the 1980s, when Indian Air Force put forward its ‘Long Term Re-Equipment Plan 1981’, a big revelation came that almost all of the Mig-21 in Indian Service will be reaching the end of their service life which by estimation was almost 40% of the Combat Strength of Indian Air Force by 1995. Henceforth, the Light Combat Aircraft (LCA) Programme was launched to replace the Mig-21 in Indian Service and develop an aviation ecosystem in India. With the first prototype of LCA named as “Tejas” by former Prime Minister of India, Shri Atal Bihari Vajpayee in 2001 with the Final Operational Clearance being received in 2019, the LCA Programme has come to a full cycle even when the Mig-21 has persisted in Indian Service albeit with all the upgrades. Here I will discuss how the Tejas is better than the Mig-21 and can it replace the venerable Mig-21 in Indian Service, stressing upon five parameters which define their Combat Strength and Capabilities in the ever-changing sphere of Modern Warfare:

A. Kinematics:

Tejas is a light 4++ generation war plane. It is designed to intercept and engage hostile jet and to perform combat air patrol, Surveillance, close air support, hitting enemy positions with precision guided ammunition in some cases as a deep penetration strike fighter. A multi role aircraft like Tejas can perform various types of role in war with a combat radius of 500 km. HAL/ADA Tejas features a Tailless Cropped Compound Delta Wing Design while Mig-21 features a Tailed Cropped Delta Wing Design. The primary advantage of Delta Wing Design is when the aircraft transitions from subsonic speed to Supersonic Speed, it reduces the drag. Delta Wings are quite robust, efficient and quite inexpensive to develop and provides necessary parameters like a high Angle of Attack, more Maximum Take-Off Weight and a large total wing area. The Thrust-to-Weight Ratio of Mig-21 is 0.79 while that of the Tejas is the 0.94. Tejas has got the better of Mig-21 here as a higher Thrust-to-Weight Ratio gives a better climb rate to the aircraft. The Wing Loading of Mig-21 is 452.2 kg/m² while that of Tejas is 255.2 kg/m² which makes Tejas more manoeuvrable in Combat than Mig-21 owing to its lower Wing Loading. The Aspect Ratio of Mig-21 is 2.22 while that of Tejas is nearly 1.75. This lends Tejas much lesser drag during Flying Missions while Mig-21 gets much more lift. In terms of Angle of Attack, Tejas has a lesser Angle of Attack than Mig-21 which is beneficial for a Light Multirole Aircraft as Tejas as it is a tradeoff between the Angle of Attack and Lift which allows the Tejas to get a Wider Flight Envelope than the Mig-21 which has a Poor Lift at low Angle of Attack. In terms of Kinematics, Tejas has a significant edge over the venerable Mig-21 as it shows much more manoeuvrability, flexibility and better climb rate compared to the vintage Mig-21.

B. Weapons Package:

The basic Mig-21 Fishbed Model has 4 Hardpoints where it can mount external loads, pods or Fuel Tanks as needed during a Combat Mission. Tejas, on the other hand, has 8 Hardpoints where it can mount various External Loads in Combat Configuration. Indian Air Force Mig-21 is employed for Interception Duties, Close Air Support and Air Interdiction Duties, with a capability to carry upto 2000 kg of stores and provisions and in such missions, it has a provision of R-73 Within-Visual Range Air-to-Air Missile and R-77 Beyond-Visual-Range Air-to-Air Missile for Aerial Missions while it employs KAB-500 TV-Guided Fire and Forget Bombs and S-24 Rockets for Ground Attack Missions. R-77 is an active radar homing missile and has a range of 80 km and provides excellent multi-purpose target engagement capabilities thanks to its lattice tail controls. In an Air to Air configuration Tejas can carry two R-73 and four Derby-ER missile along with a drop tank. With the help of quadruplex digital fly by wire and helmet mounted sight It will perform very well in within visual range engagement. With a Multi-mode radar and Derby ER missile with a range of 100 km it has the

capability to take out any hostile aircraft in beyond visual range engagement. Mark1A version will incorporate an AESA radar so in BVR combat its efficiency will increase. In-Ground Attack Duties, Tejas can also be equipped with Laser Guided Bombs and Glide Bombs while an Aero India-2019 Model has hinted at integrating the BrahMos-NG Missile with Tejas which will be a big boost for Tejas Long-Range Strike Capabilities. BrahMos-NG is a slated miniaturized version of the BrahMos with a range of 290 km and supersonic speed of Mach 3.5. In terms of Weapons Package, Tejas wins hands-down compared to Mig-21 with its new range of much more state-of-the-art Air-to-Air Missiles and Ground Attack Weapons. Surveillance : Tejas armed with AN/AAQ-28(V) Litening targeting pod will be able to monitor ground targets or enemy movement. It can also be used as a secondary armed reconnaissance fighter. The litening pod included a forward looking high resolution infrared camera LITENING significantly increases the combat effectiveness of the aircraft during day, night and under-the-weather conditions in the attack of ground and air targets with a variety of standoff weapons (i.e., laser-guided bombs, conventional bombs and GPS-guided weapons).

C. Stealth:

Mig-21 has no Low Observability Feature as it has not been theorized to provide it with an achievable Low-Observability Capability back in the 1950s when it was put on the drawing board. However, in Indian service, Mig-21 was integrated with EL/L-8222 self-protection jamming pod and Radar Absorbent Materials to provide it with some Stealth features while engaging the targets. The cornerstone of Mig-21's electronic warfare capability lies with EL/L-8222 as it is designed to increase the survivability of the platform and possess a Digital Radio Frequency Memory (DRFM) based jammer with autonomous threat environment handling. The light and nimble Mig-21 is tough to spot during Within Visual Range Engagements and that's where the Mig-21 with its complement of R-73 Missiles augmented by a Helmet-Mounted Sight becomes even more deadly. Tejas is not only the stealthiest fighter in the IAF, but also arguably the stealthiest 4.5th generation fighter in the world. Its radar signature is estimated to be just 1/3rd of a Mirage2000. Apart from use of composites and its small size a Y-duct inlet which shields the engine compressor face from probing radar waves, and the application of radar-absorbent material (RAM) coatings are intended to minimize its susceptibility to detection and tracking.

D. Electronic Warfare Suite:

Mig-21 "Bison" possess a Phazotron NIIR's Kopyo Multimode X-Band Pulse Doppler Radar which possesses an air-to-air track-while-scan capability to detect ten targets at a time and engage two of them simultaneously. It can detect targets upto 50 km head-on while upto 30 kilometres in pursuit. Along with it, Mig-21 "Bison" has a Tarang Radar Warning Receiver which issues a warning to the pilot once the aircraft is "painted" or locked-on by the enemy aircraft and allows him to take defensive manoeuvres just in time. Tejas, on the other hand, features a superior Electronic Warfare Suite named as the MAYAVI EW (Electronic Warfare) Suite. Tejas Mk.1 currently lacks an Electronic Warfare Suite due to lack of space so we might see a dedicated EW Pod with Tejas only in future iterations like Mk.1A and Mk.2. Mayavi consists of a Tarang-2 Radar Warning Receiver, Missile Approach Warning (MAW) and a Laser warning receiver (LWR), Electronic Countermeasures Suite, Infrared & Ultraviolet Missile warning sensors, Self-Protection Jammer and a Towed Radar Decoy. Apart from this, Tejas features a Pulse-Doppler Multimode Radar built around the Elta's EL/M-2032. Tejas Mk.1A, on the other hand, will feature ELM-2052 active electronically scanned array (AESA) radars.

E. Pilot Friendly Features and Safety Record:

One of the biggest bane of Mig-21 in Indian service was its inferior Pilot-friendly feature and botched Safety Record. Over the year, Indian Air Force has lost more than half of its Mig-21 fleet to crashes and accidents due to various factors like Technical Error, Human Error, Engine Flameouts, Bird Hits and has thus resulted in death of some 200 IAF Pilots and also 40 Civilians leading it to be nicknamed as the "Flying Coffin" or "Widow Maker". The Cockpit Layout of Mig-21 and its external view has always been viewed as a comprehensive nightmare for the Pilot and has always been viewed as an extremely difficult machine to fly compared to other similar aircraft in IAF inventory. Mig-21 for many years has also been used as an Advanced Jet Trainer, due to lack of trainer aircraft in Indian Air Force, which is not optimal for rookie pilots at the best as it is difficult to handle and lacks any substantial aerodynamic values. Over the years, Mig-21 was switched from an Aerial Dominance Role to Close Air Support Role, where the pilots run in high risk as low-level ejections on Mig-21 with its CK ejection seat are quite dangerous when the jet is flying at 300 kmph leading to many unsuccessful ejections and deaths. Mid-Air Collisions, Engine Flame-Outs, Bird Strikes were other reasons why Mig-21 has led a botched Safety Record over the year even when there were increasing demands for it to be retired. Tejas, on the other hand, features much Superior Safety Record compared to Mig-21. Ever since the first prototypes took to air back in 2001, Tejas has not suffered a single accident or crash and in 2018 clocked in 4000 Accident-Free Flying Hours and also achieved FOC without any single mishap in hand. Tejas also features many Pilot-Friendly Features like Get-U-Home panel (GUH), a complete Digital Fly-by-Wire Control System which gives easy handling of aircraft, a Glass Cockpit along with Mk 16LG ejection seat to provide easy and safe ejections. Perhaps the

most potent safety feature of Tejas is its Canopy Severance system (CSS) which rescues the pilot in shortest possible time during an emergency and the Recovery Parachute System which allows the aircraft to recover from the spin/deep stall by controlling it in a stabilized dive.

Is Tejas better than Mig-21?

In every Technical Parameter, Tejas completely outperform Mig-21 and it fulfils the vision of the LCA Team who first put the Light Combat Aircraft on drawing board to provide the Indian Air Force with a Next-Generation Fighter Aircraft to replace the older Mig-21 completely. Tejas has been inducted into the No.45 Squadron "Flying Daggers" and it has paved way for the mass-induction of Tejas in Indian Air Force over upcoming years along with other Fighter Jets to overcome the squadron deficiency in Indian Air Force. Not only that, the LCA Programme which has borne Tejas, has resulted in the development of an indigenous ecosystem here in India which can sustain development and manufacture of aircraft for Military and Civilian Purposes. The By-Products of the LCA Programme has been seen in the development of avionics, mechanical parts and other by HAL and Private Partners which is now being exported to foreign partners now. An example of this would be Dynamatic Technologies which possess the Main Fuselage Assembly for Tejas which is a great model of public sector-private sector collaboration in India. The reliability of Tejas was proven during Exercise Gagan-Shakti last year where Indian Air Force deployed its 8 Tejas Fighter Aircrafts out of which 6 were able to go over 6 sorties per day which speaks volumes about the capability of this platform. Tejas utilizes Internal Monitoring Systems which diagnose System Faults with help of Plug-In Testers which makes it much more simplified than other frontline aircraft like Su-30MKI which makes heavy use of Electro-Hydraulic Systems. Tejas in its true essence is the successor of the Mig-21 in Indian Air Force service and can effectively replace the Mig-21 in its role and capabilities effectively augmenting the Indian Air Force with Next-Generation Capabilities and the advantage of a sustaining Aviation Ecosystem over the upcoming years which will further pave way for more advanced designs over upcoming years like Tejas Mk.1A, Tejas Mk.2 and finally the AMCA.

Source: <https://defenceupdate.in/>

What is the difference between combat role of HAL Rudra and Kamov 226t?

The two helicopters in question belong to two completely different operation platforms. HAL Rudra, a modified version of HAL Dhruv, is essentially an attack helicopter, but can also be used in unarmed roles like troop-transport, reconnaissance, etc. It's also known by the name of ALH-WSI (Advanced Light Helicopter-Weapons Systems Integrated). It has Forward Looking Infra-Red (FLIR) and Thermal Imaging Sights Interface, LASER Ranging and Designation, stabilized day-night cameras, Integrated Defensive Aids Suite (IDAS) acquired from SAAB, Electronic Warfare with self-protection, Radar & Missile Detectors, IR Jammers, Chaff and Flare Dispensers, and what not. Its armory includes French Nexter 20 mm turret gun, Belgian 70 mm rockets, 4 x 68 mm or 70 mm Rocket Pods (Air-Force & Army version), Torpedoes, depth-charges, anti-ship missiles (naval version), MBDA Mistral air-to-air missile and air-to-ground missiles, such as the anti-tank Helina missile. Rudra can be armed with 70mm unguided Rockets and missiles like Nag anti tank missile and French made mistral air to air missile. The Naval version comes with two light torpedo's for anti shipping capability. During the Navy's evaluation trails The Israeli Elbit's target tracking system tracked surface ships at the range of 14 kilometers, and the IRST illustrated image quality good enough to read even the designation number of the Ship. Which impressed the Navy to adopt the Dhruv Mark III for coastal surveillance operations. However Navy not interested the WSI Dhruv. but the Mark 3 version. Coming to Kamov Ka-226T (Indian Armed Forces ordered 200 of these), a refinement of the proven Ka-26, it's a Russian Utility Helicopter. Approval of the acquisition of Ka-226T was given by the Indian Ministry of Defence (MoD) in May 2015 to replace the ageing Chetak (Aerospatiale Alouette III) and Cheetah (Aerospatiale SA-315B) helicopters of the Army Aviation Corps (AAC) and the Indian Air Force (IAF), respectively. The Ka-226T features an interchangeable mission pod, rather than a conventional cabin, allowing the use of various accommodation or equipment configurations. The aircraft is fitted with trademark Kamov coaxial rotors, of advanced composite design, making the Ka-226T highly manoeuvrable and eliminating the need for a tail rotor. It performs surveillance, reconnaissance, search and rescue (SAR), targeting, and transportation of cargo and troops. Medivac, Disaster relief and patrol, Air-Ambulance, Police and Fire-Fighting variants are also available for civilian missions. The military version of Ka-226T is designed for operation in hard-to-reach upland conditions as well as hot and cold climates, with service ceiling of upto 7000 m (will be able to serve at Siachen Glacier with ease). The military version of light multi-mission helicopter Ka-226T is designed for operation in remote areas, tough terrain, overseas, reconnaissance, surveillance and transportation of supplies and personnel. The Ka-226 can operate day and night, in regular and adverse weather conditions, over land or expanses of water, and also in high winds. It is operation in temperatures ranging from -50°C to +50°C with a relative humidity of 100%, and does not need to be kept in a hangar. Along with 2 crew members, HAL Rudra can also carry upto 14 passengers/ 4 stretchers, much more than the

estimated 7 passengers/ 1050 kg internal load/ 1100 kg on external sling that Kamov Ka-226T can carry. With two HAL/Turbomeca Shakti Turboshafes, each generating 1000 kW, Rudra is also much more powerful than the Ka-226T, which boasts two Turbomeca Arrius 2G1, each having an output of 435 kW.

Source: <https://defenceupdate.in/>

ASAT test: How India shifted gears to match changing geopolitical realities in space with Mission Shakti

The utility of space as a medium for war has grown exponentially since the days of the Cold War Space Race. The military potential of satellites is manifold: communications, navigation, early-warning systems, reconnaissance, and signal intelligence. Any state that manages to get the upper hand in this frontier can be expected to dominate the outcome of any war. A state with command over space-based assets can jam enemy satellites or destroy them, and stop the enemy from communicating with troops or accessing vital information about troop movements or incoming missiles. It is in this context that the events in India's neighbourhood have caused anxiety and have led to calls for a new space policy aimed at countering the growing might of China's space military program. India's space activities are shaped by its geopolitics, and the socio-economic needs of its people. India's space programme which has been shaped primarily by its scientific community has started recognizing that "space may not remain a purely civilian domain." India has also accepted the fact that its own Space Policy needs to be re-oriented towards security as now space is increasingly getting weaponized. A report titled 'Europe-India Space Cooperation: Policy, Legal and Business Perspectives from India' points out that the country's space programme had to be tweaked keeping in line with the changing geopolitical realities in Asia and beyond. The report is a collaboration between the European Space Policy Institute (ESPI), and the Observer Research Foundation (ORF). In a chapter authored by Dr Rajeswari Pillai Rajagopalan, Head of the Nuclear and Space Policy Initiative at ORF, she says that the anti-satellite (ASAT) test conducted by India recently was in recognition of the growing security threats and challenges and what it needs to do to establish its own deterrence mechanism in outer space. In 2007, China had carried out its ASAT test which was a demonstration of the growing strength of China in the military space domain. According to her, Beijing's growing muscle power in space is expected to have a multiplier effect in its dealings with India and other key spacefaring powers such as Japan. The changed focus of India's space programme has also led India to pursue collaborative ventures in space with a number of other key space powers such as the US, Japan, and France. India and Europe are heavily invested in outer space and both have important economic stakes in keeping the outer space environment safe, secure and clean. India's investments are worth \$37 billion, including the ground-based infrastructure and value-added services. Therefore, the protection of its space assets is a high priority. There are enormous benefits that space cooperation between India and Europe can bring for the social and economic development of their people and accordingly, emphasize the use of space for developmental and peaceful purposes. According to the report, both India and Europe can come together for extending space development assistance to a number of emerging space players in Asia, Africa, and Latin America. The two sides have their own capabilities in the areas of earth observation and communication satellites. India has one of the largest remote sensing satellite systems in place with the launch of CARTOSAT 1, 2, 2A and 2B, RISAT-2, RISAT-1, MeghaTropiques and SARAL and European Union's Copernicus Earth Observation and Monitoring programme can also do a great deal in meeting the requirements of the emerging space players in different regions. Both India and the region have worked together for five decades on initiatives that have led to new research discoveries, commercial opportunities and greater socio-economic progress. New Space is an unfolding and complex phenomenon encompassing various trends, including technological, political, and commercial trends that are together contributing to an increasingly more prominent role for private actors' involvement in space. According to the report, this is more of a framework that will act as an enabler to expand capacity and capability for the industry to offer end-to-end products and services. India possesses both civilian and military space assets, and the country has been focussing on increasing its space assets-build up. In today's time, no country can afford taking its space infrastructure lightly. Therefore, it was indispensable for India to ensure sufficient protection of its increasing number of satellites. Given how China has been able to develop ASAT weapons technology, India couldn't afford not to create a deterrent effect. It is necessary to analyse "Mission Shakti" in this background. The testing of ASAT weapons technology by India is not a show of muscle power. It is a realisation of the future needs of national security and India has successfully kept pace with the next-generation technology of warfare.

Source: Financial Express

How a Sukhoi-BrahMos strike will make Pakistani airspace look like Swiss cheese

India has signalled its intent to strike enemy targets with devastating force early on in a conflict. Following the success of the Balakot raid by 12 Mirage-2000 fighters using Israeli ground penetrator bombs, the Indian Air Force (IAF) is

planning to test fire the BrahMos supersonic cruise missile from its Sukhoi Su-30MKI air dominance fighter. This will allow the IAF to carry out punitive air strikes deep in enemy territory from safe standoff distances. The air-launched BrahMos-A has an estimated operational range of between 300 km and 400 km and can be dropped from 1,640 to 46,000 feet. The missile, named after the Brahmaputra in India and the Moskva river in Russia, is currently the world's fastest cruise missile. Individually, the Su-30 and BrahMos are powerful weapons. But when the one of the most supermanoeuvrable fighters in the world is armed with a uniquely destructive cruise missile, together they are a dramatic force multiplier. The BrahMos' 3,000 km per hour speed – literally faster than a bullet – means it hits the target with a huge amount of kinetic energy. In tests, the BrahMos has often cut warships in half and reduced ground targets to smithereens. The Sukhoi's blistering speed of 2,100 km per hour will add extra launch momentum to the missile, adding to its destructive power. Plus the aircraft's ability to penetrate hardened air defences means there is a greater chance for the pilot to deliver the missile on to its designated targets. The extended range of the BrahMos-A will allow IAF pilots to destroy Balakot type targets from at least 150 km within Indian territory. The Sukhois can also launch their missiles against Pakistani targets from the southwest while flying over international waters, thereby complicating the enemy's defences. While Pakistani air defences – and its terrorists in Balakot – were literally caught napping during the February 26 raid, at least the Pakistani military woke up after the Indian bombs exploded, and the PAF was able to scramble a few jets. In theory, if the Pakistanis had detected the intrusion early, they could have alerted the jihadis to vacate the buildings. But a BrahMos-A barrage by Sukhois taking off from Halwara air base in Punjab will take less than 60 seconds to crash into the terror complex in Bahawalpur, Pakistan, giving no time to the jihadis to even say their prayers. As Brahmos Corp General Manager Mr P. Pathak told, "The (missile's) accuracy makes it especially useful in attacking military targets in urban areas where reduced collateral damage is a priority. Indeed, cruise missile technology has been developing alongside the rapid development of computer technology, positioning systems and propellant technology. As a result, India is able to field a system from the air, without the need for additional aircraft." The BrahMos-A was first flight tested from a Sukhoi in July 2018 over the Bay of Bengal. The cruise missile will kick off its final developmental trials in later 2019, including two launches against a naval and a ground target. The IAF wants two squadrons of Sukhois to be modified to carry the BrahMos-A and the timeline for conversion is 2020-21.

Likely targets

While terror targets, such as Balakot, will be provided on a real time basis by Indian intelligence and space agencies, the war time targets are obvious. A two-squadron attack can within minutes utterly cripple Pakistan's command and control centres; nuclear power plants, including Kahuta where the so-called Islamic Bomb is manufactured; the Sargodha Central Ammunition Depot west of Lahore where these warheads are stored; ballistic missile bases in Gujranwala, Okara, Multan, Jhang and Dera Nawab Shah; Pakistani Army Corp headquarters in Rawalpindi; the Karachi Port, Pakistan's only major harbour and its Naval HQ; and ordinance factories that manufacture tanks and fighter aircraft. In previous conflicts, the IAF avoided attacks on non-military infrastructure, with the political leadership believing that hitting civilian targets in Pakistan would anger Indian Muslims. So for instance, in the 1971 War, while the IAF and the Indian Navy attacked the oil storage farms in Karachi port – which burned for a week – they spared railway stations and airports. The decision to equip the Sukhois with the BrahMos signals a new intent. Since the aircraft's radar can detect tall buildings at a distance of 400 km and small building at 120 km, in the next war expect a lot of damage to enemy infrastructure – dams, power stations, strategic bridges are all going to be included in the list of likely targets. The supersonic BrahMos armed with a conventional warhead can theoretically penetrate hardened command, control and communication centres. However, there is no guarantee these targets will be 100 per cent destroyed unless the BrahMos is nuclear tipped. A pre-emptive nuclear strike will therefore ensure that Pakistan's offensive capability is effectively neutralised and it is never again a threat to India. Against China, the Sukhoi-BrahMos tactic may not have the same impact as Chinese targets are located deep inland or on the east coast. However, Chinese military infrastructure in Tibet and its strategic railway lines connecting the illegally annexed province to the Han heartland can easily be destroyed should the dragon try and come to the aid of its client state Pakistan.

Indigenous innovation

The BrahMos-A is a slimmed down version of the original Brahmos cruise missile, but it is still a massive weapon weighing 2.5 tonnes. Because heavy modifications were necessary for integrating such a heavy missile onto the Su-30MKI, initially the Russians were reluctant to go along. But after HAL decided to go solo, Sukhoi – not wanting to miss out on juicy developmental contracts – came on board in 2011. Modifications include reinforcing the aircraft's undercarriage in addition to various mechanical, electrical and software upgrades. The integration process also involves hardening the aircraft's electronic circuitry to withstand the electromagnetic pulse of a nuclear blast, indicating that the BrahMos can be mated with a miniaturised nuclear warhead, if required. According to Aviation Week, "Work is also underway on a modified lighter and smaller-diameter version of the BrahMos for deployment on the Indian navy's MiG-29K and, potentially, the Dassault Rafale." This is the BrahMos-NG (Next Generation), weighing around 1.5 tons,

making it 50 per cent lighter and three meters shorter than its predecessor. Despite its compact size, 'BrahMos Lite' will be the fastest of them all at Mach 3.5 or 4, 174 kph. As well as MiG-29s, it could become the standard air-to-surface strike weapon of the Tejas and Mirage fighters. The next generation BrahMos will have a much longer range. And with the planned increase in speed, the missile will have considerably enhanced kinetic energy despite its smaller size optimised for relatively smaller aircraft. Well before India was admitted into the Missile Technology Control Regime – a largely Western club which was aimed at restricting the range of Indian missiles to 300 km or less – the DRDO and its Russian partner NPO Mashinostroyeniya had decided to quietly increase the range, signalling the country's immunity from Western sanctions. In today's transformed geopolitical climate, with the US describing India as a trusted defence partner, there are no more such constraints. DRDO's Pathak says increasing the missile's range to 800 km is now possible after India's entry into the MTCR.

Sukhois as strategic platform

In September 2010 India's newly constituted tri-services Strategic Forces Command (SFC) submitted a proposal to the Defence Ministry for setting up two dedicated squadrons of aircraft comprising 40 Su-30MKI fighters. The task of this "mini air force" is to deliver nuclear weapons. The picture became clearer in October 2012 when the Cabinet Committee on Security green lighted a programme to carry out structural and software modifications on 42 Su-30MKIs and acquire 216 air-launched BrahMos missiles. Until then, the BrahMos was for exclusive use by the Navy. The Su-30MKI is an obvious choice. According to Strategy Page, "The SFC does not want untested fighters but the ones which can be relied upon to deliver nuclear-tipped missiles. The aircraft has a titanium airframe strong enough to fly a high-speed terrain following profile. The batch of 42 Sukhois will also have hardened electronic circuitry to shield them from the electromagnetic pulse of a nuclear blast." Having a dedicated aircraft for the nuclear attack role offers India's war planners strategic flexibility and increases the odds of success. Because ballistic missiles are used only as a weapon of last resort, they cannot really be deployed at will. Once released, they cannot be recalled and if shot down are not easily replaced. Fighter aircraft, on the other hand, can perform repeated sorties and be directed to bomb targets as they move. For instance, if Pakistan moves its warheads out of the Sargodha depot, which is presumably under constant watch by Indian satellites, the Sukhois can be vectored against military convoys transporting their nuclear cargo. For those in the cross hairs of the BrahMos here's a message – don't bother to say your prayers, you won't have the time to finish. India and Russia also later agreed to work together to more than double the range of BrahMos to over 600 kilometers, an upgrade that will bring all of Pakistan within range of the missile's high explosive or nuclear warheads. The far longer range will also enable this as yet unnamed model to attack more People's Liberation Army bases in the interior of Tibet that threaten the Line of Actual Control, especially those bases aimed at the imperilled Indian state of Arunachal Pradesh China claims is part of Tibet.

Source: <https://defenceupdate.in/>

Explained: How will Apache attack helicopter augment capabilities of IAF

Indian Air Force has been handed over the first AH-64E (I) Apache Guardian Attack Helicopter yesterday at the Boeing production facility in Mesa, Arizona in the United States of America. Indian Air Force will be receiving some 22 Apache Helicopters from Boeing in the future which will start induction in Indian Air Force by the month of July 2019.

How does the Apache augment capabilities of the IAF?

The introduction of Apache will lead to the modernisation of the IAF's attack helicopter fleet which at present is equipped with Russian origin MI-35 helicopters. The Russian attack helicopters, stationed in Pathankot in Punjab and Suratgarh in Rajasthan, are now on the verge of retirement and, thus, IAF needed an urgent augmentation of capabilities. The Apache has been customised to suit the requirements of the Indian military and will have significant capability in mountainous terrain. Apache has the capability of carrying out precision attacks at standoff ranges and operate in hostile airspace with threats from the ground. The helicopter also has the unique capacity to transmit and receive battlefield picture through data up linking and networking.

What are the weapon systems that the AH64E (I) Guardian comes equipped with?

AGM-114R-3 HELLFIRE II missiles: It is an air-to-ground missile developed primarily for the anti-armour role. Each Hellfire weighs 45.4kg-49kg including an 8kg-9kg multipurpose warhead. It has 8km (LOAL, high trajectory), 7.1km (LOAL, low/direct trajectory) and 11km (UAS: LOAL, high trajectory) range depending on the trajectory. **Stinger Air-to-Air Missile:** Stinger Block I-92H air-to-air missiles sold to India are a variant of the famous shoulder-launched FIM-92 Stinger system. The Stinger is a lightweight missile used for engaging low-altitude targets and either equipped with a fire-and-forget passive infrared seeker or a fire-and-forget passive infrared focal plane array seeker. (One variant of the missile also features an ultraviolet seeker that can distinguish between flares and jet engines.) **M230**

Cannon: Hughes *M230* Chain *Gun* is a 30 mm, single-barrel automatic cannon mounted on Apache's nose and is capable of firing upto 600 rounds per minute upto a range of 4000 metres. **Hydra 70:** It is a 2.75-inch fin-stabilized unguided rocket mounted by the Apache on the Weapon Pylon and is used for Air-to-Ground Attacks, primarily used for Anti-Materiel, Anti-Personnel Suppression Operations. The helicopter is powered by two high-performance turboshaft engines with a maximum cruise speed of 284 km per hour or 152 knots.

What operational role is envisaged for Apache?

There was considerable debate prior to the contract being signed for Apaches on whether the helicopter is better suited to the Army's needs or the IAFs. The Army's contention was that since the helicopter is the highly effective platform for destruction of tanks and armoured vehicles it made sense for the Army to raise Apache squadrons. It was also pointed out that the IAF Apache units would also be employed in support of the Army strike formations which carry battle to the enemy territory. It was eventually decided that the IAF will raise two squadrons of Apaches, while the Army also received the nod for six helicopters, significantly less than its requirement. However, the Army is eventually readying itself to be equipped with 30 Apache helicopters to equip three squadrons for each of its three strike Corps

Source: Indian Express,

RISAT-2B: Radial Rib Antenna

Radial Rib antenna (RRA) is a world class technology demonstrated in-orbit today at 2:20 pm IST in the RISAT-2B spacecraft. This 3.6 metre antenna was folded & stowed during launch and later successfully unfurled & deployed in-orbit. The deployment was completed in 7 mins and 20 seconds. Development of light weight structure, hinge mechanism, design of newer mesh, actuators etc., were some of the challenges involved in the realisation of this antenna. All such key technological elements require very high level of expertise in handling space based antenna system, excellent workmanship and building redundancy apart from managing the deployment in-orbit. This antenna was realised indigenously by ISRO team in a record time of 13 months. Alternate import option would have taken about 3-4 years. Successful deployment of RRA in RISAT-2B establishes the combination of all skills mastered by ISRO indigenously.

Source: <https://www.ISRO.gov.in>

BUSINESS

DRDO spends 25% of budget on R&D, says Chairman

Defence Research and Development Organisation (DRDO) Chairman Dr Satheesh Reddy said they were spending 25 per cent of the budget on research and development (R&D). "The DRDO has been spending around 20-25 per cent of the budget on R&D," Dr Reddy said while talking about 'technology for national security' at the Institute for Defence Studies and Analyses, here. "The percentage of what goes into basic, upgraded and translation research has to be seen. When you look at it as basic research and application research, we are trying to spend a good amount of money on it," Dr Reddy said. As much as 20 per cent of resources of each laboratory should be spent on research content of futuristic technologies, he added. The government has been asking the DRDO to focus on R&D, while exploiting the opportunity and support being extended to it. On the technology front, Dr Reddy said the organisation was doing well but was lacking in areas of devises and senses. "The DRDO has developed many technologies and is doing well. But the areas it is lacking in are devises and senses. It's an important area that asks for large infrastructure and we need to establish technologies and build senses and devices," he said. Dr Reddy said people were doing "extremely well in the artificial intelligence (AI) area" and hoped in the next one-two years the country would do wonders.

Source: <https://m.dailyhunt.in/>

ADVERTISEMENTS

E-news is bringing out an exclusive slot for individuals to advertise for career opportunities. Industries and Institutions can promote advertise at very nominal charges product ranges as well as airline operators to present route and tariff