



5 February 2020

VAYU DAILY Day 1

“\$26 billion defence production by 2025”



Defence Minister Mr Rajnath Singh has set a target of \$26 billion by 2025 for production of defence equipment in India. “This involves an investment of \$10 billion in this sector and generation of two-three million

employment opportunities”, the Minister said after recently flagging off the 51st K-9 Vajra-T howitzer self-propelled gun built at Larsen and Toubro’s Armoured Systems Complex at Hazira in Gujarat. *(continued on page 3)*

“200 new fighters for IAF”

According to Defence Secretary Dr Ajay Kumar, the Indian Air Force is to receive 200 new fighters in course of the decade. “We are in the process of finalising the contract for 83 Light Combat Aircraft (LCA) Mk.1A (with HAL) to meet urgent needs... after development of the LCA Mk.1A has been finalised, Hindustan Aeronautics Limited are working to ramp up production from 8 to 16 aircraft per year” he said. *(continued on page 4)*



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(continued from page 1)

“\$26 billion defence production by 2025”

Mr Rajnath Singh rued the fact that “the private sector could not perform because of lack of support. This scenario increased our dependence on imports” but “the Government has taken many steps to change this so that India becomes not only self-reliant but also a net exporter in this sector... we have streamlined the defence offset policy, created a defence investment cell in the Defence Ministry to address bottlenecks related to investment in this sector.”

Lethal Tigersharks



No. 222 Squadron of the Indian Air Force (‘Tigersharks’) has been reformed with HAL-Sukhoi Su-30MKIs modified to carry the air-launched BrahMos supersonic cruise missile. The Squadron was inducted at the new Air Force Station at Thanjavur in Tamil Nadu on 20 January 2020, the ceremony attended by the CDS General Bipin Rawat, Chairman DRDO Dr Satheesh Reddy apart from the CAS and AOC-in-C Southern Air Command. In the picture are seen Air Chief Marshal RKS Bhadauria, General Bipin Rawat, Air Marshal Amit Tiwari.



K-4 submarine-launched ballistic missiles test fired



Augmenting India’s capabilities to neutralise enemy targets from submarines, the DRDO successfully carried out test firings of the 3,500 km strike range nuclear-capable K-4 submarine-launched ballistic missile off the coast of Andhra Pradesh on 19 and 24 January 2020. The test-firings were carried out from an underwater platform in the sea. The solid-fuelled K-4 missile is intended for deployment on the fleet of *Arihant*-class nuclear submarines being built indigenously.

(continued from page 1)

"200 new fighters for IAF"

Besides the indigenous aircraft, another 114 aircraft will be procured, "the Expression of Interest (EOI) for which has been issued for these based on which Requests for Proposal (RFP) will be sent to the shortlisted OEMs". The initial request for information (RFI) had been issued in January 2018 with seven companies reportedly including Boeing, Dassault, Saab, RAC-MiG, Sukhoi, Lockheed Martin and Eurofighter. Of these aircraft, "75% would be single seaters with 15% ordered as fly away and the balance made in India by a strategic partner/ Indian production agency."



BAE Systems MK 45 Guns for Indian Navy

The US State Department has approved a possible Foreign Military Sale to India of up to thirteen BAE Systems MK 45 5"/62 calibre (MOD 4) naval guns and related equipment for an estimated cost of \$1.0210 billion. The Government of India had requested procurement of such naval guns plus three thousand five hundred D349 projectiles, 5"/54 MK 92

MOD 1 ammunition plus spare parts, personnel training and equipment training, publications and technical data, transportation, US Government and contractor technical assistance and other related logistics support. The principal contractor will be BAE Systems Land and Armaments, Minneapolis, Minnesota with gun manufacturing at Louisville, Kentucky.

Kalyani Rafael Advanced Systems (KRAS) receives major order from RAFAEL

KRAS (Kalyani Rafael Advanced Systems Ltd. India), have been contracted to manufacture 1000 Barak-8 missile kits to be supplied to Bharat Dynamics Ltd via IAI for further integration purposes as part of the MR-SAM programme. KRAS is a Joint Venture between RAFAEL Advanced Defense Systems Ltd. and Kalyani Strategic Systems, established for manufacturing weapon systems required by the Indian Defense Forces, as well as for the export market. The photograph above includes Mr Baba Kalyani, Chairman of Kalyani

Group and Mr Pini Yungman, Head of Rafael's Advanced Defense Systems.





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VAYU DAILY Day 1



HAL at DefExpo 2020: on home ground!

Light Combat Helicopter (image by Phil Camp)



Tejas LCA (image from Deb Rana)



HAL Dornier 228 and Hawk-i (image by Phil Camp)



HAL Light Utility Helicopter (image by Phil Camp)

As nodal agency for organising and conducting the DefExpo 2020, in coordination with the Defence Exhibition Organisation (DEO), Department of Defence Production (DDP), Hindustan Aeronautics Limited are pre-eminent at this, the 11th biennial event taking place at Vrindavan Yojana in Lucknow. With focus on 'Digital Transformation', DefExpo 2020 will witness large scale participation of a diverse global audience, with some one thousand exhibitors, both international and Indian.

HAL's Accessories Division is headquartered at Lucknow's Indra Nagar, most appropriately along 'Tejas Marg'. Established in 1970, HAL's Accessories Division at Lucknow has as its prime objective the manufacturing of aircraft systems and accessories for aircraft, helicopters and their power plants. The facilities are spread over 116,000 sqm of built area set in sylvan surroundings. Presently over 1400 different types of accessories are manufactured or maintained by the Accessories Division, Lucknow.

HAL's production portfolio over its several Divisions in various parts of the country is vast and varied but at DefExpo 2020, are being showcased certain contemporary aircraft and helicopters including the Tejas light combat aircraft (LCA), light combat helicopter (LCH), advanced light helicopter (ALH), the Dornier 228 light transport aircraft (LTA) and Hawk advanced jet trainer (AJT). These will be displayed in model form although planned are flying displays over the venue at select times which would include the ALH Mk.IV Rudra, civil variant of the Dornier 228 and the Tejas light combat aircraft.

A range of avionics, accessories, components and systems such as the indigenous digital map generator (i-DMG), engine & flight display unit, GTEG-60 engine, air producer engine, glass cockpit for the Dornier 228, automatic target recognition (ATR), digital sand rapid prototyping technology and others will be displayed.

Attracting much attention would be the upgraded Su-30MKI cockpit simulator displayed during the event. An example of the Light Utility Helicopter (LUH) will be showcased at the outdoor display area.

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“More than 180 contracts since 2014”: MoD



According to an official statement, the Ministry of Defence has signed more than 180 contracts valued at over Rs 1,96,000 crore with Indian Industry since 2014, with others in the pipeline to be signed in the near future.

A contract for manufacture of Frigates under Project P-17A was signed in February 2015 with Mazagon Dockyards Limited (MDL), Mumbai valued at Rs. 45,000 crores while 2 Frigates under Project P1135.6 are to be manufactured by Goa Shipyard Limited (GSL) under a contract signed in October 2018 valued at Rs. 14,100 Crore.

Further, contracts for manufacture of 41 Advanced Light Helicopters for the Indian Air Force and 32 ALH for the Indian Navy were signed with Hindustan Aeronautics Limited (HAL) in March 2017 and Dec 2017 with a combined value of Rs. 14,100 crore. This is in addition to procurement of 14 Dornier 228 aircraft from HAL valued at Rs. 1100 crore, through a contract signed in February 2015.

Seven squadrons of the Akash Missile System are being procured from BEL following a contract in October 2019 valued at Rs. 6,300 crore as also the Integrated Advanced Command and Control System (IACCS) Nodes valuing Rs. 7,900 crore.

OFB have been tasked to supply 464 T-90S/SK main battle tanks worth Rs. 19,100 crore for which indent has been placed on it by the Ministry in November 2019. 100 numbers of 155x52mm cal self-propelled guns are being procured under the 'Make in India' initiative of the government from Larsen & Tubro valued at Rs. 4,300 crore. Contract for Modernisation of Airfield Infrastructure (MAFI), to be executed through Indian vendors is under final stages of contracting.

Services have also placed a number of contracts on the Private Sector vendors Titagarh Wagons Force Motors, Tata Power SED, Tech Mahindra, Tata Motor, Ashok Leyland, Bharat Forge, MKU, SMPP Delhi and Alpha Design for items including 1000 ton Fuel Barges, Light Strike Vehicles, Portable Diver Detection Sonar (PDDS), RFID based SMART Card, 6x6 and 8x8 High Mobility Vehicles with Material Handling Crane, Dual Technology Mine Detector, Ballistic Helmet, Bullet Proof Jacket (BPJ) and Integrated Gunnery.

However, three major areas, these being P-75(I) submarines, Naval Utility Helicopters (NUH) and 114 multi-role fighters for IAF, presently “stuck” in long-winded procedures, are being progressed under the SP Model. However, even the cases under SP model have been processed expeditiously as evident from the fact that the responses to EOIs [Expression of Interest] have been received in respect of P-75(I) and NUH cases and are under final stages of selection while SQRs are being finalized in respect of the 114 fighter aircraft.

Under Make-II, 44 projects have been given approval. Under 'Innovations for Defence Excellence (iDEX)', forty plus startups are working in new technology-related products. Make-II and iDEX reflect new level of active engagement with the industry where not only manufacturing but technology development in defence is being prepared.



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VAYU DAILY Day 1



IAI's relationship with India

VAYU Interview with Mr Nimrod Sheffer, President and CEO, Israel Aerospace Industries (IAI)



VAYU: *Kindly enumerate on IAI's presence in India and its partnership with the Indian Defence forces and Public Sector Companies involved in defence production?*

Nimrod Sheffer: IAI has a long-standing relationship with India and been one of the main pillars in supplying strategic and advanced equipment to the country, including cutting-edge technology for defence, aerospace and homeland security. IAI's systems, such as unmanned aerial systems (UAS), radars, special-mission aircraft, and air-defence systems, have been in operation in India for many years with a very high level of satisfaction from the Services.

We are expecting to expand our collaborations with local leading companies, both public and private, so as to integrate strategic state-of-the-art systems for India's Ministry of Defence in various fields, and in accordance with the *Make in India* policy.

VAYU: *Please elaborate on IAI's UAV family.*

Nimrod Sheffer: IAI is a global leader in the design, development, and manufacture of UAVs. The Heron family, with over 40 years' of experience and more than 1,800,000 operational flight hours have performing intelligence gathering and targeting missions in support of key military operations around the world. Our UAVs & loitering munitions systems are combat proven with more than 20 operators worldwide. IAI will continue to support its existing customers worldwide, while introducing additional state of the arts sensors and technologies.

VAYU: *Please update us on IAI's joint venture with the DRDO with respect to the MRSAM LRSAM. When will the first missile systems be ready for induction?*

Nimrod Sheffer: We are very proud of our work over several years on co-development projects

concerning for the MRSAM Air & Missile Defense System along with DRDO. IAI has established relationships in India for more than 25 years, and the MRSAM joint development is one of the main and strategic projects of IAI in India, utilising many years of operational experience. The MRSAM is an advanced air and missile defence system that provides ultimate protection against a variety of airborne threats, in both land and naval scenarios. It was designed jointly with the DRDO in India and is in service with both the Israeli and Indian Defence Forces.

The system includes an advanced Phased Array digital radar, command and control system, vertical launchers and missiles guided by a highly-advanced seeker. The MRSAM, both its naval and land versions, is one of the most successful Israeli defense industry developments in the world. Evolution of the system is reflected in the innovation, creativity and remarkable personal dedication of all those involved in the programme. We are constantly working with our partners in India to create the best operational outcome for requirements of the Indian Army, Navy and Air Force. The MRSAM programme is progressing as planned, and IAI recently conducted a successful demonstration with our partners at the DRDO and the Indian Navy.

VAYU: *What is IAI's theme at Defexpo 2020?*

Nimrod Sheffer: At DefExpo 2020, IAI is presenting some of the latest and most advanced defence solutions, featuring the latest technologies in military aviation, air defence and missiles, unmanned systems, special mission aircraft, radars, as also in cyber technology.

Amongst the systems on display are the operationally-proven MRSAM, special mission aircraft, the Heron TP, the largest platform in IAI's family of advanced unmanned aerial systems (UAS), satellites, radars – both strategic and tactical – loitering munitions systems, EO surveillance systems, advanced mission systems for helicopters and much more !





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VAYU Interview with Mr Thomas Danbolt, Vice President, Large Calibre Systems, Nammo



VAYU: The artillery range revolution has caught everyone's imagination! Could you please share with us Nammo's 155mm portfolio and your plans for the near future?

Thomas Danbolt: Nammo's portfolio currently consists of 155mm IM HE-ER/ HE-ER (40km range) and standard HE (30km range from L52 guns). Nammo's focus is on long range artillery ammunition, from 40km range and further. Our future plans include the 155mm High Explosive Rocket Assisted Projectile, having a range of more than 70 km, with course correction fuzes as also a 100km + projectile based on Ramjet technology, both of which are in development.

VAYU: Can this ammunition be fired from a standard 155mm weapon, including the M777 lightweight towed howitzer currently in service with the Indian Army?

Thomas Danbolt: Yes, the IM HE-ER/ HE-ER is qualified for the K-9, PzH2000 and Archer and can be fired from all standard L39 and L52 guns currently in service, including the M777.

VAYU: Nammo recently showcased its ramjet-powered, guided artillery shell having a range of up to 150 km. Please give us some more information on this.

Thomas Danbolt: Nammo is working in cooperation with The Boeing Company for development of a 155mm Ramjet projectile. Development work is ongoing and as per to schedule, test firing will be in 2020.

VAYU: In order to reach such distances, has there been any compromise between range and payload?

Thomas Danbolt: For all ranges over 40km, there would be some compromise between range and payload. Since artillery is an 'area weapon', a large payload is

needed to compensate for dispersion. Long ranges require guidance and this will ensure that the shells hit close to the target, what then reduces the need for a large payload. Long range rounds with guidance therefore do not need the same large payload as do unguided rounds for effectiveness.

VAYU: What exactly are rocket-assisted projectiles (RAP)?

Thomas Danbolt: A rocket-assisted projectile is an artillery shell with a small rocket motor which provides some of thrust; giving acceleration after leaving the muzzle which is the opposite to normal rounds. Because of its increased velocity, the RAP round will fly higher and consequently have a longer ballistic trajectory compared with standard 155mm rounds, which in turn will provide longer range.

VAYU: A 70-kilometer range is, by any estimation, a substantial leap forward from the standard range of 35 kms plus. What are your plans for India?

Thomas Danbolt: Nammo will of course offer its 70km+ round to India when this is ready for the market, within 2-3 years.

VAYU: What about the existing 155 gun system such as the K9, M777 or the FH 77 in service with the Indian Army: do they require modifications?

Thomas Danbolt: Nammo's RAP round is based on our 155mm IM HE-ER, with is qualified for both K-9 and FH77, so no modifications are needed to any of these systems, including the M777.

VAYU: Boeing and Nammo have recently signed a teaming agreement to jointly develop and produce the next generation of extended range artillery projectiles: could you please comment on this?

Thomas Danbolt: The teaming is exclusively focused on developing the 155mm HE Ramjet round for the international market.





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Spyder (Surface-to-Air Python & Derby Air Defence System) is a quick reaction, mobile surface-to-air missile system to counter attacks by aircraft, helicopters UAVs and precision guided munitions. The system provides effective protection of valuable assets, as well as first-class defence for maneuvering forces in the combat area. The system is capable of search-on-the-move fire within short halt.

Spyder incorporates Rafael's most advanced air-to-air missiles - the I-Derby active radar (RF) missile and Python-5, a dual waveband Imaging Infra Red (IIR) missile. The Spyder family includes Spyder-SR (Short Range), Spyder ER (Extended Range), Spyder-MR (Medium Range) and Spyder LR (Long Range) systems.

Python 5 and Derby are in service with the IAF as part of the Spyder LLQRM programme and as air-to-air missiles on the LCA. These missiles and their advanced versions will be part of future air-to-air and air defence programmes in the Indian Air Force and the Army. Both missiles can potentially be integrated on LCA, Hawk, Su-30 or any other combat aircraft in the IAF.

The truck-mounted Command and Control Unit (CCU) comprises surveillance radar with advanced ECCM capabilities that can simultaneously track multiple targets. Wireless data link communication enables deployment of the MFUs at a distance from the CCU. The CCU can operate with neighbouring Spyder air defence batteries and share information with higher echelons. This interoperability provides the SPYDER air defence



system with high flexibility in combat situations. The CCU is capable of search-on-the-move fire within short halt.

Spyder's highly modular structure also allows easy adaptation to customer platforms and future growth. Its truck-mounted Missile Firing Units (MFU) are equipped with both IIR and RF missiles. The MFU carries any combination (IIR/RF) of missiles on a launcher assembly. SPYDER has 360° day/night all-weather engagement capability. The system can also engage multiple threats simultaneously. It has Lock-On-Before Launch (LOBL) and Lock-On-After Launch (LOAL) modes of operation.

With a shared operational approach and technologies, a mix of Spyder Family elements can be deployed together for significant advantages such as SR/MR launchers, embedded Radar / External radar.

SPYDER-SR/ER

Spyder-SR provides all-weather, network-centric, self-propelled, multi-launch, short-range air defence. The system enables 360° missile launching within less than five seconds of the target being declared hostile by the system. Spyder-SR features Rafael's advanced air-to-air missiles - the Derby Active Radar missile and Python-5, a sophisticated dual-waveband Imaging Infra Red (IIR) missile.

Spyder ER - using the same launching system with advanced version of RF Missile, Derby MK III, the system more than doubles the range and altitude.

SPYDER-MR/LR

Spyder-MR Medium Range Air Defence Missile System (MRADMS) shares Spyder-SR's technology. Spyder-MR engages and destroys the same wide spectrum of threats at medium ranges. It protects high-value assets (capital areas, air force bases, etc.) as well as maneuvering combat forces.

Spyder-MR provides all-weather, network-centric, self-propelled, multi-launch, quick-reaction ADS capability. Spyder-MR enables 360° missile launching within seconds of the target being declared hostile by the system. The system features the proven-performance air-to-air missiles - the Derby Active Radar missile and Python-5, a sophisticated dual-waveband Imaging Infra Red (IIR) missile. Both missiles are equipped with a booster.

SPYDER LR uses the same launching system with advanced version of RF Missile, Derby MK III with a booster, the system significantly increases the range and the altitude.

Rafael is also proud to announce that a substantial share of its air defence portfolio is now made in India. Its joint venture company, Kalyani Rafael Advanced Systems (KRAS) is displaying the air defence capability at its stall at Defexpo 2020.

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Aeronautics and its Orbiter 4 UAV

Continuing evolution of the Orbiter line and the Small Tactical UAS, Aeronautics have introduced the Orbiter 4 STUAS, an advanced multi-mission platform with extraordinary and versatile carrier, mission and endurance capabilities.

“Orbiter 4 STUAS delivers top mission performance with its lightest, most versatile and most advanced covert platform available today, for both land and maritime operations”. The UAV can simultaneously carry multiple payloads, extending its ISTAR capabilities. With its ease-of-use, low logistical footprint and small crew of 3 personnel, Orbiter 4, the runway-free aircraft suits all operational needs.

Orbiter 4 builds on the successful system design of the Orbiter 3 STUAS, with its advanced avionics, communications and ground control features and applications. The acclaimed legacy capabilities of the field-proven Orbiter UAS family remain. Measure for measure, Orbiter 4 will deliver the same capabilities as the tactical platforms operational today, but with better endurance, serviceability, operational flexibility and cost-effectiveness.

Recently, the Orbiter 4 unmanned aerial system has carried out a record-breaking 25 hour flight, setting a new endurance record for the company’s flagship platform. “The flight was performed at mission altitude carrying the T-stamp EO payload with laser capabilities”.

Manufactured by the Israeli drone company Aeronautics, the Orbiter 4 unmanned aerial system is the company’s most advanced tactical UAS, the compact, light-weight system being used by military and homeland

security officials with an operating range of up to 150 km. The multi-mission UAS is a versatile and light platform and, with the capability to stay in the air for 25 hours, it extends its intelligence, surveillance, target acquisition and reconnaissance (ISTAR) missions.

According to the company, the UAS has six different autonomous flight modes and can be used for artillery fire management and bomb damage assessment (BDA), target acquisition for precision-guided weapons, communications intelligence (COMINT), electronic intelligence (ELINT) and electronic warfare (EW).

Operated by a team of three, the runway-free aircraft is highly portable and easily deployable, suiting all operational needs. With a low silhouette and silent flight mode, the advanced covert platform is available for both land and maritime operations and can be used in all weather conditions.

The platform can carry – and operate – two different payloads simultaneously, integrating an electro-optical payload with laser designator, SAR radar, MPR maritime radar or other advance payloads. In addition, the system has an open architecture that allows quick integration of new advanced sensors.

“This new achievement highlights our technological leadership in the tactical UAS segment,” stated Amos Matan, chief executive officer for Aeronautics Group. “The Orbiter 4 is a breakthrough system with an impressive roadmap, based on Rafael advance technology and payloads. We are committed to continue investing in developing the platform for the benefit of our customers and users, reaching more records and maintaining excellence.”

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IAI's Drone Guard against the new menace

Since their appearance in the late 2000s, multirotor drones have taken the world by surprise. Unlike unmanned aerial systems (UAS) pursued by the world's military forces under military research, development and supply channels, these drones, originally introduced for recreational use by hobbyists and filmmakers utilised highly integrated, miniaturised, cutting edge electronics designed for consumer, communications systems that pack ultra-advanced capabilities including remotely controlled and autonomous systems (RC), that perform remote surveillance, precision navigation, secure communications and agile, jam-resistant communications.

By end of 2020, more than 100,000,000 drones are expected to roam global skies, used in civilian, commercial and scientific roles. They carry remote monitoring, metering, sensing and security missions, infrastructure surveillance, agricultural services, fishery, forestry monitoring and control, delivering parcels and medical supplies, carry video cameras to cover sports events and more. Using open-source navigation and flight controls, amateurs and experts can hack drones to carry out missions they were never designed to do.

As they become more common in daily life, drones also become potential menaces, when they land on the wrong hands. So far, lethal use of drones was limited to the combat zones in Iraq, Syria and Afghanistan, but security forces around the world are certain that future drones' lethal use will not be limited to warzones. In fact, the uninterrupted accessibility of drones could turn critical infrastructures such as gas and oil tanks, or chemical

facilities into mega-explosives if exploited by terrorists using drones.

As small, slow and low flying vehicles, multirotor drones are hardly spotted from the ground by radar, camera or the human eye and, when strapped with rudimentary weapons, their simple yet effective control enable operators to use them as loitering weapons. In Iraq, they were used by ISIS to spread havoc among Iraqi forces, defeated only with dedicated Counter-UAS (C-UAS) equipment that was rushed to the combat zone.

One of these C-UAS weapons is the Israeli Drone Guard, an integrated system that relies on multiple sensors to detect, classify, identify and defeat drone target. Developed by IAI Elta Systems, Drone Guard employs a multi-layered approach for detection, classification and targeting. For detection, the company's ELM-2026B X-band radar and passive Communications Intelligence (COMINT) to detect and classify targets from five kilometers. Electro-optical sensors may also be used to detect targets that maintain minimal or no radar signature. Once a drone presence is verified, the radar directs the Electro-Optical (EO) system to identify it. The combination of radar and SIGINT is part of Elta's multilayered detection capability that maximises the system's efficiency.

Once detected and identified, targets are mitigated by Drone Guard using multilayered effects. The most basic effectors are electronic emitters used to jam and disrupt the drone's control and navigation channels, following different protocol that can 'fend off' the drone from the guarded premises or bring it down safely using cyber 'takeover' methods. Elta's effector portfolio may also include other effectors such as electronic warfare (EW) and 'Hard Kill' measures, to deal with specific environments and defeat existing and evolving threats.

Offering a sophisticated and agile C-UAS capability, Drone Guard is well positioned to secure civilians and military forces against the growing menace of drones.



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Thales at Defexpo 2020

Focus on digital transformation in defence & security



At Defexpo 2020, Thales is exhibiting its wide range of products and solutions through a series of demonstrations across four categories: Land, Naval and Air, Digital Transformation and Security.

Displaying its Digital transformation area, is the Thales Talios targeting and reconnaissance system, which combines targeting and tactical reconnaissance capabilities in a single pod which able to embed artificial intelligence in the future. Thales is also showcasing its Pathmaster, the first fully configurable unmanned mine counter measures system.

Thales' demonstration for land operations includes combat systems such as the fully integrated Soldier System capability, SYNAPS software defined radios among the family of communication devices, armaments and mock-up missiles supporting air defence systems such as STARStreak and light weight multi-role missiles.

In the Security section, Thales is exhibiting its Live Face Identification System, a video-based biometric facial recognition system for tracking and recognition purposes. The company is also showcasing Eagleshield, a multi-sensor integrated drone countermeasures solution which can detect, identify, classify and neutralise rogue drones flying at low altitude at ranges of up to 7 km.

In the aviation and naval areas, Thales is displaying anti-submarine warfare solutions such as its Captas 1 with Aero & Naval connectivity & Identification solutions such as the Nextwave, Interrogator Friend Foe TSB 2510 and others.

"We are enthusiastic about our participation at DefExpo India 2020 allowing to demonstrate our leadership in technologies that are completely in line with the expo's theme this year—"Digital Transformation of Defence". Our trusted technologies have been helping armed forces and authorities across the world, including India, to prepare, achieve and maintain tactical superiority and ensure national security.

Backed by over six decades of partnering with India, we look forward to continue playing a major role in job creation and skill development especially through our two Engineering Competence Centres in India and our local partnerships" states Emmanuel de Roquefeuil, Vice President and Country Director, Thales in India.



With its display of those unique digitally-driven technologies across various verticals, Thales is not only reiterating its commitment towards 'Make in India' (and export from India), but also showcasing its upcoming plans in the development and modernisation of the Indian armed forces.

Thales stand at DefExpo 2020 is R17 in Hall 3

CONTROP wins DRDO's tender for supply of iSky-50HD systems

The systems will be used on unmanned air platforms currently being developed for the Indian Armed Forces.

CONTROP Precision Technologies Ltd., a company specialising in the field of electro-optics and infrared (EO/IR) for defence and homeland security solutions, has won a tender by India's Defence Research and Development Organisation (DRDO) for the supply of its iSky-50HD systems, for use on unmanned air platforms.

The iSky-50HD is a member of Controp's iSky family of lightweight, compact EO/IR observation systems, which have been specifically designed for use in challenging airborne environments. The iSky-50HD features highly-sensitive multi-spectral sensors, which are gyro-stabilised and have advanced image processing algorithms, thereby providing maximum sensor ranges and performance, for a variety of airborne defence applications. In daily operation around the world since the 1990s, the iSky systems are integrated into a wide variety of UAV, helicopter, fixed-wing aircraft and aerostat platforms.

"Winning this tender confirms Controp's leadership in the field of electro-optic systems," says Mr. Hagay Azani, Controp's CEO & President. "We are very proud to have been awarded this strategic tender, which reflects our deep commitment to supporting the Indian Armed Forces with the latest technology. The DRDO tested several systems and concluded that our technology and pricing was best suited to meet India's defence requirements. We thank the DRDO for the confidence which they have shown in our products and technologies, and hope that this collaboration will lead to further projects in the future."

Controp specialises in the development and production of electro-optical and precision motion-control systems for surveillance, defence and homeland security. Controp's main product lines include: high-performance stabilised observation payloads used for day/night surveillance onboard UAS, small UAS and aerostats/balloons, helicopters, light aircraft, maritime patrol boats, remote weapon stations and ground vehicles; automatic intruder-detection systems for



coastal and border surveillance, port/harbour security, the security of sensitive sites, ground-troop security and anti-drone applications; thermal imaging cameras with high-performance continuous zoom lens and state-of-the-art image enhancement features and more. Controp's products are in daily operational use in many of the most critical surveillance, homeland security and defence programmes worldwide.

VAYU Interview with Mr Kishore Jayaraman President, Rolls-Royce India & South Asia

VAYU: Rolls-Royce has had a long relationship with India. How has the relationship evolved through the years?

Kishore Jayaraman: Rolls-Royce enjoys a long and fruitful partnership with the Indian Armed Forces and is committed to the long-term continuity of this partnership. It was over 87 years ago that Rolls-Royce partnered India with powering of the first IAF aircraft and first commercial airliners. Today, over 750 Rolls-Royce engines of 10 engine types power Indian military aircraft. More over the past 60 years, Rolls-Royce engines have been made in India, under licence by Hindustan Aeronautics Ltd (HAL).

Rolls-Royce is also a long-term partner of both the Indian Navy and Indian Coast Guard, with our MTU engines powering many Indian Coast Guard and Indian Navy vessels, supported by our Service teams present at several locations along the India's coastline.

As the armed forces undertake modernisation programmes, Rolls-Royce is committed to providing them with the best value, and highest quality products possible. We will continue to support today's fleets and strive to further increase their capabilities.

We are also keen to play a role in India's indigenisation programmes. Today, we are already nurturing skills, developing local supplier base and building capabilities. Going forward, we seek to embrace opportunities to co-develop and co-manufacture for the growing aerospace and defence sector with the right Indian strategic partners. This way we not only create value and contribute to local economies but also create an ecosystem that enables the sustainable growth of the sector.

VAYU: After eight decades in India, and various partnerships, how has the 'Make in India' journey been for Rolls-Royce?

Kishore Jayaraman: Rolls-Royce has been a proponent of the 'Make in India' vision having pioneered the manufacturing partnership model for our engines to be 'Made in India' under license by HAL 1956. We have since expanded our supply chain in India through various partnerships with Bharat Forge, Godrej & Boyce, Force Motors, the Tata Group as well as various MSMEs. We source various components from them, with a further goal of sourcing complex



Kishore Jayaraman

commodities from India over the coming years.

One of the biggest initiatives in this area is our joint venture with HAL, called International Aerospace Manufacturing Pvt. Ltd. (IAMPL), to manufacture aero-engine components for the technologically advanced Trent family of civil aero engines. Today, IAMPL is a fully accredited benchmark manufacturing facility within the Rolls-Royce supply chain, operating

the latest technologies to the highest levels of aerospace compliance. The JV manufactures more than 130 different aero-engine components for the Trent family of products.

We continually work with our supply chain partners to build capabilities and strengthen skills to enable the aerospace sourcing ecosystem here to meet global quality standards.

In the Power Systems business, Force MTU Power Systems is our joint-venture between Force Motors Limited and Rolls-Royce, to move the manufacturing of the entire line of 1,600 series MTU engines and generator sets from Germany to the manufacturing facility at Chakan near Pune, by 2020. The JV will cater to our customers in both Indian and global markets.

Rolls-Royce is also a big consumer of services from India. Our Engineering Centres in Bengaluru and Pune house a talent pool of engineers contributing to global design and development programmes. Another 1,300 high-skilled engineers work exclusively for Rolls-Royce through outsourced agreements with TCS and QuEST.

As part of our 'Digital First' strategy, our R² Data Labs in Bengaluru is our acceleration hub for data innovation, developing data applications that unlock design, manufacturing and operational efficiencies and creating new service propositions for customers around the world.

VAYU: What kind of opportunities does Rolls-Royce offer in the Indian maritime sphere?

Kishore Jayaraman: Rolls-Royce is partnering both the Indian Navy and Indian Coast Guard with our MTU brand of products. Within the shipping sector, the company has established a long and successful partnership with some tens of thousands of engines in operation around the globe and on all seas.

Rolls-Royce is firmly committed to serve the needs of the Indian Navy and is keen to customise its advanced technology products to best serve the Navy's power requirements. Our involvement in naval propulsion spans 50 years and we have pioneered some of the



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most important technical advances in marine propulsion including the use of aero gas turbines for surface ship propulsion.

Rolls Royce's defence business offers the highly successful MT30 marine gas turbine which combines the latest developments in gas turbine technology to deliver greater flexibility to ship designs and outstanding proven performance through life due to its high power density. We have the proven capability required to serve the needs of the Indian Navy for future naval combat readiness and look forward to partnering India in this space.

Then, our latest offering from Rolls-Royce Power Systems business is the MTU Marine Automation EM 50-2 Integrated Bridge System. The modern integrated bridge is the main access point for the information which is essential for safe and efficient operation of ships. With the new solution, previously distributed information is now gathered on a standardised display using a single graphical interface allowing quicker analysis using a modern visual framework.

VAYU : What's your vision for the Indian defence sector in the coming years?

Kishore Jayaraman: Currently, India's defence strategy is undergoing a fundamental transformation triggered by new global and regional geo-political and military developments with greater role for indigenised military technology.

Our view is that instead of pivoting the policy around import substitution and purchases alone, for India to realise its goals of developing a local defence industrial base truly, another parallel strategy should be to actively look into *Indigenisation through Co-development and Collaboration*. And this has to happen across the entire value-chain – from research, design and development to manufacturing, integration, maintenance and repair. As India requires advanced technology and manufacturing capabilities to bridge the existing defence capability gap, there is a need to look at joint production, joint



The MT30 marine gas turbine

R&D and most-importantly the need to move beyond a buyer-seller relationship. The country's vast talent pool of engineers and scientists should be harnessed to make it a R&D hub. It also needs to consider providing special tax incentives to R&D in defence and sponsoring R&D projects at private industry level to encourage R&D for developing critically advanced technologies.

With this backdrop and along our growing engineering footprint in India, we seek to establish robust ecosystem to enable co-creation across the entire value-chain – from research, design and development to manufacturing, integration, maintenance and repair.

VAYU : What products will Rolls-Royce be showcasing during DefExpo 2020?

Kishore Jayaraman: DefExpo assumes strategic importance as India continues to re-evaluate its military needs and consolidate its current warfare technologies. Our focus at the DefExpo 2020 will be to showcase our capabilities to partner India in defence, particularly in the naval marine space.

From our Defence portfolio, we will be presenting the capabilities of the "mighty" MT30 marine gas turbine that is derived from aero Trent technology. It's just over ten years since the MT30 first powered the US Navy's Littoral Combat Ship (LCS) USS Freedom. With a growing demand for power across the world's navies, the world's most power-dense in-service marine gas turbine is finding favour across the globe.

MT30 offers a superior power-to-weight ratio, generating up to 40MW from a 30-tonne packaged unit, including most of the auxiliary systems. It gives navies more power in less machinery space than alternative engine types, and offers ship designers much more options and flexibility in designing the naval vessels of tomorrow. The MT30 also supports the 'lean manning' concept by virtue of its ultra-low on-board maintenance requirement.

From our Power Systems business, MTU engines currently propel and power many Indian Coast Guard and Indian Navy vessels, as well as powering the Indian Army's Arjun Main Battle Tanks. We now hope to familiarise our Indian defence customers with the MTU Marine Automation EM 50-2 Integrated Bridge System. The modern integrated bridge forms the central point of access to all information that is crucial to safe and efficient ship operation. With the new MTU solution, information previously scattered over diverse displays is now collated at a standardised display using a single graphic interface which enables faster overview using an ultra-modern visuals concept.

In addition, we remain committed to serving India's defence needs through our vast portfolio of technologically advanced products, as well as through collaboration for co-development initiatives.

BAE Systems: “Depth of Partnerships in India”

Two BAE Systems M777 Ultra Lightweight Howitzer (ULH) gun systems are taking centre stage at DefExpo 2020. The two M777 ULH systems signify the 145-gun agreement between the US and Indian governments to strengthen India’s artillery capabilities. Under the agreement, 120 ULH systems are being assembled, integrated and tested in India by Mahindra Defence Systems Ltd. (MDSL), as part of the ‘Make in India’ programme. To date, BAE Systems has produced and delivered 25 guns to the Indian Army, with another 70-plus planned for 2020.



The M777 Ultra Lightweight Howitzer (ULH) gun system at Defexpo’16

In addition, the BAE Systems stand at DefExpo 2020 (R32, Hall 7, UK Pavilion) is exhibiting an array of state-of-the-art capabilities, including towed and self-propelled artillery, naval gun systems and ships, ammunition, unmanned autonomous systems and precision munitions. Dave Armstrong, BAE Systems’ Group Business Development Director, stated, “India is a strategic market for BAE Systems and DefExpo 2020 provides the company with the ideal platform to showcase the deep collaboration and commitment that exist with the Indian government and across industry, highlighted best by the ongoing success of the M777 ULH programme.”

Nik Khanna, BAE Systems’ Managing Director India, added: “BAE Systems is proud to be

a founding partner of defence manufacturing in India, and DefExpo 2020 is a great occasion to engage further with our key Indian stakeholders, strengthening existing partnerships and exploring avenues for new ones, particularly around the Mk45 naval gun. The team also looks forward to using this opportunity to discuss the continuing development of BAE Systems’ in-country supply chain, which the company is committed to expanding.”

At DefExpo 2020, BAE Systems is exhibiting a 3-Dimensional video of its Mk45 Mod 4 naval gun, the lightest, most compact, fully automatic 127mm naval gun in the world. With a dozen customers globally, including the US and United Kingdom, the 62-calibre Mk45 naval gun can provide a firing range of 13 nautical miles with conventional munitions.

Building on continued interest in India, and highlighting its expertise in warship design, BAE Systems is showcasing a model of the *Queen Elizabeth*-Class Aircraft Carrier at its stand at DefExpo 2020. A model of the ‘Make in India’ Hawk advanced jet trainer, which is in service with the Indian Air Force and the Indian Navy, is also on display.



M777 image from Defexpo’16

An array of munitions are being exhibited by BAE Systems, including the 57mm and 40mm programmable 3P Ammo, BONUS 155mm sensor-fused ammunition, and 120mm Tank ammunition, CT40 cannon. The APKWS laser-guidance kit is being featured on the stand. The low-cost, combat-proven APKWS kit transforms standard 2.75-inch (70-millimeter) rockets into precision munitions that reduce collateral damage. The guidance kits are compatible with existing and new inventories of rocket motors, warheads, and launchers; are easy to install; and require minimal training to use. With APKWS, rockets have achieved over a 93 percent hit rate in combat, have been fired from more than 20 different platforms, and are available to allied nations via Foreign Military Sales from the US Government.



VAYU
DAILY Day 1

MBDA at Defexpo 2020: “Making in India”

Defexpo 2020 hosts exciting developments from MBDA as it continues to expand and deliver on its vision to ‘Make in India’.

A particular highlight is that L&T MBDA Missile Systems Ltd has submitted its first bid to the Indian Armed Forces – offering Sea Ceptor, the latest generation naval air defence system – in its RFP response for the Indian Navy’s Short-Range Surface to Air Missile (SRSAM) requirement with the aim to ‘Make in India’. This development comes soon in the JV’s history, which only made its debut at the previous edition of Defexpo in 2018.

This year is particularly noteworthy as it also sees the arrival in India of the first Rafale fighter aircraft for the Indian Air Force, which will be armed with a game changing set of weapons from MBDA including the SCALP deep strike and Meteor air-to-air missile.

MBDA has been actively working in partnership with the Indian government and industry to build India’s defence industrial capabilities for over 50 years. MBDA is recognised world-wide as an absolute leader in the field of missile technologies. It is also recognised as being the only truly integrated multi-national company in the defence sector – co-operation is in their DNA in a way that is unique in the defence sector, and particularly in the field of missiles. This makes them uniquely able to partner with India, to work with the DRDO, the Indian MoD, and to support the development of India’s public and private defence-industrial capabilities.

“We have the technological knowhow needed to transform India’s industry, we have the experience of making partnerships work for the long-term, but most importantly, we also have the right attitude—we view our relationship as one of true partners, not of buyer and seller”.

“To deliver this we have a dedicated and strong industrial cooperation and offset (ICO) team that works solely on partnerships with India. This MBDA ICO team has delivered extensive and significant transfers of technology to develop India’s defence-industrial capabilities. This includes the manufacturing by Indian industry of 15 major subassemblies of MICA missile covering various complex technologies such as mechanical, electrical, electromechanical and pyrotechnic items. Similar transfers to build India’s defence-industrial capabilities have also occurred on the Mistral and ASRAAM missiles, including ToT for setting up industrial capabilities, complete missile integration and final assembly and test”.

L&T MBDA Missile Systems Ltd is a key channel for MBDA in delivering the next generation of complex weapons capabilities to the Indian Armed Forces and developing the capabilities of India’s defence industry in the complex weapons sector. L&T MBDA Missile Systems Ltd will again have its own unique stand and will be



Above: MMP firing training Canjuers military camp France



Left: Sea Ceptor CAMM launch

showcasing a number of products, including SRSAM, ATGM5 and Exocet MM40 B3.

One of the key examples of this is ATGM5 that will be designed and manufactured in India to meet India’s specific operational requirements. ATGM5 will draw on the next generation technologies of the MMP battlefield anti-tank weapon that already entered service in France. ATGM5 will be a true Indian Designed, Developed and Manufactured (IDDM) product, involving the transfer of next generation key technologies to India, boosting the domestic defence industry sector. A new functional simulator for ATGM5 is making its debut here at Defexpo 2020.

Exocet MM40 Block 3 is the latest version of the famous Exocet missile family, and includes the replacement of the missile’s traditional rocket motor with a turbojet to extend the range of the system to beyond 200 km, while the missile’s already excellent navigation system has seen further enhancements. As the Indian Armed Forces already operate SM 39, which is part of the Exocet family, it is a logical step to also use Exocet in other operational areas. In doing so, it would provide significant operational, logistics and training advantages. MM40 Exocet Block 3 is being offered by L&T MBDA Missile Systems Ltd in response to India’s RFI for the Medium Range Anti-Ship Missile, and is present on the stand of L&T MBDA Missile Systems Ltd.

As one would expect, MBDA is exhibiting a full range of missiles and missile systems portfolio on its own stand that could be of interest to India and other countries across the main defence domains: air, land and sea.

Loïc Piedevache, India Country Head, MBDA

Empowering the Nation's Defence Forces

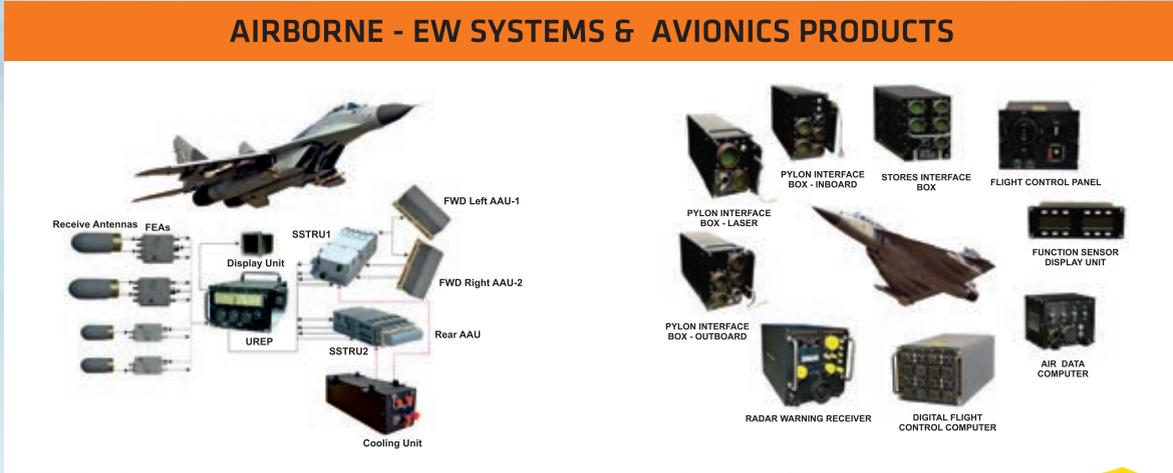


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LCA (Navy) Mk.I operates from INS Vikramaditya

Development of the LCA (Navy) Mk.I, which is seen as a precursor to the eventual LCA (Navy) Mk.II for operational service on board Indian Naval aircraft carriers in the near future, notched an important milestone on 11 January 2020 with the successful arrested landing on deck of the Indian Navy's aircraft carrier INS *Vikramaditya*. The aircraft was flown by the CTP, Commodore JA Maolankar of the NFTC who later carried out the maiden ski ramp take-off from the carrier the next day, 12 January 2020.



LCA (Navy) Mk.I takes off from ski-jump ramp



LCA (Navy) Mk.I touching down on INS Vikramaditya

As a Technology Demonstrator, the LCA (Navy) has been repeatedly tested during extensive trials at the Shore Base Test Facility (SBTF) at INAS *Hansa*, Dabolim in Goa. With completion of the critical deck landing tests, these indigenously-developed niche technologies, specific to deck based fighter operations, have been proven and will contribute towards development of a twin-engined LCA (Navy) Mk.II, which is planned for 2026.

"The landmark events of 11-12 January 2020 demonstrate the professional commitment and synergy between various agencies including ADA, HAL, CEMILAC

and the Indian Navy in harnessing the potential of our scientists, engineers and naval flight testing community in meeting expectations of the nation", stated a DRDO spokesman.



Commodore Jaideep Maolankar, Group Director (FTO) & Chief Test Pilot, National Flight Test Centre (NFTC) with Aeronautical Development Agency (ADA)

Photo credits: Debadatta Maharana

CONTROP

Turning Vision Into Reality

Innovative EO/IR Systems for Air, Land & Maritime Surveillance, Defense and Homeland Security





Brahmos makes great progress

Launch of two BrahMos missiles from land and air platforms

The Defence Research & Development Organisation (DRDO), Indian Air Force (IAF) and BrahMos jointly successfully conducted two BrahMos supersonic cruise missile tests on 17 December 2019, one each from land and air platforms. The first missile launch was from a land based mobile launcher, where most of the components were indigenous, including the missile airframe, fuel management system and DRDO designed seeker. The second



launch of the missile was carried out by the Indian Air force from a Su-30MKI platform against a sea target. The test conducted in user configuration, revalidated the ship attack capability of the advanced air-launched cruise missile. During the test, the missile was gravity dropped from the air combat platform's fuselage and the two-stage weapon's engine fired up and the missile straightaway propelled towards the intended target positioned at the sea, piercing it with pin point accuracy.

Test firing of SSM variant of Brahmos at Trak Island

The Indian Air Force BrahMos trails unit had fired two surface to surface missiles at Trak Island in Andaman Nicobar group of islands on 21 and 22 October 2019, the BrahMos land attack cruise missiles engaged the designated mock targets close to 300 km away and achieved direct hits on both. The launch was smooth and both the missiles followed the desired trajectory. The IAF had previously successfully fired the land version of the BrahMos missile at Pokhran.

Brahmos now has major indigenous systems

BRAHMOS supersonic cruise missile featuring Indian propulsion system, airframe, power supply and other major indigenous components, was successfully test fired from ITR, Chandipur in Odisha. The missile was successfully test-fired for its full range of 290-km during the launch jointly conducted by DRDO and BrahMos Aerospace. With this successful mission, the indigenous content in the formidable weapon has reached a high value, thus bolstering India's defence indigenisation and the flagship 'Make in India' programme.

VAYU Interview with Admiral Karambir Singh, CNS Indian Navy

VAYU : With your flying background and vast operational experience, would you kindly enumerate on priorities for the Navy's expansion and modernisation over the next few years, including its air arm.

CNS : The Indian Navy's Air Arm is poised for a quantum growth over the next few years. There is a comprehensive plan to augment the number and enhance the capability of ship-borne helicopters through midlife upgrades and role enhancement on the existing fleet of Kamov Ka-28 and Sea King 42B. Procurement of eight Chetak and sixteen ALH helicopters to enhance Coastal Security has commenced. Further, we also have plans to procure additional multirole helicopters to meet ship-borne helicopter requirements.

To meet Deck Based Fighter requirements, a RFI for the MRCBF (Multi Role Carrier Borne Fighter) has been hosted on the MoD website. The case is being progressed in accordance with DPP-16. Further, a case for MiG-29K midlife upgrade is being progressed. Delivery of four additional P-8Is will commence from April 2020 onwards. The Government has also accorded AON for 6 additional P-8Is.

We have added new Dornier 228 aircraft ex HAL and have also commissioned new Dornier Air Squadrons at Meenambakkam (Chennai) and Porbandar (Gujarat). At the same time, we are progressively upgrading our air infrastructure at Naval air bases across the country, as well as on the island territories.

In addition to Dornier 228s we are extensively utilising RPAs for coastal surveillance. Three RPA Squadrons have been commissioned at Kochi, Porbandar and Ramnad. Procurement of HALE RPAS as a joint tri-Service case is also on the cards.



VAYU : In reacting to the PLA Navy's White Paper on its expansion, with India "watching this carefully and responding within our budget and constraints", could you kindly elaborate in broad terms on how this will impact on the Indian Navy's own long term planning.

CNS : We are closely watching developments in relation to China in the region. The commissioning of the Chinese Military Base at Djibouti in 2017 has augmented their sustenance capability in the Indian Ocean. In 2018, an average of seven PLA (Navy) ships and submarines were deployed in the Indian Ocean Region every month. Chinese investments in various projects across IOR are also known.

The Indian Navy is aware of the security implications of the enhanced presence of Chinese ships and submarines in the Indian Ocean Region and maintains a constant and close watch on such developments. We are assessing our concept of operations and acquisition plans to meet the challenges. The operational outcomes of developing strategic imperatives in the IOR are factored in our planning to ensure that the Indian Navy remains poised to meet all maritime contingencies.



VAYU : You have stressed on the Indian Navy's shipbuilding initiatives and its linkage to nation building. Of the 51 ships and submarines currently on order, 49 are being constructed indigenously. However, what are your views on future 'strategic partnerships' and the present arrangement where state-owned shipyards receive more favourable consideration?

CNS : The Indian Navy has always encouraged mutually beneficial partnerships with industry. There has also been a constant endeavor to encourage indigenisation and self-reliance. Wherever feasible we have opted for indigenous defence products, provided they meet the SQRs.

The Strategic Partnership (SP) model has been promulgated by the Government to progressively build indigenous capabilities in the private sector to design, develop and manufacture complex platforms for the future needs of the Armed Forces. This is an important step towards meeting broader national objectives, encouraging self-reliance and aligning the defence sector with the 'Make in India' initiative of the Government. The cases being progressed by the Indian Navy under SP Model, include six Project 75(I) submarine, and the Naval Utility Helicopter projects.

However, the experience and challenges faced in Survey Vessels, Cadet Training Ship (CTS) and Naval Offshore Patrol Vessel (NOPV) projects awarded to private shipyards in the past have not been very encouraging. Therefore, the Defence Acquisition Council (DAC) has recently revised norms for capacity and financial assessment of shipyards while facilitating enhanced competitiveness in Naval warship building.

As on date, there are 10 AoN accorded and shipbuilding cases at various stages. Of these, most are being progressed on competitive basis involving private shipyards. Further, no shipbuilding case has been accorded AoN on Nomination basis since March 2015.

VAYU : On the indigenous aircraft carrier II (IAC-II), it is understood that this will be of the 65,000 tonne class,

with electric propulsion and EMALS for conventional launch and recovery of aircraft. What is the forecast for its 'go ahead', even as IAC-I is expected to be delivered in early 2021.

CNS : Indian Navy envisages IAC-2 to be a 65,000 tonnes carrier with Integrated Full Electric Propulsion (IFEP) employing Catapult Assisted Take-off But Arrested Recovery (CATOBAR) concept of flying operations. At present, the case for IAC-2 is being deliberated at MoD.

VAYU : Recently confirmed is an order for 24 MH-60R multi-mission helicopters but the requirement is for multiple times this number. Are there any plans for this or any other Type to be licence-built in India?

CNS : Acceptance of Necessity (AoN) for 24 Multirole Helicopters was accorded by DAC and Letter of Acceptance (LoA) is likely to be signed in the near future. In addition, Indian Navy also plans to procure Naval Utility Helicopters (NUH) through the Strategic Partnership Model to boost Make in India. The NUH are likely to be inducted in a phased manner commencing 2025. The most significant aspect of the Strategic Partnership is that it will facilitate absorption of niche technologies by private industries in helicopter manufacturing segment.

VAYU : The Japanese ShinMaywa US2i amphibian aircraft has been offered to the Indian Navy for some years and the Japanese Government is reportedly keen to progress this case. What is the status of this programme and do such amphibian aircraft play a role in the Indian Navy's blue water projections?

CNS : The induction of amphibious aircraft would significantly enhance Indian Navy's capabilities in terms of Operational Logistics (provision of technical assistance and supply of spares to the fleet at sea), long range Search and Rescue (SAR), Casualty Evacuation (CASEVAC), and HADR missions. The proposal for the procurement of six amphibious aircraft from Government of Japan is under deliberation.





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Major Milestones



HAL's Light Utility Helicopter LUH (photo: Phil Camp)

Safran's Ardiden 1U for HAL's LUH

Safran Helicopter Engines has received EASA type certification for its Ardiden 1U engine, now installed in India's LUH (Light Utility Helicopter). The LUH, a new three-ton, single-engine, multi-purpose rotorcraft designed by Hindustan Aeronautics Ltd. had made its maiden flight in September 2016. Since its first ground test in 2015, the Ardiden 1U certification campaign has accumulated around 1000 of hours of operation, in test beds or in flight, "to confirm the high reliability and performances inherited from the previous variant."

Benoit Gadefait, Vice President Medium Helicopter Engines Programmes, stated "this certification marks a major milestone in both the Ardiden 1 programme and our long-lasting partnership with HAL. The engine performs extremely well and has contributed to the success of the flight test campaign. The helicopter has conducted hot & high tests in the Himalayas, proving its abilities to operate in this demanding environment. It took off from remote areas at more than 5,500 meters elevation in hot conditions (up to 30°C), lifting more than



Safran Helicopter Engines supplies engines to all new-generation HAL rotorcraft

the expected payload. The engine revealed high level of reliability and performance, to the satisfaction of Armed Forces and Indian MoD representatives witnessing the tests. We remain fully committed to supporting HAL and their end customers as this Ardiden approaches entry-into-service."

The 1U is a derivative with increased power of the 1,400 shp Ardiden 1H1 and includes an innovative control system specifically designed for single-engine rotorcraft. The Ardiden 1H1 was co-developed by Safran and HAL and designed to power HAL's Dhruv and Light Combat Helicopter, with presently more than 250 units in service.

“India Critical to Boeing’s International Growth”

VAYU Interview with

Dennis Swanson, Vice President, International Sales, Boeing Defense, Space & Security and Boeing Global Services

VAYU: Boeing has been building its presence in India for decades and has won many defence contracts. What would you attribute to these successes?

Boeing: As one of the fastest growing economies in the world, India offers growth and productivity opportunities. In addition, as an aerospace leader, Boeing understands the need to play an inspiring role to promote aerospace innovation and build the next generation of engineering talent and frontline workforce across the globe. India offers us that opportunity. As a result, Boeing has established a growing defence installed base, invested in manufacturing, skill development and engineering in country, and contributed to an ecosystem that is being built on technology advancement and innovation.

In addition, over the past decade, we have seen great positive energy and strong participation across our governments. An expanded partnership between the United States and India allows us to create greater prosperity for both our nations and stands as mutually reinforcing engines of growth and innovation. Today, backed by increasing cooperation between the US and Indian governments, our defence products and services are significantly contributing to a closer security partnership and increased defence trade. Of the more than \$18 billion defence trade between the two countries, Boeing’s defence business constitutes 75% of that share in India. At the core of that is Boeing’s commitment and promise to deliver on our commitments to our India customer.

VAYU: As the leader for global defence sales for Boeing, how do you see the market for your portfolio internationally?

Boeing: Our international business is strong and opportunities are growing: international orders based on backlog currently represent 40% of Boeing Defense,



Space & Security’s business and there is continued opportunities for growth.

Customers around the world are showing significant interest in our portfolio, that includes fixed-wing military and surveillance aircraft, commercial derivative aircraft, military rotorcraft, vertical lift, satellites, human space exploration and autonomous systems. In addition, we also have significant aftermarket support opportunities for mixed fleets worldwide, focused on differentiated and cost-competitive service solutions, regardless of the equipment’s original manufacturer.

India is at the front and centre of many those opportunities with the armed services having invested in advanced capabilities for now and the future. We look forward to continue engaging with Prime





Minister Narendra Modi and his government, with our armed services customers and with our Indian partners and suppliers – who are absolutely critical to helping us build India's future in aerospace

VAYU : We see renewed cooperation and an upswing in ties between India and the US. What does that mean for Boeing?

Boeing: The defence cooperation environment between the two governments has changed considerably in the last few years and you see more cooperation in areas such as joint military exercises, technology transfer, collaboration through co-production, Defense Technology and Trade Initiative and the renewal of the defence agreement for another 10 years by the U.S. Congress.

Maritime security in the context of the military-to-military relationship has significant potential and is the surest foothold to advance the broader security agenda and realise the value of being Major Defence Partner in the near-term. The Malabar military exercises and the revival of the Quadrilateral Security Dialogue, the Quad, are a natural fit for collaboration. The utilisation of the P-8 fleet for missions in the Indian Ocean region is another way. Collaboration and engagement via the DTTI Carrier Working Group will facilitate the exchange

of ideas related to carrier operations and the potential for consulting on future design. There is strong potential for Boeing's F/A-18 Super Hornet to be an anchor of maritime cooperation between the two navies.

VAYU : On the F/A-18, what are the broad contours of Boeing's offer to India and how will enable closer ties between the two navies?

Boeing: Our F/A-18 Super Hornet Block III offers the Indian Navy a unique and differentiated capability in the form of an advanced, combat proven, multi-role naval fighter that is fully compatible with the Indian Navy carriers and would boost the growing maritime and defence relationship between the United States and India. Designed as a carrier-based fighter for high-loading, high stress operations with minimal support equipment required, the Super Hornet Block III is fully compliant with and ideally suited for the Indian Navy's carrier deck, and as demonstrated in flight trials, can take off from Indian aircraft carriers via the ski jump ramp. It is also compatible with air refueling tankers operated around the world.

With the Super Hornet being the frontline fighter for the US Navy, cooperation between the two navies in naval aviation can result in the sharing of upgrades and knowledge. The F/A-18 can unlock the potential of

cooperation in naval aviation, with the sharing of best practices in modern naval aviation systems, carrier integration know-how, services and training and weapon systems. In addition, the F/A-18's integration with Indian carriers would demonstrate India's commitment as a 'Major Defence Partner' and the 'Asia Pacific Reassurance Initiative,' serving as an important symbol of the new relationship between the United States and India.



The Hornet seen here at Aero India

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Hall 7
S 16

“Robust and Diverse Portfolio”



Lockheed Martin commitment to advancing India’s strategic security, industrial capabilities

In showcasing their robust and diverse portfolio of defence and civil capabilities at the 11th biennial edition of Defexpo India-2020, Lockheed Martin, the global security and aerospace company stated, “We’re proud to participate here where we can showcase our commitment to ‘Make in India’ directly to the largest gathering of defence and aerospace partners in the country,” stated William (Bill) Blair, Vice President and Chief Executive of Lockheed Martin India. “Lockheed Martin continues to build upon its more than three-decades of partnership with India, expand collaborations with local industry to support the evolution of indigenous defence manufacturing ecosystem, and further advance India’s strategic security and industrial capabilities.”

Blair added that Lockheed Martin’s goals at the show include building on the company’s existing foundation in India by identifying additional strategic partners from across the country, to include companies of all sizes — large, Micro, Small & Medium Enterprises (MSMEs) and start-ups. “For the past decade, we have supported the growth and development of India’s innovation and start-up ecosystem, and look forward to strengthening those partnerships to support the advancement of India’s defence industry well into the future,” Blair stated.

The F-21 fighter aircraft, which is on offer for the Indian Air Force, takes centre stage at Lockheed Martin’s display. An F-21 cockpit demonstrator is positioned at the booth for defence and aerospace partners to “fly”

the jet for themselves, experiencing “its unmatched performance”. The F-21 demonstrates Lockheed Martin’s commitment in delivering an advanced, scalable single-engine fighter to the Indian Air Force that also provides “unrivaled industrial partnership opportunities – for India, from India”.

Another platform being highlighted is the MH-60R Romeo Seahawk helicopter, on offer to the Indian Navy. “The MH-60R is the world’s most advanced maritime helicopter and will bring vital anti-submarine and anti-surface warfare capabilities to the Indo-Pacific region”.





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Photo credit U.S. Marine Corps

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Boosting Lockheed Martin's presence at the show is the C-130J Super Hercules and the S-92 multi-role helicopter, both of which represent a strong legacy of partnership with India and the Indian defence industry. The Indian Air Force operates 12 C-130Js, using the tactical airlifter "to go anywhere to do everything". India also is connected to the C-130J programme through Tata Lockheed Martin Aerostructures Limited, a joint venture, which has the distinction of being the single-global source of C-130J empennage assemblies included on all new Super Hercules aircraft. All C-130Js now built have major components manufactured in India.

On prominent display is the Javelin Anti-Tank Guided Missile system, which versatile and effective one-man-portable and platform-employed anti-tank and multi-target precision weapon system. With a range of 65 meters to 4 kilometers in most operational conditions, as well as the ability to operate through adverse weather and battlefield obscurants, the Javelin can be deployed in a variety of environments and conditions.

Also highlighted is the Modernised Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS), the advanced electro-optical fire control system used by AH-64D/E Apache helicopter pilots for long-range precision engagement.

Lockheed Martin has currently integrated more than 70 Indian suppliers including MSMEs into its global supply chain. At DefExpo 2020, the company representatives will seek to discuss partnership opportunities with Tier 1 suppliers and prospective Indian industry partners that strengthen India-US defence industrial ties and 'Make in India' opportunities.

As a part of its larger commitment to enhance the growth and development of India's innovation, Lockheed Martin has sponsored and supported the India Innovation Growth Programme (IIGP) since 2007 with the Government of India's Department of Science and Technology. In 2019, the company established MoUs with three Indian startups - Terero Mobility, Sastra Robotics, and NoPo Nanotechnologies integrating them in Lockheed Martin's global supply chain, contributing to the evolution of both the Indian and global aerospace and defence industry.



William (Bill) Blair, VP and Chief Executive of Lockheed Martin India

24 MH-60R helicopters for Indian Navy

The US State Department has made "a determination" approving the possible Foreign Military Sale to India of twenty-four MH-60R Multi-Mission helicopters for an estimated cost of \$2.6 billion.

As per details given, the Government of India has requested procurement of twenty-four MH-60R Multi-Mission helicopters plus the following systems: thirty APS-153(V) Multi-Mode radars (24 installed, 6 spares); sixty T700-GE-401C engines (48 installed and 12 spares); twenty-four Airborne Low Frequency System (ALFS) (20 installed, 4 spares); thirty AN/AAS-44C(V) Multi-Spectral Targeting Systems (24 installed, 6 spares); fifty-four Embedded Global Positioning System/Inertial Navigation Systems (EGI) with Selective Availability/Anti-Spoofing Module (SAASM) (48 installed, 6 spares); one thousand AN/SSQ-36/53/62 sonobuoys; ten AGM-114 Hellfire missiles; five AGM-114 M36-E9 Captive Air Training Missiles (CATM); four AGM-114Q Hellfire Training



missiles; thirty-eight Advanced Precision Kill Weapons System (APKWS) rockets; thirty MK 54 torpedoes; twelve M-240D Crew Served guns; twelve GAU-21 Crew Served guns; two Naval Strike Missile Emulators; four Naval Strike Missile Captive Inert Training missiles; one MH-60B/R Excess Defense Article (EDA) USN legacy aircraft.



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VAYU
DAILY Day 1

Saab's Gripen E



The Brazilian Connect

(image from Saab)

In the last week of August 2019, maiden flight of the first Brazilian Saab Gripen E fighter took place, less than five years since the formal contract was signed. This aircraft is the first Brazilian production aircraft and will also be used in the joint test programme as a test aircraft, this milestone testament to the partnership between Sweden and Brazil.

The main differences with the previous test aircraft are that the Brazilian Gripen E has a totally new cockpit layout, with a large Wide Area Display (WAD), two small Head Down Displays (sHDD) and a new Head Up Display (HUD), but also incorporates modifications both in hardware and software.

There are four outstanding aspects to be recorded: first, for an almost completely new aircraft, there are two distinct configurations being developed simultaneously for the Swedish and the Brazilian Air Force.

Second, the speed of development continues unabated with the Brazilian aircraft having a further updated flight control system as compared with the Gripen E test aircraft (39-8) that first flew a little over two years ago.

Third, that the complete development and production of an aircraft built as per Brazilian Air Force specifications took less than 5 years from contract.

Fourth, the Swedish Air Force has decided to incorporate the Wide Area Display produced in Brazil on its own fighters, an inverse process that of transferring technology to Saab. So Brazil first specified this, the WAD was developed and produced in Brazil and the Swedish Air Force followed, incorporating this on their own Gripens.

However, far more has been achieved. Saab have trained numbers of Brazilian pilots, technicians, engineers, designers and assembly line personnel. The technology transfer programme has been divided into more than 60 segments. By end of the programme, 350 Brazilian engineers, technicians and pilots will have worked in Sweden for up to 2 years, taking part in the theoretical and on-the-job training, before they return to Brazil to apply and multiply their new knowledge and skills. Till now more than 200 Brazilians have been trained in Sweden, and back in Brazil are engaged with development work on the Gripen, particularly the twin-seater variant and specific developments related to the Brazilian configuration.

The Brazilian programme is contemporary with the Indian MMRCA case, which began in 2007, involving most of the same contending aircraft. However, the Brazilian order for 36 aircraft was won by Saab in 2013, and since then, a robust transfer of technology has been underway with co-development of the product, continuous upgrades, with benefits for Saab, the Brazilian industry and of course, the Swedish and Brazilian Air Forces.

This is the model of partnership that Saab brings to the table and believes that this meets requirements of not only the Indian Air Force but would also enable the creation of a strong, sustainable and modern defence aerospace eco-system that builds on strengths of the Indian industry.

Courtesy: Saab

Count down: First Rafales for the Indian Air Force

8 October 2019, marked 87th Anniversary of the Indian Air Force which celebrated its foundation with parades at Air Force Station Hindan in the morning and an 'at home' hosted by the CAS at Air House in New Delhi in the evening.

Meanwhile, some 7000 kilometres away to the west at Merignac, a suburb of Bordeaux in France, another ceremony took place with the Indian Defence Minister Rajnath Singh formally accepting the first Dassault Rafale fighter for the Indian Air Force.

As Defence Minister Rajnath Singh officially accepted the first Rafale (RB 001) for the Indian Air Force, he stated "Our air force is the fourth-largest in the world and I believe that the Rafale aircraft will make us even stronger and will give a boost to India's air dominance exponentially to ensure peace and security in the region".

He was speaking at a formal handover ceremony along with his French counterpart Florence Parly at the Dassault facility in Merignac, southwestern France. The minister then performed a *shastra puja* on the new aircraft as he emblazoned it with an 'Om' tilak, laid flowers, coconuts and lemons (which was subject of much comment in India) He was also given a flight in a twin-seat Rafale, later exclaiming that "I had never imagined that I would be flown at supersonic speed; a very comfortable and smooth flight during which I was able to observe the many capabilities of the jet, its air-to-air and air-to-ground combat capabilities".

After completion of conversion training, the first batch of Rafales for the Indian Air Force will be ferried to India this spring, to equip No.17 Squadron at Ambala.



HAL in acceleration mode

LCH trials with IRSS



Systems performance trials of HAL's Light Combat Helicopter (TD-4) integrated with an Infra Red Suppression System (IRSS) with certain modifications made for improved air flow have been conducted. To assess the helicopter performance and handling qualities, LCH TD-4, installed with IRSS and improved cowlings was subjected to sea level trials at Puducherry during 9-13 July 2019. "Helicopter performance, loads, handling qualities and engine bay temperatures were found satisfactory".

LUH high altitude trials



The HAL Light Utility Helicopter (LUH) has successfully completed high altitude trials in hot and high conditions in the Himalayas, the trials carried out by test pilots from HAL, the IAF and Army. "A comprehensive test plan was executed at Leh (3300m) in temperatures upto ISA + 32°C which included envelope expansion, performance and flying qualities. The LUH then lifted off from Leh and demonstrated its hot and high hover performance at Daulat Beg Oldie (DBO) at 5000m followed by another forward helipad (5500m at ISA +27°C).

HAL's IMRH project given "Go Ahead"

First publically revealed as a full-scale mock-up at Aero India 2017, development of HAL's Multi Role Helicopter (IMRH) has been given formal go ahead. Essentially to be developed as replacement of the large fleet of Mi-8/17 Russian-origin helicopters currently in service with the IAF, the 12-tonne multi-role helicopter will be employed for tactical troop transport (24 seats), carriage of high value stores, off shore operations and as a VVIP transport. The twin-engined helicopter will also have a dedicated Naval variant.





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Rafael unveils SAR feature for Litening and Reccelite EO pods



Rafael Advanced Defense Systems Ltd. has unveiled its upgraded fifth generation Litening and Reccelite systems, effectively transforming them from traditional EO pods into EO+, with the addition of a unique SAR feature and the optional application of additional EO+ features, such as (EW, Comm, IRST). This constitutes a revolutionary quantum leap in all-weather, stand-off targeting and reconnaissance pods.

The Litening+ SAR is an advanced, all-weather, stand-off, SAR-optimised targeting pod. Litening is the most prolific pod in the world, with over 1900 units already in service, deployed by 27 Air Forces. Rafael teamed with ELTA to equip Litening with a powerful SAR (Synthetic Aperture Radar), adding significant capabilities to the Litening's EO, multi-spectral, stand-off pod, significantly expanded wide area coverage and true day/night, all-weather operation. This first-ever addition of SAR to an EO pod solves the EO challenge of target identification when flying above clouds. The high-performance SAR sensor joins Litening's set of high-resolution MWIR, SWIR, and HD colour sensors – all incorporated in a single, sophisticated stand-off pod. Reducing pilot workload, Litening+SAR increases mission efficiency through full support of JDAM, LGB and INS/GPS-guided munitions. The pods are equipped with a laser designator, and laser marker for joint missions, as well as an optional Data Link for CAS missions and stand-off ranges.

Reccelite+SAR is one of Rafael's latest game-changers, with the addition of ELTA's powerful SAR (Synthetic Aperture Radar) to the, stand-off Reccelite ISR pod. Overcoming the EO reconnaissance challenge when flying above clouds, the SAR-optimised pod delivers true all-weather, day/night, all-terrain, long-range capabilities, providing a full aerial intelligence picture with high-resolution images. The Reccelite ISR system consists of an airborne ISR pod, a wideband digital Data Link, and a GES (Ground Exploitation System) which can be stationary, mobile, or located on board the aircraft. The powerful SAR radar joins the system's array of advanced, high-resolution NIR, SWIR, MWIR and color sensors, together simultaneously collecting stabilized high-quality multi-spectral imagery from an unlimited field-of-regard.





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Project-75 India submarine programme: OEMs and SPs announced

At the Defence Acquisitions Council (DAC) meeting chaired by Defence Minister Mr Rajnath Singh on 21 January 2020, two Indian 'strategic partners' (SP) have been identified, being Mazagon Dockyards Limited (MDL) and Larsen & Toubro (L&T) in which programme, six conventional submarines in India will be built under P-75I, for an estimated Rs 50,000 crore. The original equipment manufacturers (OEMs) are Rubin Design Bureau (Russia), Naval Group-DCNS (France), ThyssenKrupp Marine Systems (Germany), Navantia (Spain) and Daewoo (South Korea).

The P-75I project was initially given its AoN in November 2007 but has taken over a decade since, with certain SPs and OEMs since having withdrawn from the competition. The Indian partners will have to set up dedicated manufacturing lines in partnership with one of the OEMs, and the Navy may opt to manufacturer six more submarines under the project. In a statement, the government said the DAC decisions are "in keeping with the mandate given to the Chief of Defence Staff and the newly-constituted Department of Military Affairs to promote use of indigenous hardware by the Services". This



was the first DAC meeting after the post was created, when also other project including EW Systems for the Army and trawl assemblies for T-72/T-90 approved for de-mining operations.

While these Indian companies were shortlisted for their capability to integrate systems, expertise in shipbuilding domain and the financial strength, the foreign OEMs were judged primarily on their submarine design, which had to meet the Navy's Qualitative Requirements and the Transfer of Technology and Indigenous Content criteria.

Pratt & Whitney names Ashmita Sethi Managing Director - India

Pratt & Whitney has appointed Ashmita Sethi as Managing Director for India. As Pratt & Whitney's senior-most in-country leader, Ms. Sethi will provide strategic direction for the Company's growth and business goals in India, and drive all of Pratt & Whitney's operations in India, including customer relations and support, the Company's Customer Training Centre in Hyderabad, Communications and Government Affairs. Ms. Sethi brings more than 20 years of experience from the defence and aerospace industry to this role and joins Pratt & Whitney following a distinguished career in corporate and public affairs, and communications with Boeing and Rolls-Royce. "I am very excited about the future of Pratt & Whitney in India, and this is a thrilling time to join this team," stated Ms. Sethi.



Lockheed Martin appoints William Blair VP and Chief Executive for India

Lockheed Martin has appointed William (Bill) Blair as Vice President and Chief Executive for Lockheed Martin in India. In this role, Mr. Blair will lead the growth and development of Lockheed Martin's business in India and serve as the executive representative for all of Lockheed Martin's programmes, products and services in the country. Immediately prior to assuming this post, Mr. Blair was Vice President, Strategic Solutions and Middle East Executive with Lockheed Martin's Space Systems where he led and developed strategic solutions and expanded business opportunities in countries within the Gulf Cooperation Council, and Israel. In a career spanning 30 years, he has held roles of increasing responsibility, with global assignments including in India where was based on several prior occasions.



BEL at Defexpo 2020



M V Gowtama, Chairman and Managing Director, BEL

BEL is showcasing its state-of-the-art products and systems spanning every domain of its business – Military Communication, Radar Systems, Missile Systems, Naval Systems, C4I Systems, Electronic Warfare Systems, Avionics, Anti-Submarine Warfare Systems, Tank Electronics, Electro Optics, Gun/Weapon System Upgrades, Shelters, Unmanned Systems, Homeland Security, Cyber Security, Artificial Intelligence based systems and professional electronic components. BEL is also showing its R&D capabilities by launching/demonstrating some of its new products / technologies.

BEL's display in the area of Radar includes products/models/panels of Active Electronically Scanned Array Radar (AESA), Radar for Quick Reaction Surface-to-Air Missile, Radars for automatic detection of first-round location of artillery weapons (Weapon Locating Radar) and Border surveillance and Detection of low flying targets (like Battlefield Surveillance Radar and Air Defence Fire Control Radar - Atulya).

BEL's display in the area of Military Communication includes products such as Software Defined Radios, Single Box Communication Solution, Secure Versatile IP Terminal, Cyber Security products/services, Encryptors, High Capacity Radio Relay, Data Diode used to create a physically secure one-way communication channel from one network to another, SDR VPX with NCW Applications, Configurable Live Mk II, etc.

Electronic Warfare and avionic products on display include Tethered UAV, EW Suite for Airborne Application, Quadcopter UAV, Drone Guard System, Directed Infra-Red Counter Measure (DIRCM), Combined Interrogator and Transponder (CIT), CLIFF, EOS CoPASS, etc. as well as the complete range of Electro Optics, such

as Holographic Sight, TI Sights, Image Intensifier based Passive Night Sight, Target Acquisition System, Day Night Sights for Tanks, LRF Modules, Pan & Tilt – Electro Optical Director for long range surveillance applications like coastal surveillance, border surveillance, etc.

BEL is showcasing its Naval Systems capability through Dipping Sonar, Airborne Sonar, Ship Communication Systems and Long Range Surface-to-Air Missile system.

Components/Technology modules on display include TR modules (X band and C band Quad) for Radar application, Smart cards, MPM / TWT Transmitter, Low Band receiver Modules, LTCC substrates / MMR Chips, Solar Products, Electric Batteries for two / three Wheelers, Electronic Fuses for

Artillery, etc.

Other Innovative solutions and Artificial Intelligence systems on display are Face Recognition System, Social Network Analysis, Software based Record and Replay System, Video Management System, Ytterbium Fibre Laser, Power Amplifier for sonar application, LTE- Secure Mobile, Machine Intelligence & Robotic Unmanned Ground Vehicles, Radar Pulse De Interleaver, Digital Pre-distortion for Linearization of Power Amplifier, Electronics Target Systems, Decision Support Systems for Coastal Surveillance System, Imagery Solution, Automatic Train Supervisory System, Comprehensive Integrated Border Management System, Speech to Text Technology, Smart City Solutions, Space-based products, etc.

The highlight of BEL's outdoor display is the Weapon Locating Radar – Mountain Version, KU Band SATCOM – vehicle based; X-PAR Compact version, High Altitude Shelters, Missile Containers, Indigenous Fire Control System, Advanced Landing Ground Communication Terminal (ALG-CT) and Air Defence Tactical Control Radar (ADTCR). The entire set of state-of-art equipment on offer will be a force multiplier for any defence force.

The Government is encouraging defence exports through many policy initiatives and has set a target of Rs.35,000 crore by 2024-25. BEL has identified Exports and Offsets as one of its priority areas and has drawn up plans to offer its select products and systems to various export markets.

In our bid to develop new markets in the Indian Ocean Region (IOR), BEL has established overseas marketing offices in Vietnam, Sri Lanka, Oman and Myanmar. BEL has also expanded its Singapore and New York Regional Offices to handle marketing activities. BEL plans to work



Battlefield Surveillance Radar and Air Defence Fire Control Radar - Atulya

closely with Companies in other countries to increase the geo-spatial presence.

BEL has been exporting products including Communication Systems, Coastal Surveillance System, Missile Systems, Radars, Electronic Warfare Systems, Electro Optic Systems and Electro Optic Fire Control Systems, Radar Finger Printing System, Naval Systems, Radar Warning Receivers, Electronic Voting Machines and various other equipment to USA, UK, Russia, Italy, Brazil, Germany, France, Israel, Indonesia, Honduras, Malaysia, Maldives, Mauritius, Myanmar, Namibia, Seychelles, South Africa and many other “friendly countries”.

In 2018-19, BEL sold products and systems worth \$21.6 million and had an export order book of \$158 Million in late 2019.

The Defence segment continues to be BEL’s main business domain covering about 85% of its revenues. However, BEL is continuously exploring diversification opportunities in Defence and allied non-defence areas for enhanced growth, leveraging its strengths and capabilities acquired in the defence electronics domain.

Segments like Radars and Weapon Systems, Communication and Network Centric Systems, Tank Electronics, Gun Upgrades, Electro Optic Systems and

Electronic Warfare & Avionics Systems will continue to drive the Company’s growth in the coming years. As part of its diversification strategy, BEL is also continuously exploring opportunities in Defence and allied non-Defence sectors by offering spin-off technology products.

Some of the areas BEL has already diversified into are Homeland Security and Smart City, Electronic Ammunition Fuzes, Composites, Energy Storage Systems, RF Seekers, Imaging Infra-Red (IIR) Seekers, Real Time Information System for Railways, Automatic Fare Collection Gating System for Metro rail, Intelligent Traffic Management System, Satellite Integration, Cyber Security, Unmanned Systems, Composites and Solar Power Plants.

Other areas of focus include Next Generation Indigenous Surface-to-Air Missile (SAM) System, Airborne Radars, Thermal Imager Detectors for Night Vision Devices, Indian Regional Navigation Satellite System (IRNSS), Direct Energy Weapons (DEW), Helmet Mounted Display Systems (HDMS), Directed Infra-Red Counter Measure (DIRCM), IT & Cloud Services, Ring Laser Gyro, Explosives, Propellants, Smart Bombs etc, in the Defence segment, and Space Grade Solar Cells, and Air Traffic Control Radars in the non-defence segment.

MKU at Defexpo 2020

MKU, a leading defence and security solutions provider, is participating here at DefExpo 2020. MKU is committed to 'Make in India' and has been transforming the defence industry landscape in India by deploying newer and advanced technologies in electro optics and armour solutions. MKU's products are indigenously designed, developed and manufactured at their manufacturing units in India and Germany and used by Indian and international forces across 100 countries.



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- Versatile range of Night Vision (Image intensified) weapon sights, monocular and bi-oculars that deploy Gen 3 sensor technology for excellent performance in very low light conditions
- Rugged Thermal Weapon Sights for assault rifles, sniper rifles, LMG, MMG etc that offer longer ranges and better performance even in zero visibility conditions (for, smoke, smog etc)
- Instavest series, is the all-new line up of quick release survivability and protection jackets as per BIS Standards for male and female soldiers in tactical, combat and law enforcement configurations. Instavest series feature the highest level of protection in the lightest configurations using Gen 6 armour technology
- The newly designed Insta Load Distribution System (ILDS) for the jackets, based on the Exo Skeleton technology
 - Polyshield – H bolt free helmets that are capable of providing uniform protection across the head, from faster and more lethal fragments at higher velocities

MKU will be engaging with its customers, partners, leaders from India and the global defence industry and participants from the services as well as the government.

MKU stall is at Hall # 1, Booth # R16

Irkut's 4th MC-21-300 in flight test programme

On 25 December 2019, maiden flight of the fourth MC-21-300 flight test aircraft took place at the airfield of Irkutsk Aviation Plant, an affiliate of Irkut Corporation (a UAC member). The duration of flight was 1 hour 40 minutes, flying at an altitude of 3000 meters at a speed of 500 km / h. The aircraft was piloted by Roman Taskaev and Oleg Mutovin test pilots, *Heroes of Russia*. According to the crew, the "task was performed completely, the flight was in normal mode". The test results of the first three test MC-21-300's were verified.

Irkut Corporation is conducting MC-21-300 flight tests to obtain Russian and European type certificates. The work involves representatives of the aviation authorities and industry of the Russian Federation, as well as specialists of the European Aviation Safety Agency (EASA).



EASA completes third session of certification flights

Flight test crew of the European Union Aviation Safety Agency (EASA) have completed third flight session of the MC-21-300 certification programme, having worked with their Russian colleagues on the flight simulator. Subsequently the EASA and Yakovlev Design Bureau (a branch of Irkut Corporation) carried out a series of flights on the MC-21-300. In 2019, EASA experts completed two flight sessions in MC-21-300 certification programme.



Lohia Group: ‘Taking India to New Frontiers of Aerospace Excellence’



The Lohia Group, a recent entrant into the Aerospace and Defence (A&D) sector with focus on cutting edge composites technology, are participating at DefExpo.

Kanpur headquartered, Lohia Group acquired Israel based Light & Strong Ltd, Israel’s largest private producer of aerospace focused carbon fibre composite components for Israel’s Aerospace and Defence industry in February 2019. In the process it became the first Indian company to acquire and own an international composites company. With the Idea of bringing in global standards aerospace technology to India, Lohia Aerospace Systems began construction of a ‘truly world-class’ facility at their 100-acre Industrial campus on the Grand Trunk Road at Kanpur in July 2019.

Under the UP-Government’s Aerospace manufacturing policy, Lohia Aerospace’s greenfield factory covering an area of 75,000 sq. feet, in keeping with global aerospace standards over 70% of the factory is air-conditioned, was

constructed in 6 months. “We have started trial production at the plant from January 2020 and we are proud to be displaying our sample products here. The commercial production from our Kanpur facility is expected to start in March. Our factory is now the largest unit of composites in northern India”, stated company officials.

Lohia Aerospace Systems have signed an offset based sourcing MOU with their first customer – an international aerospace contractor for supply of civil aerospace components from their factory in Kanpur. They are also in advanced discussions with other potential clients from Asia and Europe for supplying of aerospace composites from the facility in Kanpur.

Under the “SKILL India’ initiative, they have recruited 30 people from UP and sent them for training at the Israeli facility for 6 months. After the conclusion of their factory training in Israel, they will return to work at the facility in Kanpur from March 2020 onwards. “We will be developing a training institute as part of our Kanpur facility where these Indian composite maestros will further impart skills to the youth of our state so that they are able to work in global aerospace facilities such as Lohia Aerospace or similar companies. We have also recruited Israeli composites experts who will work at our India facility for 2 years for executing the technology transfer from Israel to India”.

Visit Lohia at Hall 1, S 13

Nammo unveils revolutionary ramjet artillery shell

Rocket-assisted projectiles (RAP) have been around for decades, but Nammo has gone a step further by using a solid fuel ramjet to reach ranges of over 100km, which requires no modification to the 155mm howitzer. Nammo has now introduced the new product. “This could be a game-changer for artillery. With the exception of a small number of precision-guided shells with 50-60 km range, most artillery systems still reach the same distances as they did when the M109 was introduced more than 50 years ago. This could completely change that,” stated Thomas Danbolt, VP of Nammo’s Large Caliber Ammunitions unit.

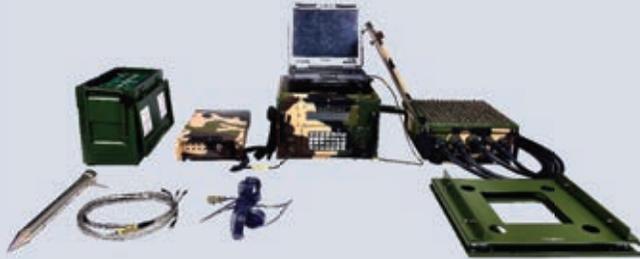
Nammo’s revolutionary design is built around a compact solid fuel ramjet which is kick-started by launching it from a cannon, and is a collaborative programme between ammunition and rocket engineers in Nammo. “We have been building rocket motors for about 60 years, and have specialised in small and powerful motors for air-to-air missiles, such as the Sidewinder, IRIS-T and AMRAAM. Some years ago, we began looking at using air-breathing motors to



help extend their range, but we quickly saw the massive impact this could have if we fitted it to an artillery shell,” stated Erland Ørbekk, VP Technology with Nammo’s business unit for Aerospace Propulsion.



VAYU Interview with Col. HS Shankar, CMD, Alpha Design Technologies



VAYU: What have been the most recent developments in the defence and space arena for Alpha Design Technologies (ADTL)?

HSS: We are pleased to announce that ADTL was declared as L1 for the important Pichora radar/ Missile Upgrade Project which is to be completed in next 3 years. The MoD has also contracted ADTL for manufacture and supply of indigenously developed ULSB Mk III, the follow on order of 1545 in addition to the 2000 already supplied three years back.

ADTL has also made significant progress in major R&D projects, such as the BMP-2 Upgrade (with modified T-72 TIFCS), software defined radios, both for IAF and Army, high capacity radio relay, tactical access switch, EW suites and others.

As for Space, ADTL-led consortium of engineers and technicians, under ISRO's guidance, has assembled, integrated and tested (AIT) two 1.635 tonne Satellites (IRNSS 1 (h) and 1 (i) for the Indian GPS programme.

This same team have carried out AIT under ISRO's guidance of the third and bigger 3.5 ton GSAT 30 Satellite (Communication Set), successfully launched on 17 January 2020. ADTL's teams are now carrying out AIT under ISRO's guidance with one such important satellite to be launched in April 2020.

The priority for ADTL was the Minister of State of Home launching the POLNET 2.0 (Pan India Police Network 2.0) at Delhi on 20 January 2020. ADTL continues to execute major hub and ground antenna receiving terminals at SAARC countries, (recently, India's PM inaugurated ADTL's 140 stations at Bhutan), the A&N Islands and elsewhere.

ADTL, as part of its Investor the Adani Group are part of the consortium with BEL and BEML for production of five PSLV launchers.

VAYU: Kindly elaborate on the role played by ADTL in the Tejas LCA and Su-30 MKI programmes as well as their simulators and helicopter upgrades?

HSS: ADTL's subsidiary Alpha-Tocol was awarded the contract by HAL for manufacture and supply of LCA rear fuselage assemblies as also manufacture and assembly of jigs, nose box, pylons, RF assemblies for the LCA.

For the Su-30, Alpha-Tocol makes ailerons, flapperons, engine mounts, and other assemblies which have so far been fitted on 120 aircraft. Alpha-Tocol is also involved with overhaul of the Su-30 at HAL Nasik.

VAYU: What are the latest developments at the Alpha ELSEC Joint Venture?

HSS: Major breakthrough for A-Elsec JVC has been establishment of facilities for UAVs (Sky Lark and Sky Striker) and the export of airframes for these to Israel. Alpha-Elsec's EO manufacturing group also exports critical units for the COAPS (Commander's Architectural Panoramic Sight) and for the TIFCS version to Thailand for upgradation of US-origin M-16 AFVs.

VAYU: Please elaborate on ADTL's partnership with DRDO and the DPSUs.

HSS: Tremendous strides have been made both by DRDO and ADTL on major IFF projects for the CABS (Interrogator, Transponder and Combined RF Seeker for MR-SAM, Missile Launch Detection System (MILDS) for the Mi-17 and Mi-17 1V Upgrade, EW sub-systems and others.

VAYU: As for exports, what are the successes achieved by ADTL?

HSS: During 2018-19 and the current year (2019-20), ADTL's sales turnover includes more than 85% in exports, which is the highest ratio in the Public/Private sector.



Navantia and the Indian Navy



Spanish Navy LHD Juan Carlos I multi-purpose amphibious assault ship and aircraft carrier

One hundred percent owned by the Spanish Government, Navantia is a shipbuilder and leader in the design, construction and integration of state-of-the-art warships and submarines, as well as ship repairs and modernisation. They are also engaged in the design and manufacture of Integrated Platform Management Systems, Fire Control Systems, Combat Systems, Command and Control systems, Propulsion Plants and through life support for all its products.

Navantia's presence in India has been established with the Scorpene programme, being involved in co-fabrication and giving Navantia the opportunity for close interaction with the country and to understand the requirements. Navantia have established an office in New Delhi with the "strongest commitment to collaborate with the Indian Navy and the 'Make in India' programme".

Currently, Navantia is concentrating on participation in several Indian Navy programmes, offering advantages of a proven product and experience gained through similar programmes with the Spanish Navy. Navantia is presenting their product based on the Spanish Navy S-80, which will shortly be ready for operation.

The S80 has been designed by Navantia and is a new concept for a 3000-tonne, conventional-powered submarine, designed from its concept with leading edge Air Independent Propulsion (AIP) system based on use of bio-ethanol and the highly efficient fuel cell developed by Collins Aerospace. The submarine can launch a wide variety of weapons and integrates a state-of-the-art system for combat and operations of Special Forces. Such

improvements give the submarine its distinctive shape, clearly different from other conventional submarines extant.

The S80 is considered as "the most advanced conventional submarine", with its high level of discretion and mobility in reaching distant theatres.

Navantia has also offered India a design based on the internationally successful Spanish Navy LHD Juan Carlos I, that had visited Mumbai in 2018, giving the Indian Navy an opportunity to assess the ship. This type has been exported to Australia and Turkey thus far, is well proven and of low risk. The partnership with India's industrial group, Larsen & Toubro, makes this robust team capable of delivering the product tailored to Indian requirements.

With inputs from: Navantia



The S-80 submarine from Navantia

GA-ASI makes Persistent Situational Awareness “more affordable”

The new Integrated Intelligence Center (I²C) from General Atomics Aeronautical Systems, Inc. (GA-ASI) presents innovative ways to improve the user experience for operators of Remotely Piloted Aircraft (RPA) and other multi-domain Intelligence, Surveillance and Reconnaissance (ISR) platforms using automation and user experience-based design (UX). And best of all, the system makes situational awareness more affordable for all involved, including intelligence analysts, mission supervisors, and decision makers.

“I²C will rapidly transform data into actionable intelligence for operators,” stated David R. Alexander, President, GA-ASI. “We see benefits to the warfighter on many fronts, including the reduction of operational cost – whether it’s Ground Ops, Air Ops, or Intel Ops. By combining XC2, Automatic Takeoff and Landing, Multi-Mission Control and our single-seat Certifiable Ground Control Station, we will reduce manning by 50 percent.”

GA-ASI’s modular and open software architecture design promotes horizontal integration of third party software and rapid integration of new capabilities making the following developments the ideal set of ISR tools for streamlined and improved collaboration. This extends to multi-INT data across multi-domain platforms:

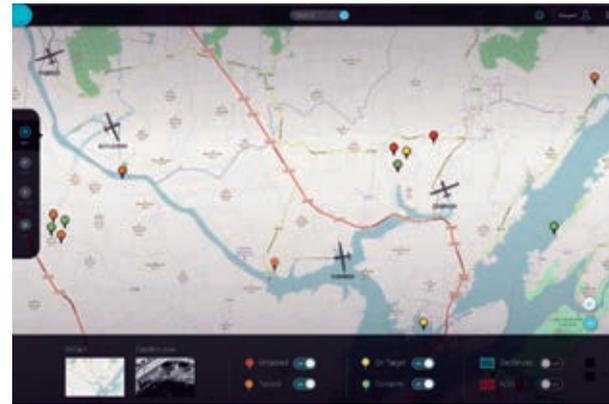
eXpeditionary Command & Control (XC2): XC2 laptop leverages GA-ASI’s Advanced Cockpit development by porting select capabilities to a ruggedised laptop. A forward-deployed maintainer can use the laptop to employ automated pre-flight and post-flight checklists that reduce setup times by up to 50 percent.

Certifiable Ground Control Station (CGCS): The CGCS enables single-seat operations to reduce manpower requirements. Its tactical situation display unifies ISR and C4ISR data, as well as mission planning into a single Common Operating Picture (COP).

Multi-Mission Controller (MMC): The MMC enables a single user to safely control multiple aircraft and perform transit and routine ISR missions using a hand controller. When an aircraft is tasked with performing more dynamic ISR or a strike mission, MMC allows a rapid handoff of the aircraft to a dedicated GCS.

Metis: Metis is a map-based interface that enables a pre-approved Metis user to request ISR products from the RPA, similar to ordering a car from Uber. Once the Metis user sends a task, it’s transmitted to MMC in real time. The MMC user selects the task and an integrated third party auto-router automatically generates a safe route to the requested target.

STARE: The System for Tactical Archival, Retrieval, and Exploitation’s (STARE) Common Operation Picture



Metis is a map-based interface that enables a pre-approved Metis user to request ISR products from the RPA



The System for Tactical Archival, Retrieval, and Exploitation’s (STARE) Common Operation Picture shows aircraft locations, as well as ISR assets and their payload data

shows aircraft locations, as well as ISR assets and their payload data. The Multi-INT exploitation tool ingests, archives, disseminates and makes ISR data discoverable for imagery analysts to utilize. STARE reduces data exploitation tasks from hours to minutes.

Automation of Intel Ops: I²C integrates third party capabilities and software services to make Intel analysts more effective. Automated Activity Alerts – based on Multi-INT data correlation – reduces the need for eyes-on RPA sensor data to pick out significant activity. GA-ASI is partnering with best-of-breed companies specialising in Artificial Intelligence (AI) and Machine Learning with proven AI-based systems deployed across multiple commercial sectors.

These tools and capabilities are either operationally deployed, undergoing customer operational assessment or are actively flying aircraft. I²C is made to ingest ISR data from any airborne, ground, or space based system, not just GA-ASI aircraft.

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Maintaining their track record



L&T's K9 Vajra-T howitzer programme

Maintaining their track record of 'ahead of time' deliveries of the 'K9 Vajra-T' 155mm/52 calibre tracked, self propelled howitzer guns programme, the company had its 51st (out of a total of 100) such system 'flagged off' by RM Mr Rajnath Singh at their factory in Hazira (Gujarat) on 16 January 2020. As Mr AM Naik, Group Chairman L&T said "Our Defence team has once again demonstrated L&T's engineering and execution prowess in building this most advanced weapon system to the exacting levels of quality while ensuring on time delivery. The Hazira Manufacturing Complex has set various international technology and manufacturing benchmarks and the K9 Vajra is certainly one of them".

L&T Defence is currently executing the programme - the largest contract awarded to an Indian private company by the Ministry of Defence, through global competitive bidding.

L&T partnered South Korea's largest defence company Hanwha to adapt the well proven K9 Thunder to realise the Vajra variant and enable indigenous manufacturing by training a team of engineers and integration specialists at Hanwha facilities.



Elettronica EW solutions



Significant geopolitical changes and new conflicts have reintroduced complex IADS (Integrated Air Defence Systems) to address the increasingly complex RF threats in the avionics environment, highlighting current vulnerabilities and raising the standards required in modern fighter aircraft protection.

Elettronica Group has worked on a wide range of solutions for Electronic Warfare (EW), cyber EW, intelligence, and brand new generation of RWR. For almost 70 years, Elettronica has been one of the world's top leaders in EW systems, maintaining high standards of excellence in the technological development process with cutting-edge technologies for mutual and self protection.

Elettronica recently displayed its SISPROS, a new system family of interception, analysis and intelligence, at Le Bourget 2019. Developed for airborne applications, SISPROS benefits from "the most modern enabling technologies: *Direct Sampling and Artificial Intelligence*". The combination of those two technologies makes the systems belonging to this family fully digital, highly resistant to interference, adaptive to the electromagnetic environment and reconfigurable via SW to new environments or different platforms.



Giovanni Carlini of Elettronica

The increasing diffusion of unmanned avionic platforms, both tactical and HALE/MALE, has meant focus on the technological effort of ELT, supported by the Ministry of Economic Development, leading to the development of light weight and low-impact installation solutions. In line with the latest architectural approaches of ELT products, SISPROS systems are also multifunctional and multi-platform, since they can derive the Alarm (RWR) or Surveillance (ESM, ELINT) function only, as a spin-off of the main product, by reconfiguration of SW. Finally, family systems are equipped with by-design interconnectivity features, supporting the ability to operate in network-centric configuration, contributing to the integrated and global vision of the scenario.

The latest RWR development of Elettronica, the ELT/162, belongs to this systems family. In addition to the warning role the product performs light ISR (Intelligence, Surveillance, Reconnaissance) function on the observed band, providing goniometry, detection, detection of received radar emissions and automatic alert in case of detection of specific signals. In support of ISR/ELINT missions, the ELT/162 can also be configured to provide detailed parameters of a designated transmitter.

IAI's ELTA launches next gen ELM-2084 MMR Radar

ELTA Systems, a subsidiary of Israel Aerospace Industries (IAI), has unveiled the next generation of its ELM-2084 Multi-Mission Radar (MMR). The operational and combat proven MMR provides air defence capabilities to operators around the world as well as being the radar of *Iron Dome*, *David's Sling* and IAI's land-based *Barak* weapon systems. The new version, named MS-MMR (Multi-Sensor MMR), fuses additional ELTA sensors to the main MMR system thereby providing an active, passive, and combined Air Situational Picture (ASP). Over the last decade, new types of aerial threats have emerged due to the advancement of low RCS (Radar Cross Section) stealth technology. Platforms such as drones and UAVs, tactical aerial weapons, cruise missiles, ballistic rockets and missiles have created new challenges for air defence and surveillance systems. Operating in S-Band frequency, the MMR provides long-range air defence, air surveillance and fire control capabilities. By fusing the MMR with an additional higher band radar and active



IFF and ADS-B sensors and passive SIGINT, EO/IR and LDS (Launch Detector Sensor) sensors, the MS-MMR now provides enhanced classification, identification and discrimination between very close targets even in dense areas and background clutter.

More AEW&C aircraft, BVR missiles from Israel

The Governments of India and Israel are working on acquisition of two more Airborne Early Warning and Control Systems (AEW&C) and Derby BVR missiles for the Indian Air Force. Israel's National Security Adviser Meir Ben-Shabbat has also visited India and met his Indian counterpart Ajit Doval. There has been speculation that India is set to conclude a follow-on order for 15 more Harop attack drones for the IAF from Israel Aerospace Industries.



IAI's new tactical UAV T-Heron

Israel Aerospace Industries (IAI) have unveiled its new tactical Unmanned Aerial System (UAS) of the Heron Family: the T-Heron. Designed for tactical missions on the battlefield, the T-Heron is expected to be used extensively by ground troops and maritime forces as well as by other protection forces. Suitable for a variety of payloads, it features the most advanced IAI technologies.

The T-Heron joins IAI's Heron UAS Family, which has "rich know-how and extensive experience of 40 years, with 1,700,000 combat flight hours and over 50 operational customers, which use IAI UAS's in a range of missions, environmental conditions and warfare theatres across the globe."

The T-Heron features the 'highest levels of flight safety and reliability' and is resistant to extreme weather conditions. Its proven Rotax engine takes it to a maximum altitude of 24,000 feet, speed of 120 knots and supports useful payloads of up to 180 kg. Capable of carrying several payloads concurrently, and equipped with IAI's sensors, the T-Heron complies with global standards, including STANAG 4671 requirements.



Illustration of the T-Heron (Credit: IAI)

Tata Advanced Systems and the F-16



Lockheed Martin have announced that their partner in India, Tata Advanced Systems, will be building wings for the F-16 at their site in India. According to Dr Vivek Lall, Vice President of Strategy and Business Development, Lockheed Martin Aeronautics, the contract awarded to Tata "is not dependent on us winning the fighter jet contract here", alluding to the planned procurement of 114 fighters to meet the IAF's immediate requirements. Dr Lall continued that "our partnership with the Indian industry on both the F-21 fighters for the IAF and S-76D helicopters for the Indian Navy will put India at the epicenter of the world's largest defence ecosystem and promises export opportunities".

Lockheed Martin had earlier hosted a suppliers conference with their Indian partner Tata Advanced Systems at New Delhi in mid-July 2019.

IAF to procure over 1000 Russian-origin AAMs



According to reports from Russia's Federal Service for Military and Technical Cooperation, the Government of India is to procure over 1,000 new air-to-air missiles for the Indian Air Force fighter fleet comprising MiG-21Bisons, MiG-29UPGs and Su-30MKIs. Numbers given are 300 each of both the R-27 (AA-10 Alamo) infrared-guided or semi-active radar-guided, medium-to-long-range missiles and 300 R-73E (AA-11 Archer) IR-guided, short-range missiles. The balance of the order valued at some \$700 million, is for 400 R-77 (AA-12 Adder) active radar-guided, medium-range missiles.



Naval Group/MDSL

INS 'Khanderi' commissioned

The Government is deeply conscious of the requirements of the Armed Forces and remains committed in providing requisite focus and financial support for its modernisation”, stated Defence Minister Rajnath Singh on 28 September 2019 at the commissioning ceremony of indigenously-built submarine INS *Khanderi* in Mumbai. Mr. Rajnath Singh said that due impetus had been given for timely acquisition of state-of-the-art weapons, sensors and platforms, adding that the Government had given more freedom and support to armed forces in taking decisions in the nation’s interest. “We are committed to far-reaching changes in our defence preparedness. You cannot buy a confident Navy. A confident Navy is always built by a confident Government”, the Raksha Mantri said, adding that the Indian Navy had that confidence which no other country in the Indian Ocean possessed.

INS *Khanderi* is the second of *Kalvari*-class diesel electric attack submarines of the Indian Navy. It has been built in India to the French *Scorpene* design (by Naval Group) and is the second submarine of the Project-75. Built indigenously by Mazagon Dock Shipbuilders Limited, INS *Khanderi* is designed for silent and stealthy sub-surface operations.

INS *Khanderi* is follow-on to INS *Kalvari*, which was the first French-origin *Scorpene*-class submarines indigenously constructed in India and commissioned in 2017. First put out to sea in 2017, INS *Khanderi* has

undergone comprehensive sea trials, torpedo and missile firings to validate her fighting capability and was handed over to the Indian Navy on completion of trials on 19 September 2019. At 67.5 meters long and 12.3 meters high, *Khanderi* “embodies cutting edge technologies that ensure stealthy, silent operations underwater and is equipped with an array of torpedoes, missiles and sensors that enable her to detect, identify and destroy enemy targets”.



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Russian Helicopters delivers attack helicopters to Russian MoD



Rostec's holding company Russian Helicopters has delivered over 20 attack helicopters to the Russian Defence Ministry, completing the state defence contract for 2019. "The enterprises of Rostec are fulfilling the needs of the Ministry of Defence for modern combat helicopters. This year, the forces have received Ka-52 Alligator reconnaissance and strike helicopters, Mi-35M transport and combat helicopters Mi-28N and Mi-28UB. In addition, were delivered the first modern Mi-28NM Night Hunter combat helicopters and by 2027 will produce 98 such machines for the Defense Ministry," stated Aviation Cluster Industrial Director of the Rostec State Corporation Anatoly Serdyukov.

Kamov Ka-226T helicopters with Safran Arrius 2G1 engines

Four years after the signing of an Indo-Governmental Agreement for the procurement of 200 Kamov Ka-226T light helicopters for the Indian Armed Forces, price negotiations have reportedly now been completed and the formal contract will be signed shortly. Following the supply of 60 such helicopters as 'fly away', the balance are to be produced by HAL at a new facility in Tumkuru, near Bangalore by the entity Indo-Russian Helicopter Pvt Ltd. (IRHL).

The Ka-226Ts are powered by the Safran Arrius 2G1 engine of 720 shp, equipped with FADEC and having a TBO of 3000 hours.



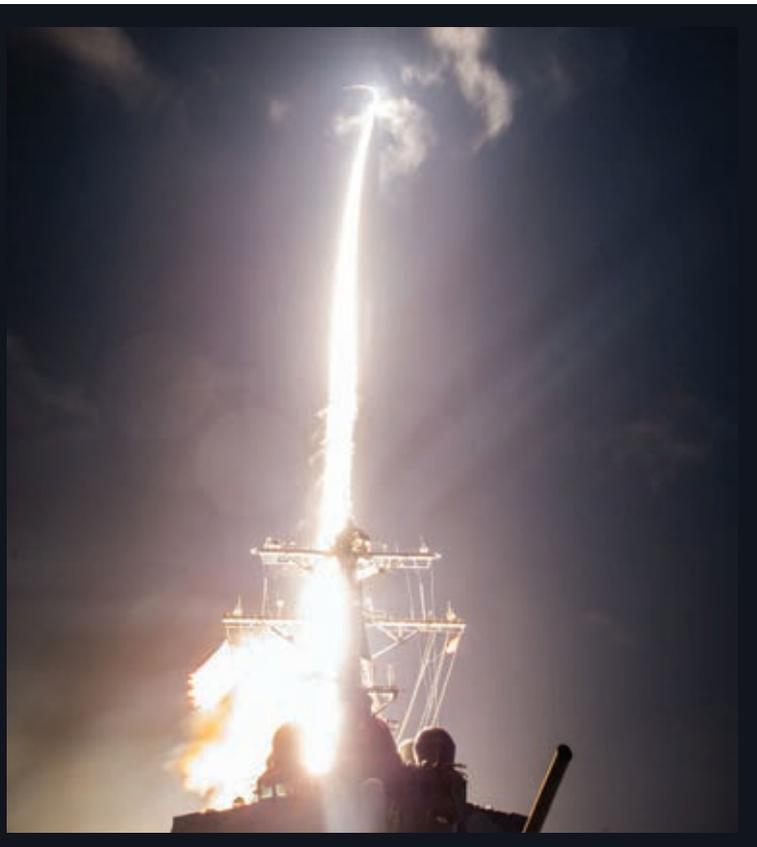
Raytheon's AMRAAM Contract



Raytheon Missile Systems has been awarded a \$768 million “non-competitive fixed-price incentive (firm) contract” for Advanced Medium Range Air-to-Air Missile (AMRAAM) Production Lot 33. This contract involves production of AMRAAM missiles, captive air training missiles, guidance sections, AMRAAM telemetry system, spares and other production engineering support hardware.

Raytheon Standard Missile-3 IIA Contract

Raytheon Missile Systems of Tucson, Arizona, has been awarded a sole-source, cost-plus-incentive-fee, cost-plus-fixed-fee modification under previously awarded contract. This modification is to definitise the previously awarded SM-3 Block IIA fiscal 2018 under contract line for U.S. and Foreign Military Sales (FMS) All-Up Rounds (AUR)s production; (2) award the fiscal 2019 SM-3 Block IIA US and FMS AURs; (3) establish option CLINs 0018 and 0019 for the fiscal 2020 SM-3 Block IIA U.S. and FMS AUR production. Under this modification, the contractor will provide the management, material and services associated with the procurement, manufacture and assembly for a total of 62 SM-3 Block IIA AURs, inclusive of all options.



DRDO: Highlights of 2019

- **Five trials of Astra air-to-air missile:** DRDO flight-tested Beyond Visual Range Air-to-Air Missile (BVRAAM) Astra from Su-30MKI off the coast of Chandipur, Odisha against a Banshee target aircraft simulating all possible threat scenarios. The five trials conducted during this period, tested missiles in different configurations. Three missiles were launched in combat configuration with warhead and neutralised manoeuvring targets to establish the end-game capability of the missile.



- **Low weight, fire & forget man portable anti-tank guided missile tested:** DRDO flight tested indigenously developed low weight, fire and forget Man Portable Antitank Guided Missile (MPATGM) on 11 September 2019 in the ranges of Kurnool, Andhra Pradesh. The missile was launched from a man portable tripod launcher on the target mimicking a functional tank. This was the third series of successful testing of MPATGM. The missile is incorporated with state-of-the-art Infrared Imaging Seeker along with advanced avionics. The test paves the way for the Army to have 3rd generation indigenously MPATGM. The missile was earlier tested successfully on 13 March 2019.

- **Second indigenous AEW&C System to Indian Air Force:** DRDO handed over the second of three indigenously designed Airborne Early Warning and Control (AEW&C) system, Netra, to the Indian Air Force (IAF) on 11 September 2019 to augment the service's network centric capabilities. The system comprises an Active Electronically Scanned Array (AESA) radar, secondary surveillance radar, electronic and communication countermeasures, beyond line-of-sight data links, satellite communication systems, advanced identification friend-or-foe system, provides 240° coverage, and surveillance range more than 250 km.

- **Quick reaction missile test-fired:** The Quick Reaction Surface-to-Air Missile (QRSAM) was tested against live aerial targets from Integrated Test Range, Chandipur on 4 August 2019. Two missiles, developed by DRDO, met all mission objectives, at different ranges and altitudes. The system has been tested in final configuration with radar mounted on a vehicle and missile on the launcher. It comprises indigenous Phased Array Radar, Inertial navigation System, Data Link & RF Seeker, and is being developed with search and track on move capability with very short reaction time.

- **Anti-satellite (ASAT) missile tested:** India has joined a select group of nations with such capability. DRDO conducted an Anti-Satellite (ASAT) missile test 'Mission Shakti' from Dr APJ Abdul kalam island in Odisha on 27 March 2019. A DRDO developed Ballistic Missile Defence (BMD) Interceptor Missile engaged a Live Indian satellite orbiting in Low Earth Orbit (LEO) in a 'Hit to Kill' mode.



- **Final Operational Clearance of LCA Tejas MK I for Indian Air Force:** The Tejas Mk I for Indian Air Force was awarded Final Operational Clearance (FOC) on 20 February 2019. Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy handed FOC Certificate and Release to Service Document (RSD) to the then Chief of Air Staff Air Chief Marshal BS Dhanoa in the presence of Defence Secretary Sanjay Mitra and Chairman of Hindustan Aeronautics Limited R Madhavan. IOC standard Tejas are already serving with the IAF.

- **DRDO'S Igniter Complex at HEMRL, Pune:** RRM Shripad Naik inaugurated the Defence Research & Development Organisation (DRDO) Igniter Complex at High Energy Materials Research Laboratory (HEMRL) in Pune on 5 Nov 2019. HEMRL has created a state-of-the-art facility for design, processing and evaluation of ignition systems.

- **Launch of two Brahmos missiles from land and air platforms:** Launch of two BrahMos supersonic cruise missiles tests, one each from land and air platforms has taken place. The first missile launch was from a land based mobile launcher, where most of the components were indigenous, including the missile airframe, fuel management system and DRDO designed seeker. The second launch of the missile was carried out by an IAF Su-30MKI against a sea target. The test conducted in user configuration, revalidated the ship attack capability of the advanced air-launched cruise missile.

- **Flight test of Pinaka missiles in salvo mode:** As part of the series of flight trials of Pinaka missile system, two test firings were conducted by DRDO on 17 December

2019. The first trial was conducted on 19 December 2019, wherein one missile was fired at 75 kilometre range.

- **Quick reaction surface to air missile flight-tested:** Quick Reaction Surface to Air Missile (QRSAM) system developed by Defence Research and Development Organisation (DRDO) was successfully flight-tested from Integrated Test Range, Chandipur off the Odisha coast on 23 December 2019. The missile was flight-tested with full configuration in deployment mode intercepting the target mid-air, meeting the mission objectives.



Airbus C295 and Pro Line Fusion Avionics from Collins Aerospace



Airbus' new C295 tactical aircraft will come equipped with Collins Aerospace System's Pro Line Fusion flight deck, significantly advancing the capabilities of C295 operators. The selection marks the first fixed-wing search and rescue platform to include Pro Line Fusion among its standard equipment. Collins Aerospace is a unit of United Technologies Corp.

In addition, the flight deck was designed to meet evolving airspace and regulatory requirements, future-proofing it for years to come. The Royal Canadian Air Force (RCAF) will serve as the launch customer for the C295 with the first delivery expected before the end of the year.

Airbus Helicopters plans for India

Airbus has partnered with Mahindra Defence for production of the H135M multi-role and the H225M medium lift transport helicopter under the 'Make in India' programme. The partnership envisages establishing of final assembly lines in India for these products, Transfer of Technology (ToT) focused on the aeronautical domain, industrial investments, support to local supply chain development and skilling of people for employment in the aviation sector. It is learnt that Airbus has responded to both RFIs issued by the Ministry of Defence for 111 Naval Utility Helicopters (NUH) and 123 Naval Multi Role Helicopters programme (NMRH) under the government's Strategic Partnership Policy.

In the picture below are Ashish Saraf, Head of Helicopters, Airbus India & South Asia (centre) along with Company Executives.



Controp Stamp and EO/IR technology for counter-drone systems

Controp Precision Technologies Ltd., specialising in electro-optics and IR defence and homeland security solutions has unveiled its cutting-edge systems designed for integration into a variety of counter-drone systems.

With contemporary drones sometimes as small as the palm of one's hand, their detection, classification and interception is a significant challenge for defence and homeland security (HLS) officials. Once the drone has been detected, the challenge is to classify the threat with pinpoint accuracy, facilitating efficient activation of countermeasures, whether jamming, interception or neutralisation. New counter-drone capabilities have been implemented in a variety of Controp's systems, such as the Speed-ER system, which provides for extremely long-range operations and the SIGHT system for mobile vehicular use, while new software provides for drone identification, classification and tracking.

Suitable for installation on stationary locations or for mobile and deployed applications, the systems are slewed to the area in which a drone has been detected and can track, automatically classify and identify the smallest of drones, at distances of up to several kilometres. Ideal for use in urban environment as well as airports and other strategic facilities, the multi-spectral systems incorporate day and thermal sensors, as well as Shortwave Infra-Red (SWIR) sensors.

Controp is now offering its new software for drone classification, enabling automatic classification of drones in the video image. The advanced image-processing algorithms were specifically developed to meet challenging anti-drone scenarios, with an interface that is compatible and easy to integrate into command and control systems, and can be customised to meet the operator's exact requirements.

Controp has also unveiled new STAMP payloads for future tactical mission requirements, including the T-Stamp-XD for laser-designation missions, and the Stamp-VMD for wide-area persistent surveillance. These lightweight, ruggedised gyro-stabilised miniature payloads have been operationally proven in the most challenging security and defence programmes worldwide.



A new product featured by Controp is the MD-STAMP; the newly-released laser-designator capability for small UAVs and drones, which is the latest product in the STAMP family of miniature payloads. Weighing less than 1kg, this compact laser-designation surveillance and targeting system closes the sensor-to-shooter cycle for tactical missions, while supporting ammunitions with laser humming seekers.

Controp's Stamp-VMD is a wide-area persistent surveillance system that provides real-time monitoring of areas spanning up to 1km², at high resolution. Designed for installation on Group 1 UAVs and drones, this compact payload weighs only 1.3kg and can fly under the cloud ceiling at 1,500 ft. Fitted with an advanced multi-megapixel day camera, it also features automatic movement detection and tracking capabilities, enabling simultaneous monitoring of multiple targets. Equipped with a new, unique integrated sensor data processor, the Stamp-VMD performs onboard image processing, with the onboard detection algorithms enabling use of a standard datalink and minimal bandwidth to send optimized images to the ground station.

Whilst both the T-Stamp-XD and the Stamp-VMD may be used as standalone solutions, when combined they offer a comprehensive, integrated solution for laser-guided munitions, facilitating better decision making, more efficient battle management and accurate assessment of mission success.

VAYU Interview with Chairman BEML

VAYU: What is the theme for BEML at DefExpo 2020? Are you displaying anything new?

BEML: In line with theme of 'Digital Transformation', BEML is launching AI-based Mobile Healthcare Diagnosis System to address medical needs of the Armed forces. Further, BEML are also showcasing new crew-protected vehicles such as the Medium Bullet Proof Vehicle and Armoured Command & Control Vehicle, Bulldozer with hydrostatic transmission drive technology (BD50HST) and 20T class heavy transportation vehicles.



Dr Deepak Kumar Hota, CMD, BEML

VAYU: Kindly tell us about the orders, deliveries and backlog at BEML?

BEML: In M&C business, after successful trials of in-house designed & developed 180T (BE1800E) eco-friendly electric excavator (India's biggest), we have received orders for five numbers, planned for delivery in FY2019-20. Further, more orders are in the pipeline including those for 150T & 190T high-end dumpers.

In the Rail & Metro business, we have considerable orders in hand, having delivered the first driverless metro coach to MMRDA's Mumbai Metro project, well ahead of schedule. At present, we are executing orders related to Kolkata Metro (KMRCL), Bangalore Metro (BMRCL), MMRDA (through DMRC) and DMRC.

Currently, the Defence & Aerospace order book is around Rs 2600 crore, with major major orders for Recovery Vehicles, Bridge Systems, 1500hp engine and aggregates for ISRO. BEML Defence is aiming to reach orders of around Rs 4000 crore by March 2020.

VAYU: What about your pact with L&T?

BEML: BEML has signed a MOU with L&T to explore and address defence products and systems for domestic and export opportunities. BEML and L&T are working together for supply of various bridging systems amongst others, based on BEML Tatra vehicles for the Indian Army.

VAYU: What about your supplies to the Indian Army?

BEML: BEML have supplied around 8500 high mobility military trucks of various types to the Indian Army over the past three decades, involving operations such as for missiles, launchers, bridging systems, ground support vehicles, radars etc. BEML has also supplied armoured recovery vehicles, wagons, tank & missile aggregates, trailers, towing tractors and others to the army. Our spares and service support has increased multifold to ensure that the vehicles are on-road, meeting strategic requirement of the Indian Army.

VAYU: On the aerospace sector, what are your plans on air defence systems?

BEML: As a part of its growth and diversification strategy, BEML started its aerospace journey with a humble beginning, offering design & engineering services, design & development of ground-support and ground-handling equipment followed by establishment of exclusive facilities to manufacture of rocket motor casings for various missile programmes, precision machining, fabrication and manufacture of airborne sheet metal structures.

BEML has been awarded AS9100 D accreditation for Quality Management Systems and is in the process of acquiring NADCAP certification for the special processes to explore business opportunities from global OEMs. Furthermore, we are associated with ISRO for providing structural assemblies and rocket motors for their Launch Vehicles.

BEML plans to tie-up with other global leaders for manufacturing aircraft structures and systems that would enable BEML reaching the level of a 'Lead Integrator' in the area of missile systems.

VAYU: Concerning 'Make in India' initiative, where does BEML stand?

BEML: We are exploring establishment of JVs with technology partners for the manufacture spare parts in the designated Defence Corridors in order to reduce import burden and develop manufacturing eco-system amongst MSMEs. For manufacture of major need equipment, BEML plans collaborate with global OEMs to introduce and subsequently manufacture select products for the Indian Army, ensuring maximum indigenisation of around 50 - 60% by value of the products.



BEML Pantoon Bridge System



“The Biggest DefExpo”!

Over 1,000 companies, including 165 international, at Lucknow

The number of companies participating at DefExpo 2020, 11th Edition of the biennial defence exhibition, taking place at Lucknow, capital of Uttar Pradesh has over 1000 participants making this the biggest ever DefExpo to be held in the country. The number of participating foreign companies has also increased to 165.

The exhibition space at DefExpo 2020 is 60 per cent more than in at DefExpo 2018, this time being 42,800 square metres, compared with 26,774 two years earlier. Defence Ministers and Service Chiefs of 35 countries are participating with a number of Memorandum of Undertaking (MoUs) are being formalised.

With 'India: The Emerging Defence Manufacturing Hub' as the banner, the event encompasses an entire spectrum of the aerospace, defence and security interests. Specific theme of the exhibition is 'Digital Transformation of Defence' which is concept of the future battlefield. Manufacturing in the aerospace and defence sector, with newer technologies focused upon, while in addition to exhibiting products and technologies, there are live demonstrations by the Services, DPSUs and industry, showcasing various land, naval, air and internal security systems. Live demonstrations are held at two locations, one at the exhibition site itself and the other along the Gomati river front.

The 'India Pavilion' exclusively showcases jointness between the public and private sector, including Small and Medium Enterprises (SMEs)/Micro, Small and Medium Enterprises (MSMEs). As appropriate, there is a sizeable Uttar Pradesh Pavilion at the venue: apart from displaying industrial prowess and potential for investors, the UP government has organised several cultural programmes on heritage of this northern state.

The Government of India has set up a specific Defence Industrial Corridor in Uttar Pradesh, involving six nodes. It is planned to build a defence manufacturing corridor along the proposed Bundelkhand Expressway, the DefExpo playing the role of a catalyst in attracting not only investments but cutting-edge technologies to the region.

A number of business seminars have been organised by both International and Indian organisations including the Confederation of Indian Industry (CII), Federation of Indian Chambers of Commerce & Industry (FICCI),

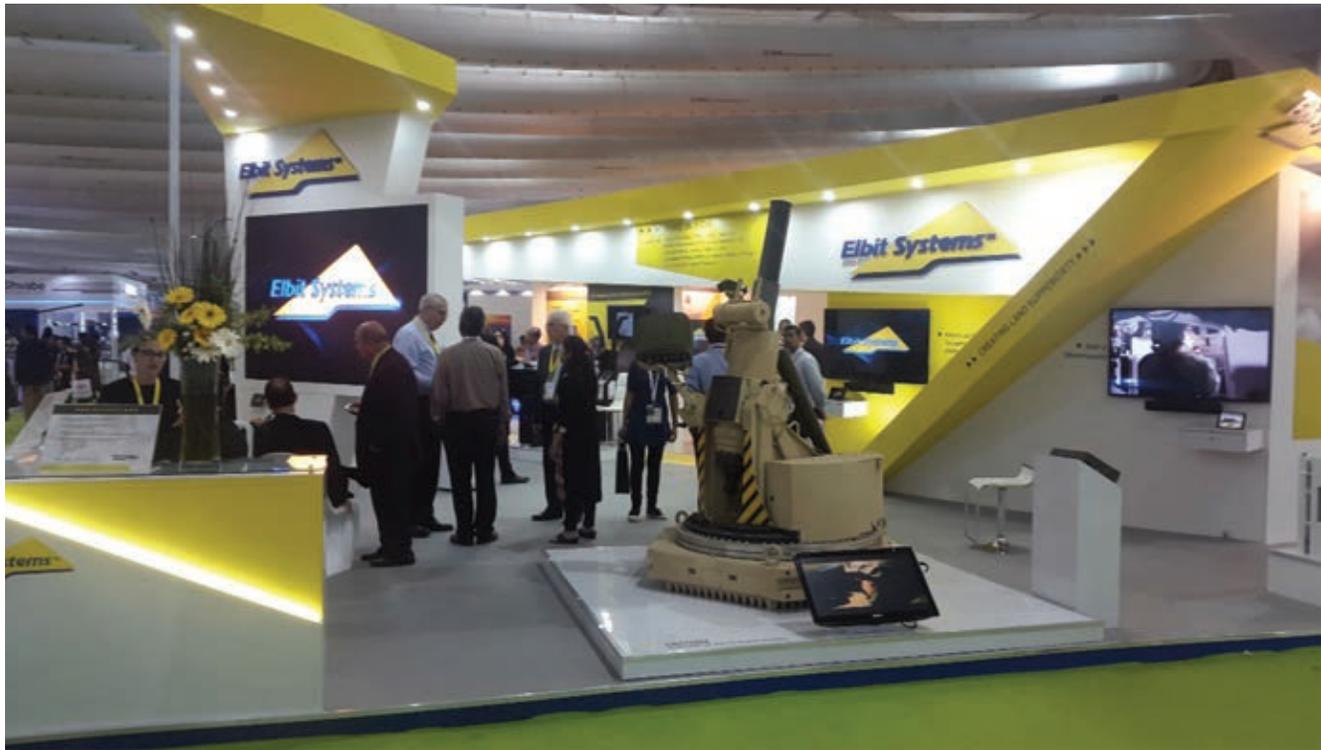


PHD Chamber of Commerce and Industry, National Skill Development Corporation (NSDC), SYNERGIA, Directorate of Standardisation (DOS)/Department of Defence Production (DDP), US-India Business Council (USIBC), US-India Strategic Partnership Forum (USISPF) and others. Seminar topics include those on artificial intelligence (AI), robotics, Internet of Things (IoT), Drones and others.

Technology has been used as an enabler, with an DefExpo App earlier released by Raksha Mantri Rajnath



Karanjit Singh from Nammo



Singh, and available on Apple App Store and Android Play Store. Main features of the App are to 'inform, engage and feedback', with detailed information on day-to-day events; participating exhibitors; DPSUs, guest speakers of seminars/webinars; publications including electronic brochures and e-books; maps and directions of the venues - and the city weather !

(Images from previous Defexpos)



Clemens Linden, Managing Director, Eurojet



Pillars of the Show, the gentlemen from RE Rogers!

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Welcome to Lucknow!



The 'City of Tehzeeb' and much more!

Lucknow is the capital of *Uttar Pradesh* state and historically main city of the erstwhile Awadh region, located on banks of the river Gomti. Fondly referred to the 'City of Nawabs' or the 'City of Tehzeeb', it has always been a city filled with varied cultures.

Its beautiful sprawling gardens, polite mannerisms, fine-cuisine, music, and poetry (*Shayari*), Lucknow had patronage of the Shia Nawabs who loved the Persian language and culture. Today, it is one of the most important cities of the country which is now emerging in various sectors like retailing, manufacturing and commercial.

Lucknow is well known for its culture, dance, music, literature, Urdu poetry and drama. Lucknow's Awadhi cuisine is unique : Nawabi style, with mouth watering *biryanis, kebabs, nahari-kulchas, roomali rotis* and *warqi parathas*. Lucknow is rightly known as a 'paradise for food lovers' !

Lucknow is headquarters of the Indian Army's Central Command as also where Hindustan Aeronautics Limited have head office of their Accessories Division. The Railway's *Research Design & Standards Organisation* is also located at Lucknow.



HAL's Transport Aircraft Division (TAD) is some 90kms away at Chakeri airfield, easily reached along the Grand Trunk Road. The IAF's Nos.1 and 4 Base Repair Depots are co-located at Chakeri, which is scene of considerable activity, with HAL-Dornier 228s being manufactured for the Indian Armed Forces, Coast Guard, Civil Operators as also for export.



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