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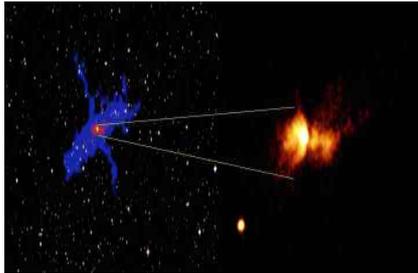
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Aeronautical Society of India
Bangalore Branch Building
New Thippasandra Post
Bangalore 560 075
Karnataka, INDIA
Telefax: +91 80 25273851
Email: editoraesi@yahoo.com
Website: www.aerjournalindia.com

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

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Head Quarters

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



Release of Special Issue on Scramjet Flight Testing

The release of the Special Issue of the Journal of Aerospace Sciences and Technologies, a quarterly International Journal published by the Aeronautical Society of India, on “**Scramjet Flight Testing**” was released on 16th October 2018 by Dr K Sivan, Chairman ISRO and Secretary, Department of Space, Government of India at an impressive function organised by ISRO at its Head Quarters in Bangalore. The function was organised at the end of the Concluding Session of the ISRO Research Council Meeting. Over 300 distinguished Scientists, Engineers of ISRO, Academicians, Past President of the Society and students participated in the function. After releasing the issue, Dr K Sivan Chairman ISRO explained in detail the significance and importance of the Scramjet Engine development programme and appreciated the initiative to bring-out a Special Issue covering all aspects. Mr S Somanath, Director, VSSC, ISRO presented a brief overview of the sixteen papers included in the Special Issue and thanked the Aeronautical Society of India for publishing the Special Issue. Mr AS Kiran Kumar, President-Elect of the Society and former Chairman ISRO in his address complimented the Editorial Team for its excellent work and hoped for more such publications by the Society. Dr R Balasubramaniam, Editor of the Journal thanked all the authors and ISRO Scientists for extending full support in bringing out the Special Issue. The function ended with the vote of thanks proposed by the Director, CBPO, ISRO Head Quarters.

The editorial team invites your views, suggestions, to the News about Members Column and contributions to the e-news.

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ISRO launches two UK radar satellites for disaster management

The Indian Space Research Organization (ISRO) launched two Earth observation satellites on 16 September from Sriharikota where the Satish Dhawan Space Center is located. NovaSAR S1-4, which were developed in and will be operated from the United Kingdom, will provide Earth observation data, including for disaster and risk management. The satellites were constructed by Surrey Satellite Technology Limited, a UK-based company that, in partnership with ISRO (the vehicle was developed by Vikram Sarabhai Space Center), has made possible the commercial PSLV-C42 mission to launch the satellite. This is not the only foreign satellite launched by ISRO. Since 1999, the space organization has released several devices from international partners. According to ISRO's web portal, Nova SAR will provide data for forest mapping, land use, and ice cover monitoring, as well as for flood and disaster monitoring. It was designed to provide a low-cost platform for S-band Synthetic Aperture Radar (SAR). Besides, S1-4 will support surveying resources, environment monitoring, urban management and maritime traffic. The device is identical to the three satellites launched in 2015 and is able to obtain more than one type of information in a single pass.

Source: <https://reliefweb.int/>

HAL to play lead role in Aero India

Defence Minister Mrs Nirmala Sitharaman met the media at Air Force Technical College (AFTC). Alongside her was Air Marshal Rakesh Kumar Singh Bhadauria, Air Officer Commanding-in-Chief, Training Command in Bengaluru, who said that Hindustan Aeronautics Limited (HAL) will play a key role in organising next year's Aero India. The Defence Exhibition Organisation had organised the event in the past. However, this time around, HAL has been asked to take up the task. The Aero India 2019 will be held at the Air Force Station Yelahanka between February 20 and 24, 2019. In August there were reports that the air show would possibly move to Lucknow. A political slug fest had broken out between the state government and the centre with the former accusing the NDA government of depriving Karnataka an opportunity to event which it has done since 1993. On September 8, ending months of speculation, the Ministry of Defence announced that the government has decided to hold the Aero India 2019 in Bengaluru. This five-day event will combine a major trade exhibition for the aerospace and defence industries with public air shows.

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

Shekhar Mande is new CSIR DG

The Government has appointed Dr Shekhar C Mande, the director of the Pune-based National Centre for Cell Science and a top functionary of Vijnana Bharati, a swadeshi science movement affiliated with the RSS, as the Director General of Council of Scientific and Industrial Research (CSIR) and Secretary of the Department of Scientific and Research (DSIR). "The Appointments Committee of the Cabinet (ACC) has approved the appointment of Dr Shekhar C Mande, Director, National Centre for Cell Science as Director General of CSIR-cum-Secretary DSIR, as per usual terms and conditions," said an official statement issued. A fellow of all three major science academies, the 56-year-old Dr Mande is a recipient of the coveted SS Bhatnagar Prize, most prestigious science honour in the country, in 2005. Dr Mande, a structural biologist with a doctoral degree from the Indian Institute of Science, Bengaluru, has been the director of NCCS since September 2011. He has also been the vice president of Vijnana Bharati, the RSS-affiliated science movement for a while. The position of CSIR DG fell vacant recently with its previous chief Mr Girish Sahni superannuating on August 31. The CSIR, which runs a chain of 38 national research labs, has been in dock for a while with its budget allocation hiked least among scientific department in the current Union budget.

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

This is how Chandrayaan-2 will perform its jobs once it lands on the moon

India launched its first lunar probe in October 2008, and it is setting up the stage for its second coming with Chandrayaan-2 liftoff. The mission will be ISRO's attempt to get a more delicate and close up look at the lunar surface, the launch of which is eagerly awaited. Unlike the first mission which carried only Chandrayaan orbiter and the Moon Impact probe, this mission will have a lander and a rover apart from the orbiter, which has been developed by Ahmedabad-

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based Physical Research Laboratory (PRL). Equipment attached to orbiter: Solar X-ray monitor: "There are three payloads developed by the PRL for Chandrayaan-2. The orbiter will have a solar X-ray monitor developed by PRL. It will monitor x-rays coming from the Sun and X-rays being generated on the surface of the moon," said PRL Director Dr Anil Bhardwaj, speaking to reporters on the sidelines of the 15th International Symposium on Equatorial Aeronomy, organised at the main PRL campus. PRL, a unit of Department of Space, was founded in 1947. Equipment attached to lander: ChaSTE : "On the lander, there will be Chandra's Surface Thermophysical Experiment (ChaSTE). This is a probe which will measure the temperature beneath the surface by getting inside the surface of the moon. It will do so after the lander lands on the moon," the director said, adding that this equipment will also be developed by PRL. (ChaSTE) is one of the science experiments proposed to conduct in lunar surface in the Chandrayaan-2 mission. Equipment attached to rover: Alpha Particle X-Ray Spectrometer : For the rover, which will come out from the lander and meant to roam on the lunar surface, PRL has developed an instrument called 'Alpha Particle X-Ray Spectrometer', said Dr Bhardwaj. "This instrument is designed to identify various elements and chemical compounds on the surface of the moon," he added. Things you must know about Chandrayaan-2 According to reports, Chandrayaan-2 is likely to be launched in January-March window in 2019. However, exact dates are not yet released. It will take one or two months for the orbiter to reach its designated place around the moon After the orbiter reaches its designated place in the lunar orbit, the lander will depart from it along with the rover Following a controlled fall, the lander will soft land on the lunar surface at the prescribed site and place the rover on the surface The rover will spend 14 days on the lunar surface covering a distance of 150-200 km on the moon The instruments on the rover will observe the lunar surface when it will walk on the moon These instruments will also perform an on-site chemical investigation The data will be sent back to earth through the Chandrayaan-2 orbiter (rover will send the data to the orbiter and the orbiter will send it back to earth) to analyse the lunar soil Aiming for the sun with ISRO's Aditya-L1 mission PRL is also developing instruments for 'Aditya-L1 mission', which is aimed at studying the Sun through a satellite placed in the halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system, said Dr Bhardwaj. An instrument for the measurement of charged particles has also been developed, he said, adding, "With this instrument, we will be able to study solar winds, charged particles and its energy range." As per ISRO (Indian Space Research Organisation) website, the satellite will be inserted in a halo orbit around the L1, which is 1.5 million km from the earth. The project is approved and the satellite will be launched during 2019 2020 time frame by PSLV-XL from Sriharikota.

Source: <http://www.defencenews.in/>

Why The Indian Air Force Should Buy More Su-30MKI Fighters

A series of reports in the past few months have said that the Indian Air Force (IAF) is against the idea of inducting any more Sukhoi Su-30MKIs into its fleet beyond the 272 that it had contracted for, all of which will be delivered by 2020. These reports come at a time when the IAF's fleet, which should ideally have 42 squadrons, is down to 31, a large part of which comprises of the obsolete MiG-21s and 27s. The service seems to have justified the push against the induction of more Su-30MKIs by saying the fighter is meant for air dominance role and is not a multi-role fighter, and its avionics, protection suite, engine and radar — all of which can be upgraded — are not fit for future needs. While these are legitimate concerns on the IAF's part, many arguments can be made in favour of a deal to add two to three more squadrons of the fighter to the dwindling fleet. These points come to mind: One, a part of the Su-30MKI fleet, around 40 by some accounts, is to be modified to make it capable of carrying an air launched version of the BrahMos cruise missile, called BrahMos-A, on its belly hardpoint. The missile has been test-fired from the fighter and BrahMos is currently developing a lighter version of the missile, called BrahMos NG, three of which will be carried by a Su-30MKI. Other platforms operated by the air force are likely to get the weapons system in a single or twin missile load-out configuration, as Livefist had reported in 2017. Structural studies performed on the fighters by Hindustan Aeronautics Limited (HAL) revealed, it was reported, "that the modifications required to make them capable of carrying the missiles are technically risky and economically unacceptable". Modifying a Su-30MKI to make it BrahMos worthy requires reinforcing the aircraft's underbelly and installing a heavy-duty mounting station. Therefore, instead of upgrading the fighters from the existing fleet, which have spent a part of their life and have suffered some amount of wear and tear, procuring new ones with modifications which enable them to carry the air launched versions of the missile will make more sense. Managing director of HAL, Mr T Suvarna Raju, has also argued on these lines. Two, the IAF's new effort to procure fighters, under which it floated a tender in April this year, is unlikely to move ahead in a politically charged atmosphere ahead of the 2019 Lok Sabha elections. Even when it does, price negotiations and talks over the 'Make in India' component of the proposed purchase are likely to take several years. Even by the most optimistic accounts, if the tender translates into a deal, deliveries will not start before 2024. Three, HAL is not producing the Tejas aircraft fast enough. By August 2017, the HAL had delivered only three Tejas fighters to the IAF of the 20 Mark 1 fighters ordered in 2013. These aircraft were to be delivered by 2016. Additionally, the 83 Mark 1A fighters contracted for by the IAF are

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yet to enter production and may not roll down the assembly line before 2020. That is, if HAL sticks to the timeline. The Mark II version of Tejas, which is still on the drawing board and is likely to have capabilities that the IAF is looking for, may only be available to it after 2025. The HAL has projected that it will build 10 fighters in 2018-19 and 16 Tejas Mark 1As each year starting 2019-20. At this rate, the IAF may — a big may going by the PSU's performance— have nearly 100 Tejas aircraft, in both Mark 1 and Mark 1A configuration, by the end of 2024. These would not be sufficient to replace the ageing fleet of MiG-21s and MiG-27s in the IAF which are obsolete and should have been decommissioned from service at least a decade ago. By some accounts, the IAF has around 130 MiG 21s and 27s in service. However, even if the IAF manages to replace the retiring MiGs with the Tejas fighters, which it will receive by 2024, it will continue to face the crunch as the number of squadrons will not go up with this transaction. Again, this is when the HAL sticks to its production schedule. A miss on HAL's part will send the IAF's combat strength into a free fall starting 2020s. In this scenario, the only addition to the number of 31 will come with the induction of two remaining squadrons of Su-30MKIs by 2020 and the arrival of two squadrons of the Rafale fighters brought in flyaway condition by 2022. The addition of these four squadrons will take the number to 35. If the IAF places an order for additional Su-30MKIs at this time, it could add two to three more squadrons (depending on the number of fighters it orders) to its fleet, taking the number to 37 or 38 by sometime around 2023-24. The HAL is set to deliver the remaining 25 of the 272 already ordered by 2020. Given that it produces 12 Su-30MKIs a year, it can build 40 in little over three years after 2020. Unlike the uncertainties surrounding the delivery of Tejas and the new deal for multi-role fighters, an order for additional Su-30MKIs would be a sure bet given the availability of an up and running production set up.

Source: <http://www.defencenews.in/>

INS Vikramaditya completes ₹705-cr refit

India's only aircraft carrier INS Vikramaditya is set to sail from the Kochi port on October 23 for basin trials before returning to its home port at Karwar after undergoing a five-month refit at a cost of ₹705 crore at the Cochin Shipyard. This was the second refit of the carrier since its induction into the Indian Navy in 2013. Both refits were performed by the Cochin Shipyard. "It's a short refit, but the Navy planned it in such a way that the underwater work package of the next refit – a longer maintenance routine to be conducted in 2020 or 2021 – was also taken up along with this. This means that the carrier is not required to be dry-docked for the next five-six years," Captain Puruvir Das, commanding officer of Vikramaditya, told The Hindu on the sidelines of a media visit to the carrier now docked at the Kochi port. "The carrier's hull got treated and painted. We have a large number of tanks and spaces which got cleaned and painted too. Then we had some work on the shafts – the carrier has four of them. In floating condition, a diver goes down and measures the health of the shafts with some gauges, but they are fully checked when dry-docked. We had found during routine check-ups that some temperature readings of the shafts were going high, so we had to dry-dock to check the condition of the bearings. That's been done now," Capt Das said. Sources said 16 of the 25 shaft bearings were changed as part of the refit. "When the carrier is alongside the jetty (that's right now), the shafts will be turned at very low RPM to see if everything is rotating properly and once we are out at sea, higher revolutions will be done. There will be a large number of workers of the Cochin Shipyard as we go out for the trials to attend to any possible issues. Once it is over, they will return by boat and we will proceed to Karwar," he said. He said the Navy was looking at various options for berthing the vessel for its next major maintenance – the normal refit that would come around 2020-21. Docking space "First, we need a docking space and you need depths. Karwar is suitable for us. Then you need the vendor base, which is well-established in Kochi. But the problem is that we will occupy this berth, the Ernakulam Wharf (at the port) for a long period. It isn't a naval port. Dredging up the channel is another issue. But the Navy is looking at it all and will take a call in a month or two," he said. Captain Das also pointed out that the air wing of Vikramaditya was full-fledged right now and that the carrier would be in Goa in November for flying operations. Over the last 10 days, nearly 16,000 people visited the carrier.

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

Russia to deliver first S-400 missile systems to India within 2 years

The first deliveries of S-400 missile systems to India will take place within two years, Mr Dmitry Shugaev, head of Russia's Federal Service for Military Technical Cooperation, told reporters. "First deliveries are expected within two years," he said. The contract for the delivery of S-400 surface-to-air missile systems to India was signed during Mr Putin's visit to India earlier this month. On the eve of that visit Mr Putin's aide Mr Yuri Ushakov told reporters that under the contract India will receive five regimental sets of Russian S-400 Triumf missile systems. The sum of the deal exceeds five billion US dollars, he said. Russia's S-400 Triumf (NATO reporting name: SA-21 Growler) is the latest

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long-range anti-aircraft missile system that went into service in 2007. It is designed to destroy aircraft, cruise and ballistic missiles, including medium-range missiles, and surface targets. The system can hit aerodynamic targets at a range of up to 400 kilometers (249 miles) and tactical ballistic targets flying at a speed of 4.8 km/s (3 mi/s) at a distance of up to 60 kilometers (37 miles). Such targets include cruise missiles, tactical and strategic aircraft and ballistic missile warheads. The system's radars detect aerial targets at a distance of up to 600 kilometers (373 miles). The system's 48N6E3 surface-to-air missiles can hit aerodynamic targets at altitudes of 10,000-27,000 meters and ballistic threats at altitudes of 2,000-25,000 meters.

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

IAF crew starts training on Chinook helicopters at US facility

The Chinook heavy helicopters are all set to arrive in India as IAF has commenced training on the heavy helicopters in United States of America. According to Indian Air force, the crew has commenced training on Chinook helicopters on October 8 2018 at Delaware, USA. During the initial conversation phase, four pilots and four flight engineers of Indian Air Force are training on Chinook helicopters. The acquisition of these heavy lift helicopters will go to add to the capabilities of the force. Air Chief Marshal B S Dhanoa on the occasion of 86th anniversary of Air Force had said that technologically evolving over eight decades, the acquisition of 36 French 'Rafale' fighter aircraft, S-400 missile systems from Russia, Apache attack helicopters and Chinook Heavy Lift helicopters from the US will add to the capability of Air Force.

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

UAE 'interested' in HAL-made light combat aircraft Tejas

India and the UAE are planning to expand their joint military training with a focus on improving desert operations. Keeping this in mind, the UAE has shown a keen interest in Tejas, the light combat aircraft made by HAL, government officials said. The issues were discussed between defence minister Mrs Nirmala Sitharaman and the UAE's minister of state for defence, Mr Mohammed Ahmed Al Bowardi Al Falacy. He is on an official visit to India and will return after visiting the facilities of defence PSUs, Hindustan Aeronautics Ltd (HAL) and Bharat Electronics Ltd (BEL). The UAE minister will be in Bangalore to visit the HAL facility, where he will be shown Tejas. "The UAE has shown interest in the Tejas," said officials. Even Sri Lanka, Egypt and Singapore have evinced interest in the indigenous fighter jet. But HAL will first have to meet the demands of the IAF. It is trying to meet IAF's demand for 123 Tejas. The IAF is also looking at inducting more than 200 Tejas Mark 2. However, the projects are heavily delayed. IAF chief, Air Chief Marshal BS Dhanoa, earlier this month pointed out that HAL has lagged behind in the deliveries of several frontline fighters such as Su-30s, Mirages and the LCA. The UAE minister will also visit the IAF's Aircraft and Systems Testing Establishment, which flight tests aircraft, airborne systems and weapon stores prior to their induction. "During their meeting, both ministers discussed a range of defence cooperation issues and agreed on priority areas for cooperation," read a statement issued by the defence ministry.

Source: https://defenceupdate.in

This is not the first time that air frame and spares are being cannibalized: Earlier it was Canberra, and now Jaguar

The process of the up gradation of the Jaguar fighter aircraft which is already six years delayed by the state owned Hindustan Aeronautics Ltd will now be expedited. Acute shortage of spares, shortage of engines is a major cause of concern for the Indian Air Force (IAF) which has presently 118 SEPECAT Jaguar IS/IB/IM ground-attack aircraft in service. The IAF operates single-seat strike, IB (trainer) and IM (maritime) versions of the aircraft. These deep penetration aircraft will get a new lease of life by the end of this year India has taken a decision to pick up spare parts and the decommissioned machines from air forces of other countries including France, Oman and the UK. Some officers hinted that India could even ask Ecuador in LatAm for the Jaguar machines which it has decommissioned. "The government has reached out to the countries including Oman, UK, France and Ecuador, who have decommissioned these machines so that they can be cannibalised for their spare parts," a senior officer told FE Online. "The delay has also been due to the engines which need to be changed to make the Jaguar fly for the next 15-20 years. We have to have a proper engine," he added. Based on the information available, India will get 31 air frames from France, and Oman and the UK will give two each. These will come with engines, spare parts which are required urgently by the HAL for the

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upgrade for IAF. Two Jaguar T-2 machines and 380 types of spares from the UK have to be shipped to India. Since these are gifts, transport costs have to be borne by the Indian government for which the modalities are being worked out. These frames will come in a semi knocked down state and will be put back together by IAF under the supervision of the HAL at the Gorakhpur Air Force Base. India had imported 40 aircraft from the UK in 1979, which was followed by licensed production at HAL. Presently, IAF is the only one left operating these aircraft and the other countries including Ecuador, Nigeria, UK, and France have decommissioned them. It may be recalled that the IAF which plans to operate these aircraft for the next one decade had upgraded part of its Jaguar fleet with new navigation and attack avionics, but the proposal to replace the engines with the more powerful ones has basically stalled the process. According to a report in Jane's Defence Weekly, France has agreed to supply the 31 Jaguar airframes as a gift while Oman has consented to donate two similar airframes as well as eight Rolls-Royce Adour engines and 3,500 lines of spares for the platforms. Also, the UK has offered two twin-seat Jaguar airframes and 619 lines of spares. In view of the squadron of the IAF dwindling, according to senior IAF officers, cannibalizing is the best way to ensure that the Jaguars remain operational.

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

India to gift 3 Mig-21 fighter jets to Russia

A highlight on the sidelines of the upcoming India-Russia bilateral summit is likely to be the gifting of three MiG-21 fighter jets to Russia. Russian President Mr Vladimir Putin will be in New Delhi on October 4 and 5 for the annual summit with Prime Minister Mr Narendra Modi. "Three MiG-21s are scheduled to be handed over to Russians based on a request from their Defence Minister to our Defence Minister. They comprise one Type 75 aircraft and two Type 77 aircraft. The aircraft to be gifted are in flight-worthy condition and the cost of crating and transportation will be borne by the Russians. This will be major symbolic gesture to showcase the all-weather friendship and deep strategic partnership between India and Russia, which has been put to test in recent times due to changing geopolitical conditions. The aircraft will get new registration numbers and may be adopted for vintage flight. However, it is not clear how the Russians intend to use them. The MiG-21 has more of emotional value for Russia, as it has the distinction of being the most produced supersonic fighter in history. According to the website militaryfactory.com, close to 11,500 aircraft were built and operated by over 50 countries. The MiG-21, a product of the Soviet Union, was designed by the Mikoyan-Gurevich Design Bureau in the 1950s. It made first flight in 1956 and entered service in 1959. However, Russia stopped producing the aircraft in 1985, while India continued operating the upgraded variants. India inducted the MiG-21s in 1963 and got full technology transfer and rights to license-build the aircraft in the country. It is the first supersonic fighter aircraft of the Indian Air Force. The IAF still has about 120 MiG-21s in service which will all be phased out of service by 2021-22.

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

Akash, PAD, AAD and now S-400 triumph air defence missile system

India has several systems in place to defend against incoming aerial attacks. Stopping an incoming missile or an aircraft flying at high speeds is tricky so a country cannot just rely on one particular system for it. One of the notable systems that India has to thwart incoming aerial targets like fighter jets, cruise missiles and air-to-surface missiles is Akash mid-range surface-to-air missile (SAM) system built by Defence Research and Development Organisation (DRDO). It is medium range nuclear capable supersonic missile. The missile system can target aircraft up to 30 km away, at altitudes up to 18,000 mts. It is in operational service with the Indian Army and the Indian Air Force. Another system that India has been working on is Ballistic Missile Defence (BMD) program. A Ballistic Missile Defence (BMD) is a system that is designed to intercept and destroy an incoming ballistic missile on its trajectory much before it approaches the target. India's ballistic missile defence system provides a two-layered shield – 'exo' and 'endo'. What this effectively means is that the system provides protection both against ballistic missiles that are outside (exo) as well as inside (endo) the earth's atmosphere. Prithvi Air Defence (PAD) is supposed to tackle incoming missiles at ranges of 80-120 km (exo-atmospheric interception). On the other hand, the advanced air-defence (AAD) mainly consists of Akash Surface-to-Air Missiles (SAM) that can intercept incoming missiles at ranges of 15-30 km (endo-atmospheric interception). To add to its arsenal, India is set to purchase S-400 Triumph air defence missile systems from Russia. S-400 Triumph is one of the world's most advanced air defence systems that can simultaneously track numerous incoming objects – all kinds of aircraft, missiles and UAVs – in a radius of a few hundred kilometres and launch appropriate missiles to neutralise them. The S-400 Triumph air defence system integrates a multifunction radar, autonomous detection and targeting systems, anti-aircraft missile systems, launchers, and command and control

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centre. The two other major air defence systems with India are Spyder and Barak 8. While Spyder has a range of just 15 kilometres, Barak 8, a joint project of the DRDO and the IAI, has a longer range of at least 70 kilometres. All these systems are optimised for different roles and have different capabilities. Like, PAD and AAD are primarily to stop ballistic missiles which soar towards targets at supersonic speeds. S-400 is optimal for stopping cruise missiles, UAVs and fighter aircrafts. Even Aakash is capable of neutralising aerial targets like cruise missiles, fighter jets, unmanned aerial vehicles (UAV) and air-to-surface missiles. Even the ranges are different. Prithvi Air Defence (PAD) is supposed to tackle incoming missiles at ranges of 80-120 km (exo-atmospheric interception). Aakash can engage targets in the range of around 30 kms. S-400 Triumph air defence missile system is a far more complex and advanced system. The highly automated S-400 has radars that can pick up an incoming object up to a 1,000 kilometres away, track several dozen incoming objects simultaneously, distribute the targets to appropriate missile systems and ensure a high success rate. The S-400 Triumph also launches 9M96E and 9M96E2 medium range ground-to-air missiles. Designed for direct impact, the missiles can strike fast moving targets such as fighter aircraft with a high hit probability.

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

How do you see the future of Su-30MKI aircraft in the Indian Air Force?

Su 30 MKI is a multi role air superiority fighter. The 'MKI' version is specially 'tailored' version made for the Indian Air Force. The 'I' stands for India in MKI. Su 30 MKI is the most potent fighter aircraft in the inventory of IAF. This aircraft is a world class platform. This aircraft is the 'tip of the sword' for IAF. It is the front line serving fighter aircraft of IAF. Su 30 MK is a Russian made aircraft but Indian version of the aircraft which is MKI is different. It has components of Russian, Indian, Israeli and French origins. The MKI was inducted into IAF in 2004 and since then 240 aircraft are in operational service out of 272 aircraft ordered. And more orders were placed taking number to 314 aircrafts. Su 30 MKI is produced locally by HAL (under licence) in its Nashik production line with spares, parts, engines supplied by Russia. Now talking about the future of the aircraft. The Su-30MKI is expected to form the backbone of the Indian Air Force's fighter fleet to 2020 and beyond. With such a potent fighter aircraft becoming backbone of the IAF the power capability of IAF will drastically increase. With two hostile neighbours IAF will need these type of potent aircrafts in numbers also that's why IAF has planned to induct 300+ MKIs. Also IAF has already began a programme under which Su 30 MKIs will be upgraded to 'Super Sukhoi' with upgraded avionics, weapon systems and most importantly the engines. Su 30 MKI is powered by 'AL 312 turbofan engines which will be replaced by 'AL 412 turbofan engines under upgradation programme which powers Su-35. Russian Air Force Su-35 which is also operated by PLA Air Force of China. The People's Liberation Army Air Force of China also operates 'Su-30 MKK' version of Su 30 family. And it also operates the Su-35. So, to answer the threats posed by PLAAF, IAF has Su-30 MKI which is no less or even better than Su-30 MKK in many aspects and is even direct competitor to the Su-35 which is most advance 4++ generation fighter jet of Russian origin till date. Also threats posed by the Pakistan Air Force's aircrafts F-16 Fighting Falcon, JF-17 Thunder is no match for MKI. Whether its range, variety of weapons, payload, manoeuvrability, etc. MKI is superior to every aircraft in PAF's inventory. So, the way I see the future of Su-30 MKI is very promising. It is the dagger of IAF. And the aircraft will see operational service till or beyond 2040. IAF will induct other aircrafts as well but MKI will be the 'backbone' of IAF's fighter fleet

Source: <https://defenceupdate.in>

Indian Air Force must take the lead for futuristic, disruptive technologies

All my growing years, I have lived amongst men in Uniform and their families – my family being one of them. Moving from one remote base to another – a nomadic life where no home was home for more than a few months and friends and neighbours changed oh so frequently. But in all that there was one constant – the deep abiding sense of commitment to serve that resonated in every man in Uniform and those who were fortunate like me to live with and imbibe values of service from them. The Indian Air Force has a long heritage of this sense of service. Our air force is one of the oldest outside the western democracies. Indian aviators have flown and fought in combat and other operations way back before even World War 1. Even our history as an Independent nation starts in its opening chapter with IAF Dakotas of 12 Sqn airlifting the gallant 1 Sikh to fightback Pakistani raiders in 1947 to save J&K. The Dakota an aircraft with which I have a deep connection all through my childhood today flies in the IAF Heritage flight with Tail no VP905 named Parashurama after the Warrior Saint. Mr Parashurama will certainly be the star of this Air Force Day – flying for first time at an Air Force Day – memorializing the many men and families who served in those early difficult and challenging years For those of you who do not know what Dakota is, here's an explainer. It is an Indian military aircraft, which played a pivotal role in the 1947-48 India-Pakistan war. Dakotas were introduced in the 1930s as part of the 12th

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Squadron of the then Royal Indian Air Force and were the main workhorse in Ladakh and the Northeast region. They did not carry weapons, rather troops and supplies during World War II. The IAF has distinguished itself repeatedly in combat and peacetime. It is constantly stepping up in rescue operations all over the country – from Kerala to Jammu – from Gujarat to Northeast as recent floods and natural calamities showed.

History

Air Force Day is celebrated, each year, on October 8, to mark the anniversary of IAF's official establishment of the IAF on October 8, 1932. The Indian Air Force Day is celebrated on the day of inception of this force in India to aid the Army that was fighting on the land. It is attended by the chiefs of all the three Defence services namely Indian Air Force, Army and Navy. I usually write about these men and women who serve and sacrifice but given recent events am penning today my thoughts about challenges being faced by our air warriors and their machines. So, as we celebrate the heritage and service of one of the worlds most distinguished Air Force's let's take a look at serious challenges it faces. **Multiplicity of platforms and technologies in its inventory** Currently, The IAF operates on 32 platforms sourced from 9 countries, although, it would be preferable to have lesser number of platforms for better management purposes. It would be desirable to rationalize and reduce the number of platforms within which IAF operates. There is a strong debate leaning towards indigenisation of the aircraft production, but for decades it has relied on only HAL to do that. Even communist era Russia (that so influenced early Indian governments) did not make the mistake of allowing only entity – They had multiple design bureaus like Sukhoi, Mikoyan, Mil ,Kamov etc but we persisted with HAL. The results are there for us to see – from being a company that designed earliest fighter jets (HF-24 Marut) outside the Superpowers and basic trainers as way back in the 1960s (HT-2) – 70 years on HAL today only has one indigenous product – the Dhruv helicopter -forcing this piecemeal acquisition strategy – sometimes from here and sometimes from there – resulting in multiple platforms and increased costs in spares, training and manpower. HAL current situation is a cumulative effect of failed political leadership of DPSUs that's visible across the spectrum of PSUs in our country. National Security timelines unfortunately are not decided by HAL or some anonymous bureaucrat in MoD. And so it is that given decades of neglect and a non-urgent approach to modernization and an increased need to demonstrate our strength and reach to threats from neighbours (Pakistan, Chinese deployment of fighters in Tibet backed by Pakistan), it leaves India with no option than to emergency import until we become self-reliant and gain self-sufficiency in production of indigenous combat aircraft of this class and generation.

Re-strengthening the IAF

The IAF combat capability is at a historic low. It may sound like an indiscrete statement, but it needs to be said. The China Pakistan threat is a real one. The need for the IAF to be a credible deterrent is crucial for Economic and overall security of country. The IAF current depleted strength and capability is a real issue. The Emergency import of 2 squadrons is only the tip of the arrow. The IAF still needs the rest of the arrow to be built up. In some areas like airlift capability, the IAF has expanded in recent years but here too more needs to be done. IAF needs 42 Squadrons to completely handle Two Front War Scenario at any given time. The shrinking number of squadrons is a concern which we need to squarely deal with and not sweep under carpet as successive governments have done – to set us up for yet another 1962 type scenario. **Imports cannot be long-term answer** Importing Aircraft or any other product is an issue that will find less and less support in India. It creates economic activity in some other country than ours. Why should we do that? The Narendra Modi government has the right idea – address short term gaps with emergency imports (because of no other option) and lay out a robust medium and long term domestic manufacturing led procurement for the real medium-term requirements of the Indian Air Force. The 2-squadron emergency import of Rafales was much needed for the air force while the larger requirement of upgrading the IAF was to be indigenously manufactured. This medium-term Design and manufacturing plan includes both PSUs, Private Indian Companies and Private Multinationals. What is therefore needed is for this to be really given impetus under real leadership to creating a viable eco-system over the next 5-10 years. That would be the only real guarantor of IAFs preparedness. HAL must make it its mission to dramatically improving LCA Tejas capabilities in next 2-3 years including if possible with a new upgraded variant. Tejas after decades of development and thousands of crores of taxpayer spent must be made into a game changing platform and nothing less.

IAF must take the lead for futuristic, disruptive technologies

India is capable of delivering best in class technologies and platforms as we have seen in space and Nuclear sectors. Even Naval shipyards like Mazagon Docks are delivering world class platforms because of direct involvement of Navy in design and management. The constantly changing bureaucratic leadership cannot deliver this much needed and vital buildup of capability and eco-system. The IAF must take the lead in creating the necessary underpinnings to create a domestic Technology eco-system. Eighty years since it was born, the IAF is in the middle of a major transformation through induction of modern state-of-the-art equipment. There remain major challenges and as a nation

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that depends on our IAF to safeguard our skies – we need to handle these challenges head-on. This Air Force Day – let that be our mission to help our Air warriors get the air force they deserve.

Source: <https://defenceupdate.in>

India may import Japanese amphibious aircraft for Navy

With Japan's export policy being liberalised in recent years, allowing the country to export defence equipment, India is planning to import amphibious aircraft from Japan, said Rear Admiral Dinesh K Tripathi, Flag Officer Commanding, Eastern Fleet. An amphibious aircraft can take off from both land and water and contenders like ShinMaywa US-2 of the Japanese navy can be used for rescue operations from air to sea. Admiral Tripathi hinted at the possibility of India importing amphibious aircraft from Japan during an interaction with reporters on board the INS Sahyadri, at which he also announced the commencement of the Japan-India maritime exercise (Jimex 18). Concurring with Rear Admiral Tripathi, Rear Admiral Tatsuya Fukada, Commander, Escort Flotilla-4 (CCF-4), representing the Japanese Maritime Self-Defence Force (JMSDF), said, "We are looking for special strategic and global partnership with Indian maritime force, which has a high-end navy, so as to enhance peace and security in the Indo-Pacific region. We are here to establish maritime security in this region, including the Indian Ocean. We also want to promote cooperation and inter-operability between the two navies. Japan is seeking active laws for security in the region." When asked about the potential challenge from Chinese navy, Rear Admiral Tripathi said, "The Chinese navy is growing commensurate with their economy. They are doing as per their national interest. And we are also monitoring deployment of their platforms here. We are a well-balanced multi-dimensional force, well poised to take on any challenge and can operate on land, air and sea." Elaborating on the close co-operation between the two navies, both rear admiral Tripathi and his counterpart Mr Fukada mentioned the maritime affairs dialogues, at the political level, with the defence minister and Prime Minister-level between Japan and India. Staff talks, port calls are also conducted routinely, besides joint naval exercises such as the recently concluded Malabar and Rimpac 2018. Another area where the two countries are closely cooperating is counter piracy operations. "Last year, the Indian Navy helped us during a counter-piracy operation in the Gulf of Aden and we are patrolling such pirate-infested stretches in collaboration with the Indian Navy," Rear Admiral Fukada said. For the nine-day Jimex 18, being held in harbour and sea phase in Visakhapatnam, Japanese multipurpose frigate Kaga and Inazuma — a guided missile destroyer — are participating. The Indian Navy will be represented by indigenously designed and built warships including INS Sahyadri, anti-submarine warfare corvette, INS Kadmatt, INS Krich, and fleet tanker INS Shakti. In addition, one submarine, P8I long range maritime patrol aircraft, a submarine and a number of helicopters would also be participating in the exercise. The Indian ships would be under the command of Rear Admiral Tripathi.

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

DRDO test fires quick reaction missile off Odisha coast

The Defence Research and Development Organisation (DRDO) test-fired short range Quick Reaction Surface to Air Missile (QRSAM) from a test facility off Odisha coast. Sources said the sleek and highly mobile air defence system was fired from a canister mounted on a rotatable truck-based launch unit from Integrated Test Range (ITR). "The test was aimed at validating various parameters, including propulsion performance of the weapon system and its killing capability. Data generated during the test are being analysed," said a defence official. The missile, which can destroy multiple targets at a distance of 15 km, will supplement the medium range surface-to-air missile Akash capable of hitting targets 30 km away. Radars, electro optical systems, telemetry systems and other tracking stations have tracked the trajectory of the weapon and monitored all the parameters. The state-of-the-art missile developed by the Defence Research and Development Laboratory (DRDL) can be used as an anti-sea skimmer from a ship against low flying attacking missiles. It employs dual thrust propulsion stage using high-energy solid propellant. Its electronic counter measures helps to outsmart aircraft jammers. "As the missile has multi-role capability and can attain high frequency with manoeuvrability, it will provide considerable advantage to the Armed Forces. With cent per cent kill probability it can destroy aerial targets like fighter jets, cruise missiles and air-to-surface missiles as well as short range ballistic missiles," the official added. The missile, which is yet to get a formal name, is a new development of DRDO. It has to undergo several rounds of experimental trials before being inducted in the Armed Forces.

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

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Nirmala Sitharaman visits Rafale manufacturing facility in France

Defence Minister Mrs Nirmala Sitharaman visited a production facility of French aerospace major Dassault Aviation near Paris where the Rafale jets to be supplied to India are being manufactured, official sources said. They said during her visit to the plant in Argenteuil, Mrs Sitharaman spoke to officials of the Dassault Aviation, the makers of Rafale, and took stock of progress in production of the fighter jets whose delivery to India will begin in September next year. Mrs Sitharaman arrived in Paris on a three-day visit in the midst of a massive controversy over the procurement of 36 Rafale jets under a Rs 58,000 crore government-to-government deal between India and France. Last evening, Mrs Sitharaman held wide-ranging talks with her French counterpart Florence Parly on ways to deepen the strategic and defence cooperation between the two countries. The talks were held under the framework of the annual Indo-French defence ministerial dialogue which was agreed to during the summit meeting between Prime Minister Mr Narendra Modi and French President Emmanuel Macron in March. The two defence ministers comprehensively reviewed the entire gamut of the bilateral defence cooperation, which is a key pillar of the India-France strategic partnership, an official statement said. They also exchanged views on contemporary regional and international developments of mutual interest. Both sides discussed ways to deepen defence related official as well as operational level interactions. It was agreed to expand the scope and complexity of the regular joint exercises (SHAKTI, VARUNA and GARUDA) in the future, the statement said. Recognising that India-France partnership in the Indian Ocean Region is important for preserving and promoting the common strategic and security interests, the two leaders noted the continuing implementation of the "Joint Strategic Vision of India-France Cooperation in the Indian Ocean Region. It was not immediately known whether the Rafale deal figured in the talks. She also called on French Prime Minister Edouard Philippe and discussed issues of bilateral cooperation. In her interaction with the top leaders of the French defence industry, Mrs Sitharaman urged them to undertake and expand their defence manufacturing in India under the Make in India initiative as well as promote defence technology and R&D cooperation with Indian stakeholders such as Bharat Dynamics Limited, Hindustan Aeronautics Limited, Bharat Electronics Limited, Bharat Earth Movers Limited, Goa Shipyard Limited, Mazagaon Dock Shipbuilders Limited etc. Mrs Sitharaman's visit to France came in the backdrop of a fierce political backlash between the ruling BJP and Congress over the procurement of the jets. In a report, French publication Mediapart said Dassault Aviation, the manufacturer of Rafale, had to choose Ambani's firm Reliance Defence as its offsets partner in India as a trade-off for getting the deal. When asked about the allegations, Mrs Sitharaman said that offset obligations for the deal are mandatory but not the names of the companies. In a statement, Dassault Aviation said it has "freely chosen to make a partnership with Reliance Group, as it rejected the report by French publication Mediapart". The latest report followed former French president Francois Hollande's comments last month that France was given "no choice" on selection of the Indian partner for Dassault and the Indian government proposed the name of the Indian company. Hollande was the French president when the Rafale deal was sealed. The Congress has been alleging massive irregularities in the deal, saying the government was procuring each aircraft at a cost of over Rs 1,670 crore as against Rs 526 crore finalised by the UPA government when it was negotiating the deal. The Congress has also been targeting the government over selection of Reliance Defence as an offset partner for Dassault. The government has vehemently rejected the allegations and asserted that it did not have any role in the selection of Reliance Defence.

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

All you wanted to know about International UDAN

Recently, the Airports Authority of India, on behalf of the Ministry of Civil Aviation, the Centre and the Assam government invited proposals from bidders for selection under a new International Air Connectivity Scheme. The last date for submission of bids is November 22. This international air connectivity scheme is being referred to as International UDAN or Overseas UDAN. International UDAN is an extension of the domestic UDAN scheme that rolled out last year. Udaan means flight in Hindi and UDAN in this context is 'Ude Desh Ka Aam Naagrik'. That is, let the common citizen of the country fly. UDAN in its domestic avatar seeks to boost air connectivity by linking up un-served and under-served airports in Tier 2 and Tier 3 cities with the big cities and also with each other. This is done by offering cheap tickets to passengers and the Central and State governments paying a subsidy to the airlines to enable them to offer cheap tickets. Two rounds of bidding have happened under domestic UDAN and many flights have commenced, with some routes doing well and others not so much. Under International UDAN, the plan is to connect India's smaller cities directly to some key foreign destinations in the neighbourhood. Such direct air connectivity, it is hoped, would promote the development of the city and the State by wooing tourists and businesspeople to travel via smaller towns, instead of their flying through the metros. The scheme seeks to make use of the open skies policy that India has with other Asian countries that allows direct and unlimited flights to and from these nations to 18 Indian destinations. Now, these routes are untested, and airlines could be understandably reluctant to ply them. To encourage them to participate,

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the government offers a subsidy in the form of pre-decided payout per seat. Airlines are required to bid on the number of passenger seats per flight for which such support is required.

Source: <https://www.aviationindia.net/>

Countdown begins: Flying response to Aero India show

Ten days after a newly designed Aero India 2019 website was launched for registration of exhibitors and visitors, about 66 exhibitors have registered to participate in the show which will be held at Yelahanka Air Force Station from February 20 to 24. Of the 66 exhibitors who have registered, 49 are Indian companies and 18 are from abroad. Airbus from France, Rafael Advanced Defense Systems Limited from Israel, SAAB AB from Sweden, Boeing from the US are among major international defence and aerospace exhibitors. Companies from the UK, Italy, Belgium and Ukraine have also registered to participate as exhibitors in the air show. Organisers said that they expect close to 500 Indian and foreign companies to participate in the show. In the last edition of the airshow, exhibitors from 22 countries — with 213 companies and 234 domestic companies along with 500 official delegates from 46 countries — participated. The aircraft expected to participate in the show will be from six companies who have responded to the IAF's request for information for 110 multi-role fighter jets. The IAF is looking to procure 110 multi-role fighter jets from these, six companies Boeing (F/A-18 Super Hornet), SAAB Aviation's (Gripen), Eurofighter Typhoon, Lockheed Martin (F-16 Fighting Falcon) and Russia's Mig-35.

Source: <https://www.aviationindia.net/>

Exomoon spotted outside solar system

Astronomers have spotted what could be the first known moon to orbit an exoplanet. Earlier observations last year with NASA's Kepler telescope had hinted at its existence, but with new and better data from the powerful Hubble Space Telescope, astronomers are now more confident that the exomoon, a moon orbiting a planet outside the solar system, is real. Evidence suggests that it is as big as Neptune, orbiting a gas-giant planet roughly the size of Jupiter (called Kepler-1625b), which, in turn, orbits a star called Kepler-1625. Researchers say that the moon hypothesis is tentative and must be confirmed by follow-up Hubble observations. The moon has been designated as Kepler-1625b-i. The new results are presented in the journal "Science Advances". Exomoons cannot be imaged directly. Their presence is inferred by their transit in front of a star, momentarily dimming its light, a technique used to detect many of the exoplanets catalogued to date. Being smaller than their companion exoplanets, exomoons are tougher to detect. Searching for exomoons, Mr Alex Teachey and Mr David Kipping, astronomers at Columbia University, analysed data from 284 Kepler-discovered exoplanets with relatively wide orbits—longer than the 30-day orbit period—around their host star. They found a transit signature with intriguing anomalies in one instance in planet Kepler-1625b, suggesting the presence of a moon. The researchers observed the planet for 40 hours using Hubble to study the planet intensively, also using the transit method, obtaining more precise data on the dips of light. They monitored the planet before and during its 19-hour transit across the parent star. But a second, and much smaller, decrease in the star's brightness was also seen by Hubble about 3.5 hours later. They determined that this small dip was consistent with a gravitationally bound moon trailing the planet. In addition to the second dip, Hubble provided supporting evidence for the moon hypothesis by finding the planet transit occurring more than an hour earlier than predicted. This is consistent with a planet and moon orbiting a common centre of gravity that would cause the planet to wobble from its predicted location, much the way the earth wobbles as its moon orbits it. "A companion moon is the simplest and most natural explanation for the second dip in the light curve and the orbit-timing deviation," Mr Kipping explained. Large moons do not exist in our own solar system. The researchers say this may yield new insights into the development of planetary systems. Kepler-1625b-i is estimated to be only 1.5 per cent the mass of Kepler-1625b, which itself is several times the mass of Jupiter. This mass-ratio is similar to the earth-moon system. In the case of earth-moon and Pluto-Charon systems, the moons are thought to be created through dust left over after rocky planetary collisions. However, Kepler-1625b and its possible satellite are gaseous. So the moon may have formed through a different process. Kepler-1925b orbits its parent star at a distance similar to the sun-earth distance. However, since both are gaseous, they would be unsuitable for life as we know it.

Source: <https://www.frontline.in/>

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China-built world's largest amphibious plane, completes maiden flight test

China's indigenously designed and built amphibious aircraft AG600, touted as the world's largest, successfully carried out its first take-off and landing tests. The aircraft, developed and built by the state-owned aircraft firm Aviation Industry Corporation of China, took off and later landed on the water in Hubei province's Jingmen, state-run China Daily reported. The seaplane took off from the Zhanghe Reservoir at 8:51 am (local time) and stayed airborne for about 15 minutes, said the report which also accompanied the videos of the aircraft's take off. The aircraft code-named Kunlong was piloted by four crew members. Early this month, it completed its first water taxiing trials at a high speed of 145 kilometres. Designed to be the world's largest amphibious aircraft, AG600 is powered by four domestically-built turboprop engines and has a range of 12 hours. It will be mainly used for maritime rescue, fighting forest fires and marine monitoring, according to an earlier report by the state-run Xinhua news agency. The aircraft has passed a series of tests since its maiden flight last December. It successfully finished eight taxiing tests on water at a speed of 80-kilometre per hour and 120-kilometre per hour.

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

'Mangalyaan with 6-month mission life completes 4 years in orbit

India's first interplanetary mission, the Mars Orbiter Mission or the 'Mangalyaan', which had a launch life of six months, completed four years in orbit on 24 September. Launched on 5 November 2013, the Mars Orbiter Mission, India's pioneering interplanetary mission to outer space, inserted the satellite into Mars's orbit during its first attempt on 24 September 2014. The Indian Space research Organisation (ISRO) has released some stunning images of the Red Planet sent by the satellite to commemorate four years of its revolution round Mars. The satellite is one of ISRO's finest for its cost-effective engineering and construction, space-effective equipment in its payload, and its weight-balanced design. The orbiter's onboard camera has recorded over 980 images so far, which have been compiled into an atlas of the planet. Mars's two moons — Phobos and Deimos — have also been captured up close by the orbiter's Mars Colour Camera. ISRO's Mars Orbiter is also the only man-made satellite around Mars to catch and relay glimpses of the entire disc of Mars in a single frame, and the far side of its moon Deimos, an ISRO release said. MOM is credited with many laurels like cost-effectiveness, short period of realisation, economical weight-budget, miniaturisation of five heterogeneous science payloads etc. Satellite is in good health and continues to work as expected. MOM is built with full autonomy to take care of itself for long periods without any ground intervention. The spacecraft came out of communication 'blackout' and 'whiteout' geometry successfully during this period. ISRO made an 'Announcement of Opportunity' (AO) through its website seeking for proposals to expand the scientific community within the country that can access and analyse MOM data. A planetary data analysis workshop was conducted to enhance exposure and reach of MOM-AO scientists. Initial two years data of MOM were released to public through ISSDC website <https://mrbrowse.issdc.gov.in/MOMLTA/>. Third year data are ready to be released to public. More than 2100 users have registered and downloaded more than 620 GB data so far.

Source: <https://www.domain-b.com/>

Megha-Tropiques Successfully Completes Seven Years in Orbit

Megha-Tropiques satellite was built by ISRO and CNES as a Joint Venture. The satellite is meant to study water cycle and energy exchanges in tropical region for weather prediction and climate research. Megha-Tropiques was launched on 12th October 2011 from SDSC, Sriharikota. The satellite has successfully completed seven years of on-orbit observations with four Science instruments on board, namely, MADRAS, SAPHIR, SCARAB and ROSA. Megha-Tropiques provides scientific data on the contribution of the water cycle to the tropical atmosphere, with information on condensed water in clouds, water vapour in the atmosphere, precipitation, and evaporation. All science instruments provided valuable data to the user community. Many national and international papers have been generated by utilizing these data. The Global response for the Announcement of Opportunities for science data utilisation of the instruments on-board Megha-Tropiques has been good and is increasing with time.

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

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ISRO successfully tests Cryogenic Engine (CE-20) for GSLV Mk-III / Chandrayaan-2 Mission

The upper stage of GSLV MK-III vehicle is powered by Cryogenic Engine (CE)-20 which develops a nominal thrust of 186.36 kN with a specific impulse of 442 seconds in vacuum. The engine operates on gas generator cycle using LOX / LH2 propellants combination. The major subsystems of the engine are thrust chamber, gas generator, LOX and LH2 turbo pumps, igniters, thrust & mixture ratio control systems, Start-up system, control components and pyro valves. The fifth hardware of CE-20 integrated engine designated as E6 is earmarked for GSLV Mk-III M1-Chandrayaan 2 mission. The flight acceptance hot test of E6 engine was successfully tested for 25 seconds at High Altitude Test facility, ISRO Propulsion Complex (IPRC), Mahendragiri on October 11, 2018. The test demonstrated steady state operation of engine. The performance of all engine subsystems were observed to be normal during the hot test.

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

AstroSat Picture of the month - Oct 2018

This month, APOM brings to you the ultraviolet view of one of the most spectacular objects in the sky, NGC 6302. Located nearly 3,800 light years away in the constellation Scorpius, NGC 6302 is a planetary nebula, whose shape is strikingly similar to the wings of a butterfly, hence aptly named as the Butterfly Nebula. This is the second planetary nebula that we bring forth to you, the first being NGC 40, covered in the APOM issue of December 2017. Planetary nebulae are beautiful structures formed during the last few stages of the lives of stars like the Sun or a few times heavier. As the stars burn up all the hydrogen or helium fuel, they increase in size and become redder in colour, and are known as giant stars. As the giant star passes through few more stages, it continually sheds its outer layers revealing an inner hot core called the white dwarf. The white dwarf heats up the spewed-out gas which shines in the form of planetary nebula. Many of these planetary nebulae have strikingly symmetric shapes that need not be spherical and it has been suggested that this could be due to the various physical processes occurring in and around the star when it hurls out the gas from the outer layers. These nebulae are named planetary because when astronomers first observed them, they thought that these resembled planets. We now know that this is not the case, although the name has lingered. Prof Kameshwar Rao, from the Indian Institute of Astrophysics (IIA), and his team have been investigating planetary nebulae in the ultraviolet light. They have imaged the Butterfly Nebula through the far and near-ultraviolet filters of the **Ultraviolet Imaging Telescope (UVIT)** of **AstroSat**. Using these images, they have discovered that gas which is bright in the far-ultraviolet extends beyond the known wings of the butterfly out to 5.5 light years from the centre, nearly three times of what is seen in the optical. The reddish coloured figure on the right is the far ultra-violet image of the Butterfly Nebula. The blue image is a cartoon that represents the full extent of the far-ultraviolet emission. These researchers argue that the extended far-ultraviolet light is due to cold hydrogen molecules in the gas present in the outer parts of the nebula which are excited by the central star. They suspect that these far-ultraviolet structures of the planetary nebula point to the possible presence of two central stars in a binary system that are gravitationally bound.

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

Three years of AstroSat

AstroSat, India's first space observatory class satellite dedicated to Astronomy, was launched onboard PSLV from Satish Dhawan Space Centre SHAR, Sriharikota on September 28, 2015 into a low earth orbit. After the first six months of calibration and verification phase, the observatory started observing cosmos in multi-wavelength spanning a wide range from near Ultraviolet (UV) to High Energy X- rays. AstroSat carries a total of five scientific payloads, namely, Ultra-Violet Imaging Telescope (UVIT), Soft X-ray Telescope (SXT), Large Area X-ray Proportional Counter (LAXPC), Cadmium Zinc Telluride Imager (CZTi) and Scanning Sky Monitor (SSM). AstroSat has provided good spatial resolution images in UV over half degree field of view and has a large collecting area at High Energy X-rays (LAXPC). Except for SSM, other four payloads onboard AstroSat are co-aligned and capable of performing simultaneous observations of astronomical sources. The observations were carried out based on the proposals received from users in India and abroad. AstroSat has observed more than 750 sources till September 2018. For the proposal cycle starting from October 2018, around 150 of them are approved and scheduled for observations. From the beginning, AstroSat is providing good results. Data from AstroSat has resulted in close-to 100 publications in refereed journals, and this number is expected to increase with the data now made open to public on September 26, 2018. (Archival Data of AstroSat released).

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AstroSat has provided several new and exciting results like

- Solving the decade old puzzle of a cool red star but bright in UV, by identifying it as a binary
- X-ray polarisation from Crab nebula
- Detection of a coronal explosion on the nearest planet-hosting star (simultaneously observed by NASA's Chandra X-ray observatory and Hubble Space Telescope)

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

TECHNOLOGY

ISRO's Astrosat completes three years in space

A few days after the Mars Orbiter Mission (MOM) marked four years in space, another important mission by the Indian Space Research Organisation (ISRO) completed three years. Astrosat, India's first dedicated multi-wavelength space observatory, completed three years in space on September 28. ISRO celebrated the anniversary by its 'Picture of the month' post on its website. For the last one year, the space agency has been posting images captured by the instruments onboard the observatory every month under the title 'picture of the month'. To mark Astrosat's third anniversary, ISRO posted images of the observatory a few days ago. It has posted two images of the fully assembled Astrosat and an illustration of the observatory with sensors. The pictures help space technology enthusiasts identify each of the five telescopes of the observatory. The observatory has five instruments onboard, all of which can look at the same piece of sky simultaneously. These five telescopes give Astrosat the capability of observing in the ultraviolet, X-ray and gamma ray bands. These five instruments include ultra violet imaging telescope (UVIT), the soft X-ray telescope (SXT), the large area X-ray proportional counter (LAXPC), the cadmium-zinc-telluride imager (CZTI) and the scanning sky monitor (SSM).

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

'ISRO will double satellite launching capacity'

Indian Space Research Organisation (ISRO) has decided to double the launching of satellites by constructing another Polar Satellite Launch Vehicle Integration Facility. Cost-effectiveness has attracted several countries including the U.S. and the U.K. to use ISRO's launch pad at Sriharikota, according to Mr B.V.V.S.N. Prasad Rao, Scientist G and Deputy General Manager at Satish Dhawan Space Centre (SDSC), Sriharikota Range (SHAR). Mr. Rao, who was in the city to take part in the World Space Week celebrations, told The Hindu that at present, the ISRO was able to launch seven satellites from the first launch pad. "As the demand for PSLVs to launch payloads of foreign satellites is increasing, the ISRO has decided to augment its infrastructure. Once two launch pads are available, we will be able to take up launching of satellites simultaneously, increasing the total number up to 16 per annum," Mr. Prasad Rao said.

'Fat boy'

He further said the ISRO had achieved phenomenal success in Geosynchronous Satellite Launch Vehicle (GSLV) Mk II with its expandable launch system and Mk III propelled by cryogenic rocket engine popularly described as 'Bahubali' or 'fat boy' of Indian space. "Now, we are gearing up to complete all the launches scheduled in the manifest and complete the projects in time," Mr. Rao said.

Record achievement

ISRO has set an all-time record by launching 104 satellites including primary payload Cartosat-2D from a single rocket from the first launch pad at the spaceport at Sriharikota last year, out of which three were from India. No space agency in the world has achieved the feat of launching so many satellites into the orbit on a single flight, he added.

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

SPACE X AND BOEING TO CARRY OUT HUMAN SPACEFLIGHTS IN MID 2019,

The first human spaceflight aboard a **SpaceX** rocket to the **International Space Station (ISS)** is expected to take place in June 2019, while a flight on a **Boeing** spacecraft is set to follow in August 2019, NASA said. It is the first crewed mission by the US since the retirement of the space shuttle in 2011. **NASA** astronauts currently use Russian Soyuz spacecraft, and its contract is set to expire in November 2019. While both SpaceX and Boeing launches have already been postponed several times, NASA on 4 October 2018 said that it would now be providing monthly updates

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on deadlines. “This new process for reporting our schedule is better; nevertheless, launch dates will still have some uncertainty, and we anticipate they may change as we get closer to launch,” Mr Phil McAlister, director of commercial spaceflight development at NASA headquarters, said “These are new spacecraft, and the engineering teams have a lot of work to do before the systems will be ready to fly,” he added. In 2014, Boeing and SpaceX were awarded a combined \$6.8 billion in contracts from NASA to develop spacecraft capable of flying crews to the space station. Earlier in August, NASA had also named nine astronauts including Indian-origin astronaut Ms Sunita Williams for its first human spaceflight programme since the retirement of the space shuttle in 2011. “For the first time since 2011, we are on the brink of launching American astronauts on American rockets from American soil,” NASA Administrator Mr Jim Bridenstine had said while announcing the names of the astronauts. The crewed flights will succeed uncrewed missions. The first test flight — Demo-1 — is scheduled in December, 2018 but the launch will occur in January, 2019 to accommodate docking opportunities at the orbiting laboratory. Boeing’s targeted readiness for its **Orbital Flight Test** is March 2019, NASA said. Boeing and SpaceX have made significant strides in the development and operation of a new generation of spacecraft and launch systems in partnership with NASA’s Commercial Crew Programme. The success of these human spaceflight systems will be an unprecedented achievement for the commercial space industry and will enable NASA to focus on deep space exploration with NASA’s Orion spacecraft and Space Launch System, as we return humans to the **Moon** and on to **Mars**.

Source: <https://www.firstpost.com/confirm nasa>

China unveils deadly bomber aircraft that is ‘invisible’ to radar

China has released a video footage of one of its most powerful unmanned fighting jets, the Wing Loong II. It has the capability to avoid radar detection which makes it almost invisible to detect and can successfully destroy targets with laser-guided missiles. It is speculated that the Wing Loong II has been developed specifically for the export market and it can be used for surveillance and aerial reconnaissance missions. China will be providing 48 of these drones to the Pakistani Air Force. The aircraft has a maximum payload capacity of 400 kg and can also be fitted with a variety of weapons to be used to perform combat and strike operations. The aircraft is remotely controlled by one operator from the ground using consoles. It is capable of flying for 20 hours without refuelling. The Wing Loong II could automatically choose an airport and perform emergency landing under unexpected circumstances, the plane’s chief designer Mr Li Qidong was quoted. The aircraft has been designed and manufactured by the Aviation Industry Corporation of China and it is an improved version of the Wing Loong I UAV (Unmanned Aerial Vehicle). The new version has an optimised aerodynamic design, an improved airframe, and upgraded airborne systems. The Wing Loong II can go upto a speed of 370 kilometers an hour and can reach an altitude of 9,000 meters. The plane is considered as Beijing’s answer to US Air Force’s MQ-9 Reaper, the most feared military drone in the world.

Source: <https://indianexpress.com/>

This is how Chandrayaan-2 will perform its jobs once it lands on the moon

India launched its first lunar probe in October 2008, and it is setting up the stage for its second coming with Chandrayaan-2 liftoff. The mission will be ISRO’s attempt to get a more delicate and close up look at the lunar surface, the launch of which is eagerly awaited. Unlike the first mission which carried only Chandrayaan orbiter and the Moon Impact probe, this mission will have a lander and a rover apart from the orbiter, which has been developed by Ahmedabad-based Physical Research Laboratory (PRL). Equipment attached to orbiter: Solar X-ray monitor: “There are three payloads developed by the PRL for Chandrayaan-2. The orbiter will have a solar X-ray monitor developed by PRL. It will monitor x-rays coming from the Sun and X-rays being generated on the surface of the moon,” said PRL Director Dr Anil Bhardwaj, speaking to reporters on the sidelines of the 15th International Symposium on Equatorial Aeronomy, organised at the main PRL campus. PRL, a unit of Department of Space, was founded in 1947. Equipment attached to lander: ChaSTE: “On the lander, there will be Chandra’s Surface Thermophysical Experiment (ChaSTE). This is a probe which will measure the temperature beneath the surface by getting inside the surface of the moon. It will do so after the lander lands on the moon,” the director said, adding that this equipment will also be developed by PRL. (ChaSTE) is one of the science experiments proposed to conduct in lunar surface in the Chandrayaan-2 mission. Equipment attached to rover: Alpha Particle X-Ray Spectrometer : For the rover, which will come out from the lander and meant to roam on the lunar surface, PRL has developed an instrument called ‘Alpha Particle X-Ray Spectrometer’, said Mr Bhardwaj. “This instrument is designed to identify various elements and chemical compounds on the surface of the moon,” he added. Things you must know about Chandrayaan-2 According to reports, Chandrayaan-2 is likely to be launched in January-March window in 2019. However, exact dates are not yet released. It will take one or two months for the orbiter to reach

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its designated place around the moon After the orbiter reaches its designated place in the lunar orbit, the lander will depart from it along with the rover Following a controlled fall, the lander will soft land on the lunar surface at the prescribed site and place the rover on the surface The rover will spend 14 days on the lunar surface covering a distance of 150-200 km on the moon The instruments on the rover will observe the lunar surface when it will walk on the moon These instruments will also perform an on-site chemical investigation The data will be sent back to earth through the Chandrayaan-2 orbiter (rover will send the data to the orbiter and the orbiter will send it back to earth) to analyse the lunar soil Aiming for the sun with ISRO's Aditya-L1 mission PRL is also developing instruments for 'Aditya-L1 mission', which is aimed at studying the Sun through a satellite placed in the halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system, said Mr Bharadwaj. An instrument for the measurement of charged particles has also been developed, he said, adding, "With this instrument, we will be able to study solar winds, charged particles and its energy range." As per ISRO (Indian Space Research Organisation) website, the satellite will be inserted in a halo orbit around the L1, which is 1.5 million km from the earth. The project is approved and the satellite will be launched during 2019 2020 time frame by PSLV-XL from Sriharikota.

Source: <http://www.defencenews.in/>

France unveils model of the Next Generation Fighter that will replace Rafale

The well-known French company Dassault used this year's Euronaval 2018 exhibition to display a model of the New Generation Fighter (NGF) that will eventually replace the current generation of Dassault's Rafales and Germany's Eurofighter Typhoons aircraft by around 2035-2040. The Dassault 's next-generation aircraft has no tail fin and a swept W-shaped wing design and incorporates highly advanced stealth technologies and integration with information systems. The new aircraft will have tricycle-type landing gear for runway take-off and landing. The air vehicle is expected will be adapt to contemporary air threats and exploiting the potential of artificial intelligence. It is likely that the new fighter jet project is developing as part of Europe's Future Air Combat System (FCAS) and will eventually replace the current generation of Eurofighter and Rafale fighter aircraft by around 2035-2040. According to a news release put out in April 2018, Germany and France have agreed on the central requirements for a new fighter jet to replace Eurofighter Typhoon and Rafale warplanes beginning in 2040. The CEO of Dassault Aviation, Mr Eric Trappier early said the Airbus and Dassault decided to team up to ensure that Europe retains control over its future weapons systems. Airbus and Dassault said it was important for France and Germany to launch an initial joint study this year so they could get demonstrators of the technology done for 2025. Mr Trappier said the fighter jet would not be a copy of the U.S. F-35 fighter, but would be more ambitious.

Source: <http://www.defencenews.in/>

IAF to hold competition for swarm drones technology

In the first of its kind in the Indian defence sector, the Indian Air Force (IAF) has announced the Mr Mehar Baba prize under which individuals, start-ups and other "for profit" entities can compete to build a swarm of 50 drones to be employed in Humanitarian Aid and Disaster Relief (HADR) operations. The competition aims to tap into the young talent pool available across the country and leverage its expertise to meet the emerging requirements of the armed forces. If successful it can be a benchmark for other services to emulate. "The winners, up to three, will get up to ₹10 lakh in prize followed by a co-production opportunity with a Base Repair Depot (BRD) towards a ₹100 crore order for induction of their developed drone swarms," an IAF officer said. The increasing frequency of natural disasters in the country and the extensive damage they cause, underlines the need for enhanced HADR response efforts, especially in the remote and far-flung areas and the swarm technology has great potential in this domain. The competition is split in three phases where those in Phase II and Phase III meet the jury set benchmarks, shall get their development cost reimbursed of up to ₹25 lakhs and ₹10 crores respectively, the officer added. The deadline to submit proposals for the competition is November 14 2018 and those shortlisted would have to make a presentation and present a detailed plan before a jury for which the deadline is December 18. The competition is named in the honour of Late Air Commodore Mr Mehar Singh affectionately called Mr Mehar Baba. He was commissioned as a pilot officer in 1936 in UK and was posted to the sole squadron in the Royal Indian Air Force based in the North West Frontier. Post-independence Mr Mehar Baba was the first to land in Srinagar, was the first to land in Poonch in Kashmir, and later the first to land in Leh, Ladakh and Daulat Beg Oldie (DBO) – the then highest altitude airstrip in the world. Swarm drones as a technology concept, in which a large number of drones are operated and employed collectively on a task, is picking up traction and several countries are investing time and efforts to build large swarms that have multiple applications.

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



India Becomes 6th Country To Have A Fully Operational Nuclear Triad

India joins the list of select nations to have an operational Nuclear Triad i.e. the ability to launch a nuclear counter-strike from land, sea or air. Even though India already had the nuclear triad, but according to media reports, they have become fully operational for the first time. Only the US, Russia, UK, France and China have a proven and an operations nuclear triad. The commander of the Strategic Force Command (SFC) of the Indian defence forces holds the key to the nuclear triad, marking the success of a journey which commenced soon after India carried out nuclear tests in Pokhran, Rajasthan, in May 1998. The nuclear triad is also a remarkable illustration of top-secret collaboration between the armed forces, and experts in fields like atomic energy, space, and defence. Though news about the ability of some missiles to deliver nuclear warheads has made it to the public domain, the means of devastating strikes have been kept under wraps. While a nuclear warhead can be delivered deep into the enemy territory through surface-to-surface Agni missiles, some of the IAF's Mirage-2000 fighter jets have been modified to launch a nuclear attack from the air. The Rafale jets which will be inducted in the Indian Air Force by 2019 will also become nuclear capable. From the sea, 'Dhanush', a naval variant of the Prithvi missile, has the capability to fire a nuclear warhead from a ship, and 'Sagarika' from INS Arihant, the country's first nuclear-powered submarine. The Strategic Force Command (SFC) carried out a test of 'Dhanush' missile in February this year as part of training for the Indian Navy, sources added.

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

Insuring India's nuclear power assets: How much cover is good enough?

Does a Rs 15-billion insurance cover serve the expanding nuclear business in India? Even though the target of 63 GWe of nuclear power by 2032 set by its National Energy Policy looks far too ambitious to achieve, the scaled-down 22 GWe would also need more insurance cover. It is one of the key themes for global nuclear industry captains and Indian insurance companies, as they gather for the two-day India Nuclear Business Platform in Mumbai this week. It also makes private companies reluctant to invest in the Indian nuclear projects, giving state-run ventures like those from Russia and France an advantage over them. The Indian reinsurance company, GIC-Re, with the four state-run insurance companies, is in a difficult position to try to convince the foreign companies that the sum is adequate for now. The Indian government had set up the Rs 15-billion India Nuclear Insurance Pool on June 12, 2015, to provide cover corporate liability against any accident at nuclear plants. The cover comes under India's Civil Liability for Nuclear Damage Act of 2010 (CLND Act). The pool was created as India stepped out to solicit more investment in its power sector by nuclear power developers. The sum agreed to essentially caps the liability of the insurers, even as project developer companies are told that their liability is unlimited. The Indian government claims, not incorrectly, that the risks are quite unlikely, so making the pool a larger sink only leads to larger demand for greater capital from GIC-Re and the four insurance companies. Though there are seven other Indian insurance companies with stakes in the pool, such as ICICI Lombard and Tata AIG, their stakes are narrow. The big money comes from the government-run New India Assurance, National Insurance, United India and Oriental Insurance, each of which contributes Rs 3 billion to the corpus.

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

ASTRA Missile getting ready to be inducted in service next year: another successful test

conducted by Indian Air Force during Sept 26 to Oct 3, at Integrated Test Range (ITR), Balasore as part of final development trials of the missile. The trials were a combination of complex tests for engagement of pilotless target in different modes of manoeuvring, off-boresight, medium and long ranges. The missiles were telemetered for evaluation of online performance of all sub-systems especially the datalink, RF seeker and proximity fuse for end-game performance. Astra has been tested six times under different launch conditions and ranges as part of the final development trial. The missile has engaged targets and all the mission objectives have been met. With Indian Air Force's (IAF) active participation, Defence Research and Development Organisation (DRDO) has developed the missile and integrated the weapon on Su-30 and other air platforms. Hindustan Aeronautics Limited (HAL), Nasik has been instrumental in the modification of a number of Su-30 aircrafts for Astra weapon integration and support during trials. Just last month the indigenously built missile was successfully test-fired by the IAF from Su-30 aircraft, at Air Force Station, Kalaikunda. It was successfully engaged a manoeuvring target with high precision meeting the mission objectives. All the sub-systems including the indigenous RF Seeker performed accurately, meeting all the mission parameters and objectives. Two missiles were also launched in the combat configuration

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with warhead and the targets were neutralized. More than 50 private and public sector industries are involved in the development and production of different sub-systems of the missile. The missile is expected to be inducted into IAF in 2019.

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

DRDO indigenously develops 'Glide bombs' for bigger ranges

India has moved closer to self-dependence in precision-guided 'smart glide bombs' as it conducted covert trials of these bombs successfully at Pokharan firing range in Jaisalmer on August 17 last month. Christened as 'Garuthmaa' and 'Garudaa', the 'glide bombs' are being indigenously developed by the Defence Research and Development Organisation (DRDO). Of these two drop trails, the test of Garudaa, the non-winged glide-bomb, was carried out to evaluate its precision for a range of 30 kilometres while in another set of drop trails, both Garudaa and 'Garuthmaa' were successfully tested from a Su-30 MKI aircraft, a DRDO official said in a newsletter released recently by the Aeronautical Society of India (AESI, Hyderabad branch) at a meeting here. Garuthmaa, the 1,000 kg winged smart glide bomb, was tested for its maximum 100-km range, Top DRDO officials termed the tests as a 'major success'. Sources in DRDO said that guided by on-board navigation systems, Garuthmaa was tested for its first phase of trials in Thar Desert for assessing its accuracy in hitting a target after gliding for 100 kilometres. "The bomb was dropped from a Su-30 MKI aircraft for which we got full support from the Pune airbase. The IAF has been involved in development and related trials of this 'smart bomb' from the beginning", said an official, adding that non-winged Garudaa was tested for 30-km range and would be tested for bigger ranges (up to 100 Km) in future. "Garudaa", the non-winged version of this guided bomb with a range of 30 kilometres was tested initially three years back. DRDO officials shared that contrary to the conventional 'dumb bombs' which take a free flight after being dropped, guided bombs like 'Garuthmaa' have winglets and on-board navigation and guidance systems enabling these to hit the target with precision after being dropped from varying heights. Both 'Garuthamaa' and 'Garudaa' are a brainchild of various laboratories of DRDO including Research Centre Imarat in Hyderabad, Defence Avionics Research Establishment (DARE) in Bengaluru, Terminal Ballistics Research laboratory (TBRL) in Chandigarh, Armaments Research and Development Establishment (ARDE) in Pune.

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

BUSINESS

After Presidents trip to Tajikistan, India hopes to expand strategic presence at Ayni Air Base

India, seeking to expand its strategic presence in Central Asia, is hoping to expand its military base in Tajikistan — its only such facility abroad — where Indian Air Force and Border Roads Organisation personnel have been stationed since 2005. President Mr Ram Nath Kovind visited Ayni Air Base, about 15 km west of the Tajik capital Dushanbe, during his October 7–9 trip and signalled India's interest in expanding its presence there, according to sources. Almost 150 Indian personnel have been posted in Ayni. Mr Kovind met the IAF contingent at the base. India established a presence at Ayni in the days following the September 11 attacks and the US campaign in Afghanistan. At that time, India operated a hospital at Farkhor on the Tajik-Afghan border, where legendary Afghan political leader Mr Ahmed Shah Masood was treated. India, Russia and Tajikistan agreed in 2002 to operate Ayni on a rotational basis once construction work at the air base was completed. The Border Roads Organisation helped to rebuild the airstrip and associated facilities at Ayni. With India entering the Shanghai Cooperation Organisation, a Eurasian alliance, and keen on stabilising Afghanistan in collaboration with Central Asian states and Russia besides expanding the counterterrorism partnership, boosting facilities at Ayni will be handy, experts pointed out. Expanding defence ties with Tajikistan was among the talking points during President Mr Kovind's trip.

Source: <http://www.defencenews.in/>

HAL's Jets costlier than foreign ones, says Defence Ministry audit

Fighter jets made by Hindustan Aeronautics Limited (HAL) – the Bengaluru-based defence public sector unit – cost more than the same jets produced abroad by the original equipment manufacturer (OEM), a recent review of the state-owned company by the ministry of defence (MoD) has found. The department of defence production is studying the document, said an officer aware of the development who did not want to be identified. Su-30MKI – the mainstay fighters of the Indian Air Force (IAF) which is manufactured by HAL under licence from Russia – is about Rs 150 crore costlier

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than the ones made in Russia, according to the document, a copy of which has been reviewed by Hindustan Times. "The aircraft produced at HAL comes at a significantly higher cost when compared to direct purchase from the OEM," the document added. A Su-30MKI made in Russia cost Rs 269.77 crore whereas one made by HAL in India costs Rs 417.69 crore, almost "Rs 150 crore" more per aircraft, the review said. Similarly, there is a huge cost difference between the cost of the Hawk trainer aircraft manufactured by British Aerospace and those made HAL. After long and torturous negotiations, India bought British made Hawk jets to train pilots in 2004. Of the initial 62 Hawk jets, 24 were to be bought in a fly-away condition and the remaining were to be manufactured under licence by HAL. Each Hawk aircraft manufactured Britain in 2004 cost Rs 78 Crore. Those manufactured at HAL would have cost Rs 88 crore that year. The cost Hawk aircraft produced by HAL continued to increase. In 2010, the cost shot-up to Rs 98 crore and in 2016, Rs 153 crore. The difference in price "is primarily due to lesser efficiency and exorbitant man hour rates," the review has found. Interestingly, the purchase of 126 Medium Multi-Role Rafale fighters from French Defence manufacturing giant Dassault that was negotiated by the previous government (108 would have been assembled in India by HAL) was scrapped because of high man hour cost at the Indian state-owned company. HAL would have needed 2.7 times more man-hours than the French company for each aircraft. HAL disagrees with the interpretation of the report. Responding to queries, a spokesperson said "Cost escalation from 2005 (for the Hawk jet) is normal. We also need to take into account the life-cycle cost of each product against off the shelf purchase from overseas. The indigenous benefits, the ecosystem HAL creates for the larger benefit of the country should be factored in also. Importantly, staggered or small orders deny economies of scale to HAL." HAL also pointed to supply chain issues adding to cost. "Given that multiple agencies get involved in our manufacturing process, kit cost from OEMs and other delays like raw material and spare part supply issues, which are also endemic to the aerospace industry in India, the increase in cost must be evaluated in the right spirit," the spokesperson added. The National Democratic Alliance's decision to enter a \$8.7-billion government-to-government deal with France to buy 36 Rafale warplanes made by Dassault was announced in April 2015, with an agreement signed a little over a year later. This replaced the previous United Progressive Alliance regime's decision to buy 126 Rafale aircraft, 108 of which were to be made in India by the state-owned Hindustan Aeronautics Ltd. The deal has become controversial with the Opposition, led by the Congress, claiming that the price at which India is buying Rafale aircraft now is Rs 1,670 crore for each, three times the Rs 526 crore, the initial bid by the company when the UPA was trying to buy the aircraft. It has also claimed the previous deal included a technology transfer agreement with HAL. The NDA has not disclosed details of the price, but the UPA deal, struck in 2012, was not a viable one, former defence minister Mr Manohar Parrikar has previously said, implying that it would have never been closed and that, therefore, any comparison is moot. Indeed, the UPA was not able to close the deal till 2014, largely over discussions related to pricing of items not included in the initial bid. The NDA has said that the current deal also includes customised weaponry. The deal has also become controversial on account of the fact that one of the offset deals signed by Dassault is with the Reliance Group of Mr Anil Ambani. The Congress claims the earlier deal was scrapped and a new one signed just to provide Mr Ambani this opportunity for an offset deal. Both the government and Reliance have repeatedly denied this.

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

Dassault to start delivery of Rafale Fighter Jets to India from 2019 : CEO

Amid the political controversy over Rafale deal with France, the Dassault Aviation has announced that it will deliver the fighter jets to India from 2019 and may see new orders in coming months, reported news agency Reuters. Dassault Aviation Chief Executive Officer (CEO) Eric Trappier told this to Reuters ahead of the world's largest business jet show in Orlando. The announcement comes amid a huge political row over the deal with France, with the Congress party spearheading a campaign against what it terms as Rafale scam. Congress president Mr Rahul Gandhi has accused Prime Minister Mr Narendra Modi of benefitting Reliance Defence's Mr Anil Ambani with the deal.

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

India Hopes for Early Conclusion of \$19 Billion Contract for 110 Fighter Jets

Air Chief Marshal B.S. Dhanoa has said that following the failure of the decade-long negotiations with Dassault Aviation for 126 fighter jets, the Indian Air Force (IAF) has become wiser, hence, this time around the proposed

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procurement of 110 fighter jets will be hassle-free and prompt. The IAF was earlier looking for a single-engine jet to replace the aging fleet of MiG-21s and MiG-27s, but the government had to change the plan to avert a controversy as only two manufacturers Lockheed Martin and SAAB had expressed interest in the tender."For 110 fighters we issued the RFI, (and) got a response from six vendors. Have to get an AON (acceptance of necessity) and then we'll float the RFP, will not be a long procedure because testing and procedure were done last time. We are (also) wiser after the last RFP we had issued," IAF Chief B.S. Dhanoa said while addressing the media in New Delhi. In July of this year, four firms namely Boeing F-18, Dassault Rafale, Eurofighter Typhoon, and United Aircraft Corporation had proposed selling their twin-engine fighter jets for the project worth \$19 billion while Lockheed Martin's F-16 and SAAB's Gripen were single-engine fighters. The tender for 110 combat aircraft mandates the building of at least 85 percent of the order locally. The Narendra Modi-led government has come under intense scrutiny after it scrapped an order with Dassault Aviation for 126 Rafale jets worth \$12 billion in 2015, struck after a decade of negotiations, and sealed a separate government to government contract in 2016 for 36 fighter jets.

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

Rafale Deal Bears Fruit : India To Get Two Major Missile Assembly Units

Amid the political allegations levelled against the Modi government by the Congress party in the Rafale deal, one state-owned company is expected to gain big from one of the two major proposals which are part of the offset of the Rafale deal, Livefist has reported. The major proposals include moving the final assembly of major missile systems to India and manufacturing of substantial parts. The offset clause in the Rafale deal mandates manufacturers of the jet and other stakeholders to source parts of the aircraft and weaponry from India which means that the manufacturers have to establish joint ventures with Indian companies and invest close to half of the Euro 7.87 billion deal in them. Apart from Dassault, Thales and Safran, European missile maker MBDA, the fourth firm in the deal, also has major offset commitments to fulfil. The company intends to transfer a significant part of missile parts manufacturing and entire final assembly lines of certain missile systems to India. According to Livefist, MBDA is intending to transfer its ASRAAM air-to-air missile final assembly in Bolton, United Kingdom to the Hyderabad facilities of state-owned Bharat Dynamics Limited (BDL). MBDA is also offering to conduct final assembly of the Mistral air-to-air missile at the facilities. The other proposal is to build the rear portion of the MICA air-to-air missile in a joint venture with Larsen & Toubro. MICA, which the Indian Air Force will receive both on upgraded Mirage 2000 jets and new Rafales, is presently being manufactured at Selles-Saint-Denis in France.

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

EVENT

2nd National Aerospace Conceptual Design Competition (NACDeC-II)

The Aeronautical Society of India Mumbai Branch Organising the second edition of National Aerospace Conceptual Design Competition.

For more details of NACDeC-II are available at :-

<http://www.aerosocietymumbai.org/nacdec2>

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