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AERO INDIA 2021 PAVING WAY FOR GLOBAL AEROSPACE OPPORTUNITIES

This year despite the pandemic, Aero India has 600 exhibitors with 522 being Indian and 78 being foreign. The main highlight of this year's Aero India edition shall remain as 'Atmanirbharta' or self-reliance of the Indian defence and aerospace industry as also goes the tagline 'Atmanirbhar Bharat ki Udaan.'



AERO INDIA 2021: SURYA KIRANS IN FLIGHT

AYUSHEE CHAUDHARY

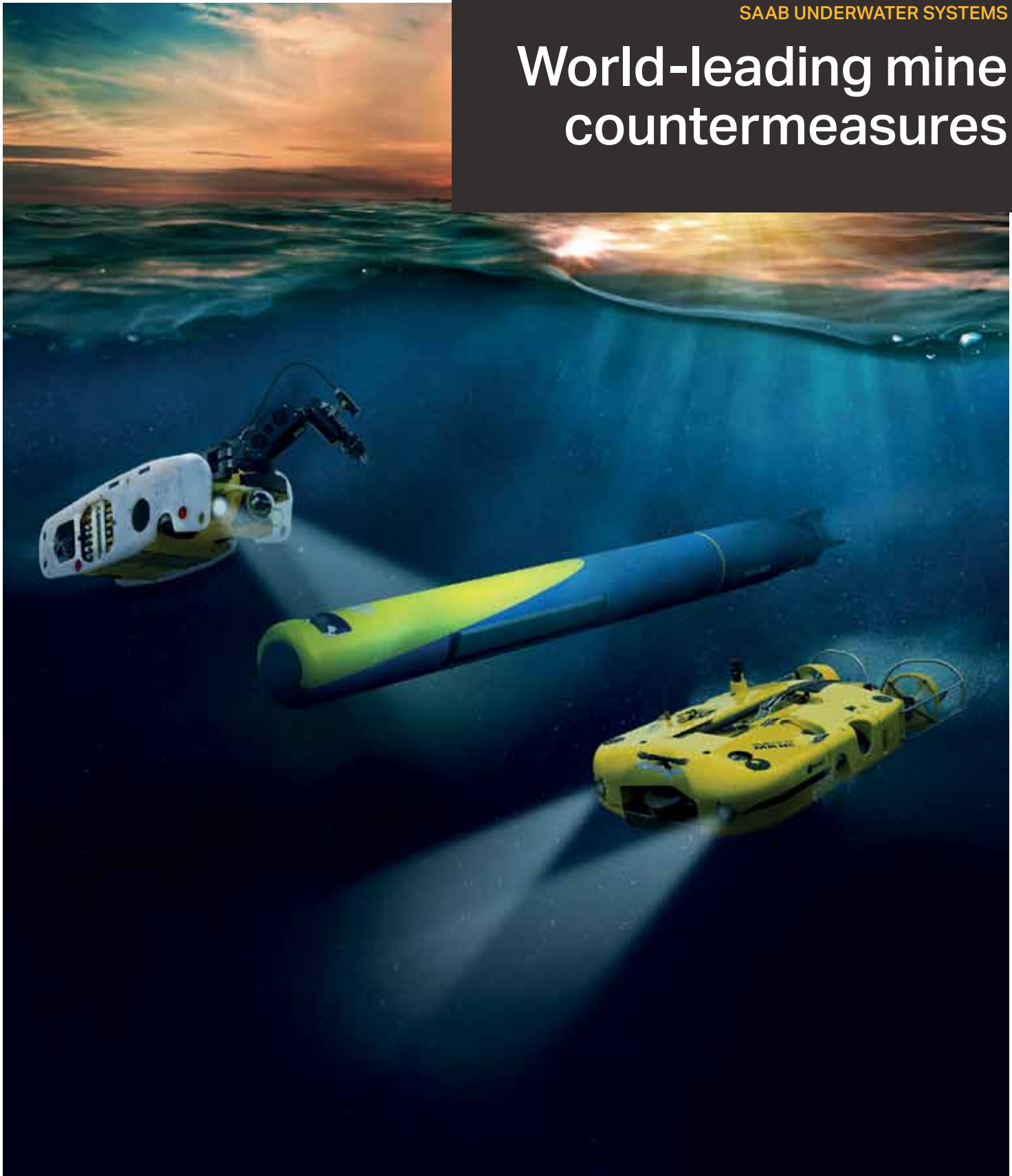
Being the "Runway to a Billion Opportunities", Aero India 2021 is unique in ways more than one, remarked the Defence Minister of India, Rajnath Singh. Scheduled from February 3-5, 2021 in Bengaluru, Karnataka, Aero India is claimed to be the largest aerospace exhibition in Asia. The biennial event will be inaugurated by Rajnath Singh and the valedictory function is scheduled to be presided by the President of India, Ram Nath Kovind. This is the 13th edition of this major exhibition for the aerospace and defense (A&D) industries. Being held offline as well

as online, the Aero India 2021 exhibition's occurrence despite the pandemic year is being hailed as a significant step. Aero India has been a major platform for industry professionals to showcase their products and services, to network as well as to gain market insights and announce new developments.

In its previous edition held in 2019, Aero India witnessed 403 exhibitors with 238 Indian exhibitors and 165 foreign exhibitors. This year despite the pandemic, Aero India has 600 exhibitors with 522 being Indian and 78 being foreign. Even though the number of foreign exhibitors has gone down for offline, this is only due to the travel restrictions following the novel coronavirus situ-

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DEFENCE MINISTER RAJNATH SINGH AT THE LAUNCH OF THE AERO INDIA 2021 WEBSITE

ation in many countries. There is still participation confirmed from 14 countries and 214 virtual exhibitors have been recorded.

Important topics like the future and dynamics of Civil Aviation sector, drones & counter-drone opportunities in defence and homeland security, US - India defence collaboration opportunities and challenges, energising the R&D capabilities with industry, emerging hub for aerospace & defence industries, convergence of civil and defence, building collective maritime, etc. will be deliberated through the various seminar sessions scheduled.

ATMANIRBHAR BHARAT

The main highlight of this year's Aero India edition shall remain as 'Atmanirbharta' or self-reliance of the Indian defence and aerospace industry as also goes the tagline 'Atmanirbhar Bharat ki Udaan'. Self-reliance in defence has also been the cornerstone of India's defence production policy that was released last year, prior to which the Prime Minister of India, Narendra Modi had called for "Atma Nirbhar Bharat". Over the years, transparent and streamlined Procurement Procedures, Production Policies and 'Make in India' initiatives have provided significant stimulus to demand for indigenous products. The policy draft noted that the size of the Defence industry, including aerospace and naval shipbuilding industry, is currently estimated to be about ₹80,000 crores (2019-20). While the contribution of Public Sector is estimated to be ₹63,000 crores, the share of Private Sector has steadily grown to ₹17,000 crores over the years. The indigenisation policy laid out by the department further aims to create an industry ecosystem to indigenise the imported components (including alloys and special materials) and sub-assemblies for defence equipment and platform manufactured in India. 5,000 such items are proposed to be indigenised by 2025. Many global companies are also taking the necessary steps to enhance the 'Make in India' initiative and build India into the defence and aerospace manufacturing hub.

The Defence Minister will also reportedly sign India's largest defence orders for Indian industry, a ₹48,000 crore contract for 83 LCA Tejas Mark 1A aircraft and an order for 15 Light Combat Helicopters worth ₹3,000 crore with HAL (Hindustan Aeronautics Limited).

HYBRID SHOW

This year due to the COVID-19 pandemic, the air show, Aero India 2021 would be a hybrid show, which means delegates would be present either physically or virtually. As per the organisers, the 2021 edition will also be held on an indigenously developed virtual exhibition platform on a hybrid model. This is the first global air show being organised in the Covid era. Most of the other major international shows were postponed.

All the sessions that will be held during the exhibition will be available at the virtual platform also including the virtual booths of the exhibitors who have registered virtually. There is an option to live chat as well with the people virtually, and swap contacts of the people you meet during the exhibition through the Aero India App. The App will also showcase major agendas, send notifications, provide details and also allow an option to report for hygienic measures related to COVID care. The registrations on the virtual portal have been made free of cost for anyone to watch Aero India virtually.

INDIA PAVILION

Another important highlight of the Aero India is going to be HAL's India pavilion that is expected to be spread over a large area. The central theme of the India Pavilion is rotary wing capabilities in India. In line with the theme, HAL's Rotary platform LUH (Light Utility Helicopter) will be the centerpiece of the display with scaled models and the Indian helicopter manufacturing ecosystem also on display. The pavilion will showcase indigenously designed and developed fixed and rotary wing platforms, technologies covering power plants and future generation combat-capable airborne solutions. This is again a major step to underline the promotion of defence exports from the nation. An exclusive conclave of the Indian Ocean Littoral (IOR) states is also scheduled to be held by the Defence Minister.

DEFENCE CORRIDORS

The two Defence Corridors that are being set up in Tamil Nadu and Uttar Pradesh are specifically targeted by providing additional support as well as by offering higher multipliers for offset discharge for investments flowing into the Defence Corridors. The UP Defence Corridor which is being set up at six places in the state - Chitrakoot, Jhansi, Kanpur, Aligarh, Agra and Lucknow, will be a part of international Aero India this year for the first time. During the show, the visitors will be made aware of the activities, policies and current investments made by UPEIDA (the nodal agency for setting up the Defence Corridor) and about 15 MOUs are expected to be signed.

START-UPS

There has been a significant focus on start-ups and small and medium enterprises as well through the last year with initiatives like iDEX (Innovations for Defence Excellence). To provide an opportunity for startups to interact with key stakeholders from the industry, 'Startup Manthan 2021' is also a part of the Aero India exhibition where startups had been asked to register at very affordable prices to ensure more participation.

DISPLAY

In its previous edition, 61 aircraft were displayed at Aero India. This time around, according to the organisers, 41 aircraft including Dakota, Su-30 MKI would participate in the flight display on the inaugural day while there would be 63 aircraft on static display. The key attractions would be the display by Surya Kiran aircraft and Sarang helicopters, five of HAL's indigenous aircraft in the fixed and rotary wing category are also set to fly in a unique display titled 'Atmanirbhar Formation Flight'. An American B-1B Lancer heavy bomber and Lockheed Martin's F-21 multi-role fighter jet are also expected to perform a fly-by at the Aero India 2021.

A negative COVID-19 report is mandatory for all those who are attending the program. After being uploaded on the virtual platform, the report will be cleared by a team of about 50 doctors. With efforts in place for a dual show online as well as offline, Aero India 2021 is starting with an uplifting note for the Indian industry as well the global industry to witness the prowess of India's defence and aerospace sector at present and in the times to come. ●



(LEFT) DR VIVEK LALL WITH US PRESIDENT JOE BIDEN; (MIDDLE) C-17 GLOBEMASTER (RIGHT) CH-47F(I) CHINOOK

GROWING INDO-US DEFENCE AND AEROSPACE COOPERATION HAS FORTIFIED RELATIONS

In June 2016, the US elevated India to a 'Major Defence Partner,' a status no other country holds

VIVEK LALL

India-US ties have strengthened since the turn of the century, and the two countries have established a "strategic partnership." This relationship embraces every field of human endeavor, including defence, space, counter-terrorism, non-proliferation, cyber security, energy, trade, healthcare, as well as education and women's empowerment. During Prime Minister Modi and President Obama's meeting in Washington, D.C. in June 2016, the US elevated India to a 'Major Defence Partner,' a status no other country holds. The designation, which became law in August 2018 after it was approved by the US Congress, enables India to enjoy some of the benefits of being a US treaty ally, such as access to defence technology, though the alliance is not a formal one. Since then we have witnessed a lot of emphasis on defence and security ties and trade.

The US National Security Strategy of 2017 welcomed India's emergence as a leading power and a stronger strategic and defence partner, inspiring the leaders in February 2020 to declare this a comprehensive global strategic partnership. This period is also marked by the emergence of the Indo-Pacific as an overarching strategic definition for geopolitics in the region. The Indo-Pacific region encompasses the world's largest and fastest growing economies and the most populous nations. More than 50 per cent of international trade passes through its waters.

From the US perspective, one of the top defence priorities of the US government is implementing the National Defense Strategy in an era of great power competition and focusing the Departments of State and Defence on the priority theater – the Indo-Pacific. One of the main pillars of the US's Indo-Pacific strategy is strengthening partnerships and this is where India becomes a critical ally.

Both the US and India have adapted their internal institutions to this regional orientation: in 2018 the US Department of Defence renamed its Hawaii-based United States Pacific Command as the Indo-Pacific Command. That same year India's Ministry of External Affairs established a new Indo-Pacific Division. The bilateral naval Malabar Exercise that commenced in 1992 was joined by Japan in 2015. In a significant development, Australia participated for the first time since 2007 in the Malabar exercise, pointing to growing convergence on the Indo-Pacific region and formally establishing the "QUAD".

India and the US continue to enhance the joint military exercises. These included the first-ever tri-services amphibious military exercise known as Tiger Triumph in 2019, which will now be an annual exercise. As a result of these defence agreements and military exercises, forces of the two countries are working more effectively together to keep the Indo-Pacific free and open.

Increased interoperability between the military services of India and US has also been achieved through growing exchanges, joint trainings and postings of liaison officers. In 2020, the US for the first time posted a naval officer to an Indian military facility – the newly established Indian Ocean Information Fusion Center in Gurugram. Similarly, India posted for the first time a naval officer to the US Naval Forces Central Command (NAVCENT) in Bahrain.

India and the US have recently made significant strategic gains in their bilateral ties. The 2+2 dialogue has formulated a new template for a deeper defence and security partnership between the two nations. In the latest 2+2 held in October 2020, the last of the "foundational agreements" were signed – The Basic Exchange and Cooperation Agreement (BECA) allows for the sharing of sensitive geospatial data for deeper military cooperation. The other pacts are the Logistics Exchange Memorandum of Agreement (LEMOA) signed in August 2016 and the Communications Compatibility and Security Agreement (COMCASA) signed in September 2018.

The bilateral relationship is also characterised by an expansion of defence

industrial cooperation. The US government and defence industry have increased joint research, production and defence sales with India and made available some of the most sensitive US military equipment. In 2018, the US granted the Strategic Trade Authorisation Tier 1 status, commonly referred to as STA1. India now enjoys a status normally limited to US's closest allies, which enables India to access many of highly regulated technology items.

The upward trajectory of the India-US strategic partnership has bipartisan backing. The fundamental precepts of this relationship and the convergence on strategic issues is expected to strongly continue at strategic levels in both government and industry this century. ●

The author is on the Global Board of Directors, US-India Business Council



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(LEFT) IAI HERON TP; (RIGHT) MRSAM

IAI HAS IMPLEMENTED THE 'MAKE IN INDIA' POLICY EVEN BEFORE ITS OFFICIAL LAUNCH BY INDIAN GOVERNMENT

IAI is Israel's largest government-owned company in the fields of defence, aviation, aerospace, intelligence and cyber, and stands in line with world leaders in these fields. IAI's advantages over other companies are first and foremost its ability to be flexible and tailor its systems to different customers according to their differing needs. In an Exclusive interview, the new IAI President and CEO Boaz Levy, details their existing footprint and future plans for India

SP's ShowNews (SP's): What all will be the exhibits during Aero India 2021 for?

Boaz Levy (Levy): At Aero India 2021, IAI will present some of the latest and most advanced defence solutions, featuring the latest technologies in military aviation, air defence and missiles systems, unmanned systems, special mission aircraft, radars and cyber technology. Among the systems on display are Heron TP, the largest platform in IAI's family of advanced unmanned aerial systems (UAS), Maritime Heron and VTOL UAVs family by BlueBird. In addition, we'll display satellites, radars, both strategic and tactical, loitering munitions systems, EO surveillance systems, advanced avionic upgrades and many more systems.

SP's: What are the new offerings you propose to show case at this edition of Aero India, and you would like to aptly elaborate on the same?

Levy: IAI offers its Indian partners advanced ground, air, and marine systems, including long-range air defence, the Heron TP UAV, loitering and precision ammunition and is preparing for industrial collaborations with State-owned and private companies. In addition we are prepared with our Multi Mission Tanker Transport (refueling aircraft) to answer all the needs of our Indian partners.

SP's: Would you like to comment and elaborate on -
a: As to how your solutions have edge over the competitions and
b: As to why they are the best suited options to be considered?

Levy: IAI is Israel's largest government-owned company in the fields of defence, aviation, aerospace, intelligence and cyber and stands in line with world leaders in these fields. IAI's advantages over other companies are first and foremost in its ability to be flexible and tailor its systems to different customers according to their differing needs. Secondly, IAI's systems are combat-proven. Finally, we have experience in cooperating with local vendors and bringing added value to a local ecosystem, according to the 'Make in India' policy.

SP's: Indian Government initiatives:
a: What all have been your engagements on the following?
b: And what more you propose towards below?

i: Atmanirbhar Bharat; **ii:** 'Make in India'; **iii:** Skill India
Levy: IAI has \$2 billion worth of business partnerships with Indian companies as part of India's Make in India Policy. For years, IAI has developed and manufactured a range of technologies in India in collaboration with local vendors and implemented the 'Make in India' policy even before its official launch by the Indian government. In the recent decade, IAI entered to more and more strategic collaborations with local Indian firms, both PSU and private. Two of them with BEL and HAL were signed last year.



SP's: Would you like to speak about some of your key partnerships in India in terms of industrial partnership and in terms of development partnership?









Levy: Over the past year IAI entered more and more strategic collaborations with local Indian firms, both PSU and private. Two of them with BEL and HAL were signed last year.

Another project is the MRSAM. MRSAM is an advanced, groundbreaking air-and missile-defence system, jointly developed by IAI and DRDO for the Indian

Armed Forces. During development, IAI collaborated with Israeli and Indian industries, including Rafael, Tata, BEL, L&T, BDL and many other private vendors. The system provides the ultimate protection against a variety of aerial platforms. It is used by the Indian Air Force, the Indian Army, the Indian Navy and the Israeli Defense Force. The system incorporates an advanced phased array

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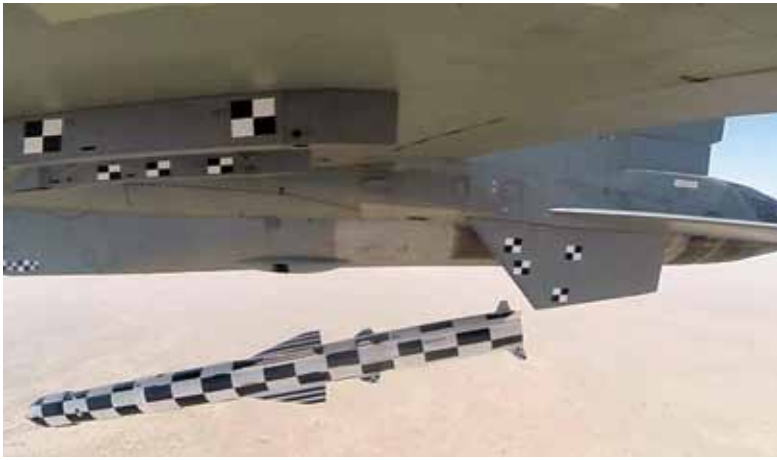
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(LEFT) BRAHMOS LAUNCHED FROM A SU-30MKI; (RIGHT) LCA TEJAS

ATMANIRBHAR BHARAT: AIMING TO ACHIEVE THE OPTIMAL STRENGTH FOR THE COUNTRY

“When India speaks of becoming self-reliant, it doesn't advocate a self-centred system. In India's self-reliance, there is a concern for the whole world's happiness, cooperation and peace” —Narendra Modi, Prime Minister of India

AIR MARSHAL SUKHCHAIN SINGH (RETD)

Atmanirbhar Bharat, a self-reliant policy does not aim to be protectionist in nature. The Finance Minister said, “self-reliant India does not mean cutting off from rest of the world”. The Law and IT minister, Ravi Shankar Prasad, said that self-reliance does “not mean isolating away from the world. Foreign Direct Investment is welcome, technology is welcome, self-reliant India translates to being a bigger and more important part of the global economy.” Further, in May 2020, Prime Minister Modi laid down the five pillars of ‘Atmanirbhar Bharat’. These are economy, infrastructure, technology-driven systems, vibrant demography and demand.

Defence sector has been identified as one of the core areas to boost ‘Make in India’ where immediate transformation is required. A vision of achieving five billion dollars (₹35,000 crore) defence related exports target to become net exporter of defence equipment in the next five years. In August 2020, Defence Minister Rajnath Singh announced that the Defence Ministry is “now ready for a big push to Atmanirbhar Bharat initiative” by imposing an “import embargo on 101 items” in a staggered manner over a period of five years. The Defence Production and Export Promotion Policy (DPEPP 2020) and Defence Acquisition Procedure 2020 (DAP) aims towards self-reliance. The DPEPP 2020 policy aims at providing greater visibility of Armed Forces requirements to the defence manufacturing industry. Under this policy, export target has been set as 25 per cent of the revenue. By 2025, this policy aims at achieving ₹1.75 lakh crore in annual turnover. To promote Atmanirbhar Bharat in the defence manufacturing, a separate budget of ₹52,000 crore has been set aside for procurement from domestic vendors.

Speaking on MoD issuing a negative list of 101 defence items on the valuable suggestion of Prime Minister Narendra Modi, Rajnath Singh said, “After a certain period of time these items will not be procured from outside. This list is the beginning of a process that has the potential to transform the defence industry. This list of 101 items includes not only minor parts but also warfare systems, integrated platforms, combat vehicles. This list is just a beginning, so that in the coming time, defence equipment worth ₹1.40 lakh crore will be purchased domestically.”

The government has made several bold policy reforms to promote self-reliance, in the defence sector. These include increasing the limit to 74 per cent for Foreign Direct Investment through automatic route in the Defence sector and setting up of Defence corridors in UP and Tamil Nadu in addition to Strategic Partnership (SP) Model to promote investments, liberalisation of Industrial License regime, and ‘Defence Investor Cell’ to address the problems of investors. Corporatisation of Ordnance Factory Board (OFB) would be completed within a year. and the two Defence Industrial Corridors in Uttar Pradesh and Tamil Nadu were targeted to attract 20 thousand crores of investments in the next five years.

THE JOURNEY WITH A PURPOSE

Atmanirbhar Bharat will allow a focussed and aggressive approach of all the stakeholders that includes all the three Services, MoD, DRDO and industry to energise strategies in developing niche technologies and promote a culture of innovations.

Development of a large eco system with well-defined role for all stake hold-

ers/ MSMEs as tier-II / tier-III suppliers, start-ups and academia as innovators, industry houses as aggregators, testing & quality assurance services providers is expected to be the outcome of the synergies so developed.

Hopefully, this will propel India as an integral part of Global Supply Chain and top-class destination for manufacture of defence equipment. India needs to develop world class testing and evaluation infrastructure by utilising existing infrastructure with DRDO and private industry to remain relevant and competitive in this global chain. Atmanirbhar in manufacturing and sustenance of eco system for life cycle support of indigenous equipment will be a necessity to ensure the combat capability is sustainable. As part of the journey, emphasis by the industry ought to be on co-production through joint ventures with foreign partners as well.

Technology up-gradation for self-sufficiency in various fields has to be an ongoing and vigorous action. Government needs to aggressively encourage and fund Research & Innovation in the DRDO Labs, private sector and in academic institutions as well. The PM has alluded to this a number of times in his interactions with the intelligentsia.

The IDEX initiative which was launched to encourage entrepreneurs particularly those associated with MSME and Start-ups, is also getting positive results. Through this platform, more than 50 start-ups have developed technology and products for military use. More needs to be done keeping the requirements of defence both in the short as well as long term projects.

India has the potential to become a reliable supplier of defence equipment to many of its friendly nations. It will strengthen India's strategic partnerships and strengthen India's role as a “net security provider” in the Indian Ocean Region.

DEFENCE ACQUISITION PROCEDURE 2020 (DAP 2020)

The DAP provides that the list of items under the embargo list can be procured from an “Indian Company”. The definition of an “Indian Company” includes any company incorporated in India. Therefore, subsidiaries of foreign companies are entitled to bid under the categories reserved for the Indian market such as – Buy Indian India Design, Buy Indian and Buy and Make Indian procurements. Therefore, it now encourages foreign players to set up and manufacture their products in India. It is expected that approx. USD 60 billion will be spent by the Indian Armed Forces to procure the 101 items over the next 5-7 years.

The Inter-Governmental Agreements have been specifically exempted from offset requirements. This is an important step as India moves away from buying from foreign private suppliers to buying from friendly Governments. Private parties who are sub-contractors to foreign governments stand to gain from this exception as meeting the offset requirements and actual offset implementation delays were blamed to be the bane of the Indian defence industry.

Another important development is that for the first time, “leasing” has been introduced in the draft DAP 2020 as a category of defence acquisition in addition to the ‘buy’, ‘buy and make’ acquisition categories. India has previously leased submarines from the former Soviet Union and Russia. The leasing category encourages firms supplying critical equipment and weapons to enter into long term/medium term contracts. The contractor would be responsible for maintenance and repair for the duration of the contract. This may be a possible short-term solution for the Indian Armed Forces to possess and operate expensive platforms required for a limited period to avoid huge capital expenditure on outright purchase.

SPECIAL REPORT



FIRING OF ASTRA BEYOND VISUAL RANGE AIR-TO-AIR MISSILE

The Government has also identified a list of 49 technologies for Transfer of Technology (TOT). Previously, grant of offset credits for TOT was subject to the buyback conditions. That is, the foreign vendor was required to undertake mandatory purchase of products from its Indian TOT partner. Further, offset claims for non-equity investments were also restricted to a percentage of subsequent buyback. A significant change proposed in the DAP is the enhanced viability of Transfer of Technology (TOT) and non-equity investment as modes for discharge of offset obligations. The non-equity route is proposed to be merged with the equity route, making full offset credits available to vendors subject to verification. Similar provisions have also been issued for the TOT route.

A new chapter on Information Communications and Technology (ICT) acquisition has been introduced in the DAP. The IP in the ICT systems would however belong to the buyer of the products. India and Indian IT companies have already established themselves globally as being the best in the IT industry. Now, foreign companies which supply IT to Armed Forces as well as home grown IT companies will gain immensely since this category has now been recognised as a procurement avenue leading to more investment and employment in the IT sector.

FEEDBACK OF THE INDUSTRY IN DAP 2020?

Indian industry had recommended that acquisition categories viz. 'Buy (Indian-IDDMM)', 'Buy (Indian)', 'Buy & Make (Indian)' and 'Make (Make-I, II & III)' categories and the projects being pursued under SP model must be reserved for the domestic Indian industry owned and controlled by resident Indians. However, as per the detailed Press Release issued by MoD, only the categories of Buy (Indian-IDDMM), Make I, Make II, Production Agency in Design & Development, OFB/DPSU and SP model will be exclusively reserved for Indian Vendors meeting the criteria of Ownership and Control by resident Indian Citizens with FDI not more than 49 per cent. Hence, JVs created by foreign OEMs in India with more than 49 per cent FDI in the defence sector will be eligible to participate in RFPs issued under 'Buy (Indian)' and "Buy & Make (Indian) categories, besides the new category of Buy (Global- Manufacture in India) being created in DAP-2020.

The Strategic Partnership (SP) model notified under DPP-2016 on May 31, 2017, is based on the concept of creation of additional capacity in the private sector over and above the production capacity existing in the public sector, thereby enabling new System Integrators to emerge in the private sector. Private industry had strongly recommended against allowing DPSUs/OFB to compete for the projects being pursued under SP Policy either as OEM or as SP.

INNOVATION INITIATIVE

The 'Innovations for Defence Excellence (iDEX) framework, was launched by Department of Defence Production, with the aim to achieve self-reliance and to foster innovation and technology development in Defence and Aerospace Sectors by engaging industries including MSMEs, start-ups, individual innovators, R&D institutes and academia. The projects or problem statements are identified based on the requirements projected by the armed forces and certain other stakeholders involved in the defence ecosystem. According to publicly available information, 58 iDEX winners have so far been identified for 18 problem statements/challenges under three rounds of Defence India Start-up Challenge (DISC).

The Defence Industrial Corridors at Uttar Pradesh and Tamil Nadu are expected to encourage indigenous production of defence and aerospace related items and reduce reliance on imports and promoting export. This is expected to generate direct/indirect employment opportunities and growth of private domestic manufacturers, Micro Small and Medium Enterprises (MSMEs) and Start-ups.

Atmanirbhar Bharat will succeed in delivering the intended outcomes and much will depend on activation of the Project Management Unit (PMU) which the DAP 2020 promises. Nothing will give the armed forces greater satisfaction than fighting and coming out victorious in wars with indigenous technology and equipment. ●

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BOEING C-17 GLOBEMASTER OF THE INDIAN AIR FORCE

“BOEING BELIEVES IN BUILDING INDIGENOUS CAPABILITIES TOWARDS DRIVING INNOVATION AND CONTRIBUTING TO THE GROWTH OF THE INDIAN A&D INDUSTRY”

Surendra Ahuja, Managing Director, Boeing Defence India talks about Boeing's presence in India, the upcoming opportunities and their support to the growth of an indigenous aerospace and defence ecosystem

SP's ShowNews (SP's): What according to you are the future opportunities for Boeing in India especially in the defence sector?

Surendra Ahuja (Ahuja): Boeing has been working with India's defence forces for many years supporting their mission-readiness and modernisation objectives. Our portfolio of products and services offer unmatched operational capabilities across the entire mission spectrum.

In addition to our response to the Indian Air Force (IAF) RFI for the 114 MRFA and the Indian Navy's (IN) MRCBF with the F/A-18 Block III Super Hornet, there are several other opportunities we are pursuing herein India. In 2020, the Ministry of Defence signed the contract for the acquisition of an additional six Apaches for the Indian Army. We're also having discussions with IAF on their tanker requirements.

We are seeing the growth of our services business and with it, in the value Boeing is able to provide through the lifecycle support. We are working with the IAF and the IN to provide exceptional operational capability and readiness for the P-8Is, the C-17s, and the Head of State aircraft through sustainment contracts, and the Chinooks and Apaches through warranty.

The recent developments in India's space arena that allow the private sector to participate in this sector are positive. We look forward to partnering with ISRO in their endeavours. We want to bring the best of Boeing to India and the best of India to Boeing...and to the world!

SP's: The defence MRO market segment in India is projected to reach an approximate figure of \$2.5 billion by 2025? Do you propose to offer any solutions on this front?

Ahuja: Last year, the Ministry of Defence signed a contract for the acquisition of six additional Apaches for the Indian Army. Significant parts of these aircraft will be built at Tata Boeing Aerospace Limited (TBAL), our joint venture with Tata in Hyderabad. We're also seeing growth in our localisation of MRO services and training, and the value Boeing is able to provide through the lifecycle of its products. We work with the Indian Air Force and the Indian Navy to provide exceptional operational capability and readiness to the P-8Is, C-17s, and Head of State aircraft through local sustainment services in India.

In so far as Boeing goes, the lessons we've picked from supporting C-17 and P-8I in India, coupled with in-depth Boeing experience in sustaining aircrafts worldwide, we've been able to set processes to develop similar sustainment concepts for other aircraft. For the aircraft, it means deploying the best global expertise gleaned from the experience of operating these aircraft in different conditions, and to suit different needs.

SP's: Can you explain more about the kind of maintenance work Boeing is involved in for P-8I and C-17?

Ahuja: We are working with the IAF and IN to provide operational capability and readiness for the P-8Is, the C-17s, and the Head of State aircraft through sustainment contracts, and for the Chinook and Apache fleets through warranty support. Ensuring mission readiness of our customers and providing them seamless services and support on our platforms is an imperative for Boeing. Boeing's local

sustainment support footprint is enhancing responsiveness on sustainment and training contracts.

Boeing supports the IAF C-17 fleet under the Globemaster Integrated Support Program (GISP) that maintains high mission-capability rates, by providing them access to an extensive support network for parts availability and economies of scale.

India's P-8I fleet is also supported through Boeing's services business by providing spares, ground support equipment, and field service representative support. Boeing's integrated logistics support has enabled the highest state of fleet readiness at the lowest possible costs. Since induction, the Indian Navy P-8I fleet has surpassed 29,000 flight hours. Boeing's training and support package for the P-8I promises to increase proficiency in a shorter time, while reducing the on-aircraft training time resulting in increased aircraft availability for mission tasking. A 60,000 sq. ft. Training Support and Data Handling Centre is being set up at INS Rajali, Arakkonam (the base for P-8I fleet), with a secondary centre at Naval Institute of Aeronautical Technology (NIAT), Kochi.

We are also working with Indian companies to develop capabilities in the country so that they can perform maintenance locally, including heavy checks and supply of indigenous equipment. Air Works in partnership with Boeing, successfully completed the first heavy maintenance check for the first P-8I in 2019. We plan to continue working with Air Works for similar checks on the remaining aircraft. Further capability development planning is in the works to support the growing P-8I fleet, improving the local aviation ecosystem while ensuring quicker turnaround for the Indian Navy.

SP's: Can you also provide an update on Boeing India's engineering presence and the growing relationship with its suppliers in India?

Ahuja: Boeing believes in building indigenous capabilities towards driving innovation and contributing to the growth of the Indian A&D industry. Teams in India undertake high-quality, advanced aerospace work spanning engineering design of structures and systems, manufacturing support, developing systems to test our aircraft, and providing digital solutions to our airline customers. Cutting-edge R&D in traditional and emerging areas such as next-generation airplane health management, environment-friendly coatings, advanced networks and secure-communication are areas where teams are leveraging new-age technologies to replace traditional approaches, enhancing safety and productivity.

Boeing engineering design teams are working with the R&D team to leverage Artificial Intelligence and Machine Learning methods to introduce automation in the process, resulting in a significant reduction in time taken for tasks, and also enhanced quality of output. Digital aviation efforts are helping airlines reduce fuel consumption through route optimisation, and make effective utilisation of their crew. Digital engineering is being used to enhance the manufacturing environment and provide value to customers. Digital threading is being used to create a digital twin before manufacturing aircraft systems, resulting in fewer manufacturing issues. This drives efficiency, optimizes product design, and enhances manufacturability, making the end-to-end supply chain more digital.

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Safeguarding land, sea and air space



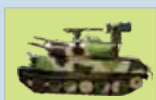
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Empowering the Nation's Defence Forces



(LEFT) MANNED-UNMANNED TEAMING OF S-100; (RIGHT) EQUINOR CARGO DELIVERY IN NORWAY USING CAMCOPTER

UAVS ARE PERFECTLY SUITED FOR DULL, DIRTY AND DANGEROUS MISSIONS

Every year, Schiebel reinvests up to 30 per cent of its profits into the further development of the S-100 to ensure the whole system stays at the forefront of this technology. Also it's important to note that S-100 is an extremely flexible, multi-role, multi-domain asset. **Neil Hunter**, Global Head of Business Development, Schiebel gives an overview of Camcopter VTOL UAS and how the Indian Armed Forces can benefit from it.

SP's ShowNews (SP's): How did Schiebel come up with the idea of a Camcopter VTOL UAS?

Neil Hunter (Hunter): Schiebel's major international breakthrough was back in 1991, when the company specialised in state-of-the-art mine detection equipment. The company won a significant contract for its AN-19/2 Mine Detecting Set to become the standard equipment for the US Army. As a consequence, Schiebel built an excellent international reputation for the development and production of quality products for military and counter-mine use.

Starting in 1994, Schiebel began the development of unmanned helicopters. The initial idea was for them to be used for mine detection, carrying Schiebel mine detectors. In early 2000, the CAMCOPTER 5.1 was launched, and following a complete redesign in 2005, as the CAMCOPTER S-100. With the payload capacity to be able to carry high quality day and night cameras, the S-100 quickly established itself as the ideal VTOL platform for ISR tasks. Schiebel achieved its worldwide leading position in the UAS market by winning its first major contract in the UAE a year later.

SP's: Kindly take us through the evolution of your Camcopter S-100.

Hunter: The CAMCOPTER S-100 is the result of almost 20 years experience in continuously developing and producing UAS. Since 1994, the whole unmanned system has been continuously upgraded with the latest technology. The system is now an operationally proven capability for both military and civil applications. It requires no prepared area or supporting equipment for launch and recovery. It operates day and night, under adverse weather conditions, with a beyond line-of-sight capability out to 200km over land and sea.

The payload capacity is 50kg and it can fit multiple simultaneous sensors and payloads, e.g. MX-10 camera gimbal, cargo box, EO/IR and radars. Almost any capability, within the obvious size and weight constraints, can be integrated on the CAMCOPTER S-100.

SP's: What kind of R&D, investment and testing went into the development of the S-100?

Hunter: Every year, Schiebel reinvests up to 30 per cent of its profits into the further development of the S-100 to ensure the whole system stays at the forefront of this technology.

SP's: What are primary roles and functions for which S-100 UAV is used?

Hunter: The CAMCOPTER S-100 is primarily used for ISR on land and at sea. The UAV can be operated in adverse weather conditions and on small ship decks, which make it ideally suited for maritime operations. The system has also conducted many search and rescue missions, where the S-100 searches and locates objects and if necessary, people at sea. In addition, the S-100 can be fitted with a cargo box or underslung load in order to transport cargo, such as life vests or urgent spare parts for e.g. gas platforms and medical equipment.

SP's: What is your global footprint now? How many S-100 have been sold to how many customers in how many countries?

Hunter: We have sold 350 AVs so far and have 34 clients worldwide. We are oper-

ating all over Europe with the French Navy and the European Maritime Safety Agency in Europe, as well as for the Royal Australian Navy, Thai Navy in the East, and many more.

SP's: Would you like to share any specific case study with us?

Hunter: Recently, we conducted the world's first unmanned cargo delivery to an active oil and gas platform in Norway. Please see press release/case study on our company website.

SP's: In view of constant debate on Manned Versus Unmanned, how would you like to advocate unmanned solutions?

Hunter: Unmanned operations are significantly cheaper than manned flight hours. e.g. when delivering an urgent spare part to an offshore platform it is more cost-effective to use a UAV than a manned helicopter. In addition, flights can be operated almost contactless which is a highly valuable advantage in times of a pandemic. UAVs are perfectly suited for the 3D missions (dull, dirty and dangerous), especially given that there is no pilot in the unmanned helicopter human lives aren't put in danger.

SP's: Please tell us more about the LOI 5 that S-100 has achieved.

Hunter: We see a lot of potential in Manned-Unmanned Teaming, where the UAV is controlled and flown by a pilot in a manned helicopter or aircraft. The UAV then acts as the eyes and ears of the manned asset live feeding the information directly to the manned aircraft. In 2018 we successfully conducted a trial with Airbus, where the S-100 was controlled by an H145 helicopter and achieved a level of interoperability (LOI) of 5, meaning the pilot in the H145 was able to launch, operate, command and control the UAV as well as receive all the data (video) back into the manned helicopter.

SP's: What kind of new-age capabilities can Schiebel offer to Indian Armed Forces?

Hunter: The S-100 is an extremely flexible, multi-role, multi-domain asset. It can be fitted with multiple payloads and sensors depending on the customers needs. The Indian Armed Forces will be particularly interested in our Manned-Unmanned Teaming capabilities as well as our suitability to perform either at sea or over the land, carrying multiple and different payloads with a reliability of up to 95 per cent.

Future capabilities/payloads we're currently working on are: Anti Submarine Warfare (ASW), Light Detection and Ranging (LIDAR), SATCOM C2, Magnetic Anomaly Detector (MAD), and a communications relay.

SP's: What is the focus of your display at Aero India 2021?

Hunter: We are looking forward to presenting and showcasing our CAMCOPTER S-100 to the Indian market. Our focus will be to highlight our maritime and land-based operations, showing our experience, pedigree and maturity. We will be emphasizing the fact that the CAMCOPTER S-100 is a proven UAS with about 100,000 total flight hours, 10,000 maritime flight hours and 2,000 deck landings to date. ●



SAAB MULTI-SHOT MINE NEUTRALISATION SYSTEM (MUMNS)

COMBATTING SEA THREATS WITH UNMANNED SOLUTIONS

Saab's Double EagleMkIV can be an effective addition to India's Mine Counter Measure (MCM) capabilities, says **Ola Rignell**, Managing Director, Saab India

More than 90 per cent of the world's trade happens by sea, so any disruptions to the global flow can have serious consequences. The Indian Ocean Region is an important Sea Lines of Communication as it is both energy and trade corridor. Sea mines are an inexpensive but low-tech weapon that can cause havoc with trade and communication. Since the end of the Second World War, more ships have been lost to one maritime weapon than any other. But it's not anti-ship missiles, torpedoes, or terrorist attacks; it is sea mines. Not having minesweeping capabilities can have deadly consequences as even modified fishing trawlers can be used for laying mines. Illegal, Unregulated and Unreported (IUU) fishing is one of the gravest non-traditional global maritime security threats which can now also be used to lay mines.

Modern mine reconnaissance and mine disposal demand a multifunctional Remotely Operated Vehicle (ROV) that can operate in extreme environments and

cope with advanced mines. Saab's new MuMNS (Multi-Shot Mine Neutralisation System) could be a breakthrough in countering mine warfare.

According to Ola Rignell, Managing Director, Saab India, "With Indian Navy looking to enhance their Mine Counter Measure (MCM) capabilities by acquiring mine countermeasures vessels (MCMVs) that can be built in India, Saab's Double EagleMkIV can be an effective addition to India's MCM suite. Not only is it designed to handle modern sea mines, the modularity of the design allows the operator to utilise the vehicles for both mine detection and mine disposal. The stability of the vehicle simplifies these missions. MuMNS including the Double Eagle MkIV has also been adapted to the Craft Of Opportunities (COOP), where it can be housed in a container that can be easily installed on almost any type of ship."

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(LEFT) CYBER SECURITY SOLUTIONS; (RIGHT) MULTIBAND TERMINAL FOR PROTECTED, SECURE COMMUNICATIONS

DELIVERING ADVANCED CAPABILITIES ACROSS SPECTRUM

“Raytheon Technologies has invested heavily in expanding our footprint in India over the years. Across our businesses, we employ approximately 5,700 people in India, and are one of the largest exporters in the aerospace and defence sector in India”

— **Dan Darnell**, Vice President Global Solutions, Raytheon Intelligence & Space talks about how their cutting-edge technologies can benefit the Indian Armed Forces and the Commercial Aviation Sector.

SP’s ShowNews (SP’s): How exactly is Raytheon Technologies (RTX) creating “The future of Aerospace and Defence”?

Dan Darnell (Darnell): Raytheon Technologies formed last year from the merger of United Technologies and Raytheon Company. The combined company now possesses one of the best technology portfolios in the world served by 60,000 engineers. This means the ability to deliver the most advanced capabilities in aerospace and defence, faster and more efficiently than ever before.

Our diverse portfolio of businesses includes Collins Aerospace, Pratt & Whitney, Raytheon Intelligence & Space and Raytheon Missile & Defense. Already industry leaders in their own right, they serve customers in India and more than 100 countries through platform agnostic solutions for safer and more connected air travel, smarter defence systems and intelligent space technologies.

We can now leverage this incredible depth and scale in India, making more products in country, investing in the workforce and growing the economy.

SP’s: What are some of the Path-Breaking products and transformative technologies that RTX is Developing?

Darnell: Our businesses come from a long tradition of developing solutions to difficult problems that push the limits of known science. Some of these include the guidance computer for the Apollo 11 spacecraft that landed on the moon and environment satellite systems that help predict severe weather. The challenges confronting customers today are in many ways as complex as ever before.

That’s why we’re accelerating development of a number of break-through technologies in high-value areas, including hypersonics, directed energy, avionics and cybersecurity for commercial aerospace and defence.

Combining R&D efforts and collaboration across the company offers the opportunity to deploy complementary technologies for multiple applications.

SP’s: What support can RTX offer to the Indian Armed Forces specifically in the domains of AI, Cyber, C4I and multi-domain battlefield?

Darnell: The military sector has access to more data now than ever before, and AI can be a powerful tool to makes sense of that data for faster decision-making in the battle space. Raytheon Technologies can deliver some of the most advanced analytics and artificial intelligence capabilities across our Collins Aerospace, Pratt & Whitney, Raytheon Intelligence & Space and Raytheon Missiles & Defense businesses.

Other key capabilities that we’ll be able to offer as a result of the merger include:
Communications: We can combine Raytheon’s expertise in secure military networks, command and control and cybersecurity with Collins Aerospace’s background in tactical communication devices embedded within weapons systems. The result is more integrated and interoperable communications systems that address one of the major challenges identified by our defence customers. Our solutions, next generation software-defined radios, advanced sensors and navigation systems, empower the connected battle space.

Cyber solutions: With decades of cybersecurity experience, Raytheon Technologies offers layered cybersecurity capabilities tailored to meet the needs of military, government and commercial customers.

Multi-Domain Battle space: Commanding the future battle space demands seamless integration of military platforms and systems worldwide across air, land, sea, cyber and space. Building on experience in product manufacturing and software and systems integration, we are working across the company to combine

sensors, software, data, interconnectivity and speed, to provide the right information to the right people at the right time.

SP’s: What all are you displaying at Aero India 2021 and what is the focus of your display?

Darnell: Given the pandemic, we will utilise our team in India primarily to support meetings with customers and partners during the event, and will have a dedicated meeting space at the show. We will also have a web presence highlighting our commitment to India as well as our diverse array of commercial and defence capabilities from all of our businesses.

As we look at the Indian marketplace, one area we are particularly excited about is India’s ongoing efforts to modernise its airfield infrastructure and Air Traffic Management (ATM) systems. Raytheon Technologies is proud to offer highly capable and affordable products and services in this arena including Air Traffic Control (ATC) automation systems and radar systems, unmanned aircraft management systems and Remote Virtual Tower (RVT) systems.

We are pleased to have supported numerous such projects in India to date including: ATC automation systems at Mumbai, Delhi, and Chennai; ATC radar systems at Mumbai and Delhi; and ATC automation systems at 44 Indian Air Force bases throughout India under the MAFI (Modernisation of Airfield Infrastructure) contracts. Raytheon is currently in the process of executing another contract for supplying ATC Automation systems to another 44 MOD sites in Phase II of the MAFI program.

We are most proud not only of our long-term relationship with the Airport Authority of India (AAI), but also of our ongoing ATM related partnerships with Indian industry. We look forward to the continued opportunity to support the Government of India, AAI, and Indian industry in their efforts to provide the people of India with a civil aerospace infrastructure that best enables safe and efficient air traffic operations in the ever-growing realm of Indian civil aerospace.

SP’s: What are the objectives behind your participation at Aero India 2021?

Darnell: A key part of Raytheon Technologies’ strategy in India is to collaborate with local companies. Our team on the ground during Aero India will focus on meeting with potential partners in addition to customers. We are looking forward to discussing opportunities to respond to India’s defence and security requirements, make more products in India, develop the local knowledge base and help grow the Indian economy.

SP’s: Kindly tell us more about how RTX is aligning itself and supporting Indian government policies like ‘Make in India’, ‘Digital India’, ‘AtmaNirbhar Bharat’ and ‘Skill India’?

Darnell: Raytheon Technologies has invested heavily in expanding our footprint in India over the years. Across our businesses, we employ approximately 5,700 people in India, and are one of the largest exporters in the aerospace and defence sector in India.

Our work in the Collins Aerospace design, engineering and manufacturing centers, and Pratt & Whitney’s training center, as well as the many STEM programs we host and sponsor, all support the government’s Make In India, Digital India and Skill India programs. ●

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(LEFT) GTF ENGINES; (RIGHT) PRATT & WHITNEY EAGLE SERVICE ASIA FACILITY IN SINGAPORE

WE ARE THE ONLY ENGINE COMPANY WITH GEARED TURBOFAN TECHNOLOGY IN SERVICE

In an interview, **Ashmita Sethi**, President and Country Head, Pratt & Whitney talks about their MRO services, their initiatives towards cleaner skies and how airlines are benefitting from their GTF technology

SP's ShowNews (SP's): How is the progress on GTF technology?

Ashmita Sethi (Sethi): The Pratt & Whitney GTF (geared turbofan) engine leads a new era of commercial jet engines. It is designed with superior architecture and has an unmatched runway for growth.

In fact, India was an early adopter of this revolutionary technology and now more than 180 A320neos for IndiGo and GoAir are powered by the GTF. As of today, the engine family has flown more than 2 million engine flight hours in India and is now delivering an industry leading dispatch reliability of 99.98 per cent.

Across the world, the GTF has delivered on its promised ability to reduce fuel burn and carbon dioxide emissions by up to 20 per cent, reduce nitrogen oxide emissions by 50 per cent compared to the regulatory standard, and to slash noise footprint by 75 per cent. We will continue to advance the engine throughout its lifecycle and deliver efficiency gains that will let our customers fly even farther, with less fuel, well into the future.

SP's: Can you indicate on the commitments coming from various airlines for this specific technology?

Sethi: The GTF powers more than 900 aircraft for nearly 50 airlines and three aircraft families; namely the Airbus A320neo, Airbus A220 and Embraer E-Jets E2. Since its debut five years ago, these engines have saved more than 400 million gallons of fuel.

With the upgrades complete, these engines are now delivering industry-leading reliability of 99.98 per cent for the A320neo family. Combine this with our best-in-class fuel efficiency and low carbon emissions, it's easy to see why GTF-powered fleets have seen high utilisation as the industry begins to recover after the pandemic.

The GTF has proven itself to be the engine architecture of choice. We are confident it will drive the next generation of efficient, sustainable air travel – allowing airlines to open new routes and fly more people, farther, with less fuel. That's why with over 10,000 orders and commitments, market demand for the PW1100G-JM engine remains strong.

SP's: There have been some hitches on this front. What all efforts are being made to offer an absolutely flawless GTF technology to various operators around the world?

Sethi: The geared turbofan is a new architecture engine in its first phase of its deployment cycle. Therefore, it worked up to the high levels of durability and reliability that it now delivers. We incorporated more durable LPTs into the engine fleet and redesigned a seal in the high-pressure compressor. These upgrades have been put into all new production engines and during planned maintenance visits of in-service engines.

In India, we worked closely with airlines to upgrade their engines to the latest configuration and minimised impact to their operations. We also adopted an inventive and agile way of retrofitting the fleet worldwide, investing both on the production side and the maintenance, repair and overhaul (MRO) side. Even during the extended lockdown in 2020, we continued to work closely with airlines to ensure that they were ready for a well-supported return to demand. As we have done for every engine throughout our history, Pratt & Whitney will continually work to improve the reliability and durability of the GTF over its entire lifecycle.

SP's: Where do you find your engine program's standing versus the competition in the world?

Sethi: We are the only engine company with geared turbofan technology in service and building on that experience that will put us well ahead of other engine makers. Since its entry into service in 2016, GTF-powered aircraft have accumulated more than 6 million engine flight hours. But what keeps us competitive and significantly ahead is also the additional investments we're making – across production, MRO and data analytics.

In the first half of 2020, the Pratt & Whitney GTF MRO network expanded to nine facilities, including Delta TechOps in the United States and EME Aero in Poland. Air India Engineering Services Limited (AIESL) was announced as a provider of maintenance services in support of GTF operators in India and the surrounding region. We are looking at this number increasing to 11 facilities in 2021.

We also have a growing suite of data analytics and real-time intelligence offerings that predict and prevent engine disruptions before they occur. Real-time intelligence and analytics allow us to compare individual engines and aircraft to the global fleet, identify trends and issues right away, and service engines more quickly to maintain the highest levels of aircraft availability. The GTF has a long runway for future growth and Pratt & Whitney is ready to deliver what the aviation industry needs next.

SP's: Can you elaborate more on your MRO services worldwide?

Sethi: Pratt & Whitney has a comprehensive engine repair and overhaul services and support, that is backed by a global state-of-the-art service network of engine OEM-owned and designated facilities. With our continued investment in technology, our facilities and our industry-leading workforce, we are well prepared to meet the need of MRO services worldwide.

Over the last five years, we have significantly grown our global MRO network. An example of this is our global Geared Turbo Fan (GTF) MRO capacity, which has increased 6x since 2017. In the first half of 2020, network expanded to nine facilities, including Delta TechOps in the United States and EME Aero in Poland. In India, Air India Engineering Services Limited (AIESL) was announced as a provider of maintenance services in support of GTF operators in the country and surrounding regions. It is part of the Pratt & Whitney GTF MRO network worldwide and provides maintenance services in support of GTF operators. Previously, such services were conducted only by international MRO hubs.

Additionally, Taj Air's Mumbai facility maintains Pratt & Whitney's PW308C engines. We also offer a growing suite of sustainment solutions for engines, for large and small aircraft, that support the Indian Armed Forces' mission readiness.

SP's: Given India is talking big for MRO - how can Pratt & Whitney play a major role?

Sethi: With the emphasis on self-sufficiency, it is positive to see the Government's plan to make India a hub for MRO of aircraft. This will not only strengthen our MRO capacity and capabilities in India, but also and open up future avenues for growth, aligned to the Government's "Atmanirbhar Bharat" vision.

For over 20 years, AIESL has been performing overhaul services on Pratt & Whitney's legacy engines such as the JT8D, JT9D, & PW4000. So, our MRO presence in India and our AIESL partnership goes back a long way. So, in 2020, we announced

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RETURN OF THE KINGS – THE MULTIROLE HELICOPTER STORY

COMMODORE G. PRAKASH (RETD)

Exactly twenty years ago I solemnly gifted a memento to my ship on behalf of the Officers of my department. The memento was a solid 3 x 1.5 feet carved wooden frame, that surrounded two beautifully painted war elephants. We had carefully selected the two elephants from a stack of elephant paintings the best Rajsthani art dealer on Colaba Causeway had in his stock. Their eyes had to be ferocious and their tusks had to be razor sharp. That is because they were going to represent the best multirole helicopters (MRH) the world had seen then, the Sea King Mark 42Bs, known lovingly as just 42Bs, or Bravos. They were called Flying Frigates. Rightly so, as they could do almost anything the Frigate that carried them could do. With two Bravos each on ship, the Godavari Class were matchless fighting entities.

The occasion was the formal disbanding of the last Bravo Flight on the Godavari class Frigates. The reason was straightforward. In response to India's bold step at Pokharan in 1998, the US had imposed sanctions and this was likely to affect the operational availability of the 42Bs. Though the Bravos had come to us at that time from UK's Westland Helicopters Ltd (now Leonardo Helicopters), the basic aircraft was under the license of Sikorsky (a Lockheed Martin company), USA. So, till we could get a clearer picture on the effect of the US sanctions, the Indian Navy was prudently consolidating its assets as per a revised utilisation plan. My crew and I got posted out immediately thereafter.

When the 42Bs arrived in India between 1988 and 1990, they were the second lot of Sea Kings to ever come to India. The first lot of 12 had come in 1970, just before the Indo-Pak war. Equipped with an excellent Sonar and a Radar, they were the most modern ASW helicopters in the world when they arrived. But they came a bit too late and during the 1971 war, could only undertake some shore based operations from Mumbai. But soon after that, the Indian Navy managed to operate these large helicopters from Frigates and even acquired three more helicopters, with slight design changes to better suit operations from small decks. Getting these 10 tonne helicopters to operate from Frigates, was a path breaking innovation.

In the decade after the 1971 war, the Indian Navy carefully charted out options for all round up-gradation of military equipment, and some, much required indigenisation. In the field of multirole helicopters, it was to be a two pronged approach. For indigenisation, HAL was to first make a smaller MRH to develop skills and confidence. A larger one could follow later. Meanwhile, to meet operational needs, some MRH were to be imported. The choice fell again on Sea Kings, as they were still the best available.

But this time around, there was a difference. The aircraft was to be equipped with state of the art Weapons, Sensors, Communication systems, Navigation systems and most importantly, a Tactical Mission System (TMS) to integrate everything so that operating them was humanly possible. The mix was eclectic. Air to Surface Missiles (British Sea Eagle), Torpedoes (Italian A244S), Depth Charge Mk 11 (Indian), Radar (British), Dinking Sonar (French), ESM (Italian), Sonobuoy System (British), Tactical Air Navigation System (British), V/UHF (USA), VHF Homing (UK) & HF (USA) and a British TMS. This was the first time anyone



LOCKHEED MARTIN MH-60R SEA HAWK

was attempting to integrate this stupendous mix of capabilities into one helicopter. The best part was that this entire architecture was designed by India, to be executed by Westland Helicopters (now Leonardo Helicopters). This complex integration effort was the aviation equivalent of the amazing integration of multi country origin equipment the Indian Navy had achieved with the Godavari Class.

Only those who operated the 42Bs in their prime would know the extreme invincibility we felt. It won't be too wrong to say that with half a dozen of them flying, the Arabian Sea had shrunk to a pond. Suddenly submarines in the region had a potent enemy and ships of adversaries couldn't be sure of their safety from incoming missiles. Those making electronic transmissions could be identified and Over The Horizon Targeting as well as long range communications capabilities became virtual game changers. After a decade of this glory, the US sanctions hit. But the Bravos continued to operate. They still do.

It is ironic that the country which attempted to limit our operational capabilities through sanctions, is now poised to send us the third wave of the kings of the sea, the MRH. Earlier this year, India signed a multi billion \$ deal with USA for 24 MH-60R helicopters from the Sikorsky (a Lockheed Martin company) family. They are expected to be delivered next year.

Yet again, the Arabian Sea is poised to shrink to a pond, as the MH-60R are the best MRH in the world today. Since they come from a family of helicopters with which the Indian Navy has a familiarity of over 50 years, in their operation and maintenance, we will hit the deck running too.

What does this reveal about India? Someone somewhere had kept steadily chipping away at shaping foreign policy, ultimately achieving a reversal of relationship unimaginable two decades ago. The arrival of the second set of MRH in the end of the 1980s had been two decades after the arrival of the first batch in 1970. Two decades is the legitimate time period after which such aircraft should be replaced. The third set should have come by 2010. But the complex wheels of geopolitics and global economics delayed this arrival by ten years. India had steadily got stronger too during the period. It was only natural that suitors would flock, attracted by the value of our friendship and money.

Soon after I presented the memento of two painted elephants to my ship, I moved to New Delhi. One day, at the Aviation Directorate, I took a fresh, blue coloured official file cover and wrote MRH on it with a black marker pen. Little did I know at that time, that it will take 20 years for the English I started filling into the file, to manifest as real helicopter. I am glad that the day is almost here. A most critical operational gap is about to be closed. Indian Naval aviation is poised to soar higher. ●

GEARED TURBOFAN...continued from page 15

AIESL as a provider of maintenance services in support of GTF operators in India.

The GTF MRO with AIESL not only brings our engine support closer to our customers in the region, it also supports the government's vision of developing India as a major regional MRO hub. We also get to leverage India's skills and add to our advanced and competitive global MRO capabilities.

Just as we continue to increase up our presence in-country when it comes to supply chain, sustainment and research and engineering – we will continue to be a significant driver of India's MRO success story.

SP's: Would you like to elaborate on the key initiatives towards cleaner skies?

Sethi: Throughout our 95 year history, we have defined, and redefined, aviation. Now, we're working towards making environmentally sustainable aviation a reality. We want to enable our customers, and help them deliver cleaner, greener, and more sustainable air travel. In fact, the GTF has already set a new standard for fuel efficiency, as well as reduced emissions and noise footprint.

We continue to closely study novel solutions like hybrid-electric and hydrogen-powered propulsion in aviation and support wider adoption of Sustainable

Aviation Fuels (SAFs). Globally, SAFs will be an important "Drop-In" solution that let us reduce carbon footprint while using existing gas turbine technology. The industry remains committed to sustainable growth, and we are committed to delivering for the industry and our customers.

SP's: R&D plays a very major role for futuristic and evolving technologies. What kind of investments do you make on this front?

Sethi: Innovation remains a key focus for P&W and we continue to channel our vast Research & Development (R&D) resources on advancing next-generation engine technologies. Be it designing engines of the next decade, researching advanced materials and aerodynamics, exploring manufacturing breakthroughs, or using big data and artificial intelligence – there is a lot of work happening globally. In fact, there's some exciting R&D work on advanced gas turbine technologies and materials, combustion, and mechanical design happening right here in India at our R&D Center of Excellence (COE) at the Indian Institute of Science (IISc), Bengaluru. We're also engaging the vibrant Indian start-up ecosystem through the RTX Innovation Challenge and exploring disruptive innovations for aerospace. ●

IAI HAS IMPLEMENTED...continued from page 6

radar (MF-STAR or digital MMR), a command and control center, mobile launchers and interceptors and an advanced RF seeker.

SP's: Do you propose to offer any solutions on the front of MRO? Is it military and civil both? What's the road map?

Levy: IAI has MRO capabilities since its establishment in both the military and civilian spheres. Beyond this, IAI is Israel's home of aviation and deals also in aircraft upgrade, maintenance and more. We will be happy to join the MRO world in India, and are examining some possible partnerships.

SP's: Do you have any offering in the field of space and if so, would you like to elaborate a little?

Levy: IAI, the National Space House of Israel, is a one-stop-shop for cost-effective small to medium size satellites. With about 40 years of experience in space technologies, IAI focuses on space systems for national security, scientific or research satellites and commercial applications:

- Observation satellites with different types of payloads (EO and SAR)
- Research or scientific satellites, including a moon lander and nanosatellites
- Communication satellites
- Space platforms
- Ground control stations, including services on-demand
- Mission and applications centers
- A full range of space sub-systems

IAI implements its extensive experience in space technologies, along with a new approach to outer space. Dozens of satellites have been launched successfully and are performing with excellent results, providing services to users in Israel and abroad. IAI works closely with its customers to enable efficient solutions, according to their special needs and budget constraints. IAI is ready to explore further modes of cooperation with potential customers and partners. The company has a proven record in conducting a full space project cycle - starting from definition-of-mission requirements, through design, manufacturing, integration, launch-testing and in-orbit delivery.

IAI and the Israeli MOD have recently successfully launched the "Ofek 16" reconnaissance satellite into space and delivered it the IDF for operational use. "Ofek 16" is an electro-optical reconnaissance satellite with advanced capabilities. Its development was enabled by the experience gained by the defence establishment in the production of earlier satellites in the Ofek series, which have been produced and launched since 1988. The satellite was launched aboard the "Shavit" launcher. ●

"BOEING BELIEVES...continued from page 10

Boeing Research & Technology India has delivered commercially viable solutions for Airplane Health Management (AHM) and Air Traffic Management (ATM). Its ATM experts are currently working with the Airports Authority of India to develop a road-map for air traffic management modernisation in the country. Today, the research center is using artificial intelligence and machine learning to improve the quality of wide-body airplanes that Boeing delivers. Using Internet-of-Things (IoT) technologies, its engineers are finding ways to improve passenger experience during air travel.

We continue to grow a globally competitive supplier base in India, with strong partnerships aligned with the Atmanirbhar Bharat vision. Our sourcing from India stands at \$1 billion per year from 225 suppliers who are manufacturing critical systems and components for some of Boeing's most advanced products. Our joint venture with Tata, Tata Boeing Aerospace Limited (TBAL), in Hyderabad, is producing aero-structures for Boeing's Apache helicopter, including fuselages, secondary structures and vertical spar boxes for Indian and global customers, employing over 500 engineers and technicians. Apache fuselages and structures made in this cutting-edge factory in Hyderabad are for not just the Indian Army but for customers around the world, including the US Army. We look forward to seeing the Indian Army's recently contracted six new Apaches rolling down that production line. The state-of-the-art facility is an example of Boeing's strategic focus on Make in India and TBAL marks a major step towards the co-development of integrated systems in aerospace and defence in India.

Dynatomic Technologies, another Indian partner, manufactures the ramp and complex aft pylon for Chinook heavy-lift helicopters. Rossell Techsys manufactures wire harness and electrical panel for the AH-64 Apache, and the harness for V-22 Osprey. SASMOS HET Technologies manufactures electrical panel assemblies and wire harness for the F/A-18 Super Hornet and F-15 Strike Eagle. Hindustan Aeronautics Ltd (HAL) manufactures F/A-18 gun bay doors and wire harnesses, and P-8I weapons bay doors and friend-or-foe identification transponders.

In terms of skilling and upskilling, we are developing Indian MSMEs, aircraft maintenance engineers, technicians, and frontline factory workers across India with our industry partners like Tata, Rossell, Jaivel and Lakshmi Machine Works. Our vision is a robust, globally competitive aerospace and defence ecosystem in India. ●

IAI TO PRESENT A VARIETY OF SYSTEMS

Israel Aerospace Industries (IAI) will take part in the Aero India 2021 exhibition, slated to take place between February 3-5 in Bengaluru, India. The Company expects to expand its cooperation with local leaders in integrating strategic state-of-the-art systems for the Indian Ministry of Defence in several fields and in accordance with the Indian Government's 'Make in India' policy.



IAI MINI HARPY LOITERING MUNITION

These collaborations are a direct continuation of IAI's business deals in India which totaled some \$5 billion in the past five years.

IAI has been working with India's defence industries and armed forces for the past 30 years and the strategic cooperation spans many areas. The company works with local companies and with India's defence agencies, as well as the navy, air force, army and coast guard. Joint development projects include the MRSAM air defence system, in both its maritime and land-based versions; mission aircraft; various radar systems and UAVs. Cooperation agreements are based on the transfer of technology for the benefit of local production as part of the Indian Government's 'Make in India' policy.

Boaz Levy, IAI's President and CEO, said, "IAI sees India as one of our main partners. This valued partnership is characterised by long-term cooperation, joint development and manufacturing, technology transfer and technical support over decades. During the Covid-19 pandemic, IAI continued bilateral work in India, conducted significant trials in strategic systems like the jointly developed MRSAM Air and Missile defence system and our professional crews in Bengaluru and New-Delhi supported all relevant projects such as UAV's, radars, air defence and more. In addition, we advanced our mutual partnerships with local Indian industries with no interruption, according to 'Make in India' policy."

At the exhibition, IAI will present a wide variety of strategic defence systems with an emphasis on unmanned aerial systems, among them the Heron TP and Thunder B VTOL. In the loitering-munition category, IAI will present the Rampage, Mini Harpy and Rotem L. The company will also display its Multi Mission Tanker Transport (MMTT), which enables air refueling, cargo, VIP, passengers and ISR systems, as desired by the operator. IAI will also present the mission aircraft for intelligence missions, aerial control and naval surveillance on different platforms-ELW 2090. ●

UNMANNED SOLUTIONS...continued from page 13

Sea mines are unremarkable-looking, iron-encased explosives, most often placed under the water's surface (buoyant mines) or on the seabed (ground mines). There they float or sit silently for years, until a ship or submarine strikes them directly, or produces the right magnetic, acoustic or pressure signal to set them off. The resulting explosion can be every bit as devastating as, say, a missile. In just a four-day period during the first Gulf War in 1991, the US Navy saw the USS Princeton and USS Tripoli put out of action for several months due to the damage caused by Iraqi sea mines.

"A sea mine gives you area denial. They are an inexpensive and highly effective way of waging a maritime campaign," explains Chris Lade, Engineering and Defence Sales Manager at Saab Seaeye. Before joining Saab, Lade spent 31 years with the British Royal Navy, as a navy diver who actually laid charges to neutralise sea mines, and as a planner during the 2nd Gulf War to clear Iraqi waters for Allied vessels.

"They are used in key waterways, such as the Straits of Hormuz in the Middle East, the Malacca Strait in Indonesia, the Bosphorus in Turkey or the Kattagat entrance to the Baltic Sea. If these 'chokepoints' are closed off due to mines, they make a big strategic impact at a relatively low cost. Sometimes forces make it look like they have laid mines. The threat alone is enough to disrupt sea lines of communication, affecting trade, logistics and naval patrols," says Lade, though it contravenes the Hague Convention on mine usage.

Saab's solution to these problems represents a breakthrough for safer seas. It has been six years in the making, involving a core team of 12 people, including Lade. "The MuMNS can go down and use a camera to identify a target. The beauty of MuMNS is that you have three weapons rather than one, and you have an ROV that has 'six degrees of freedom': it can fly upside down, manoeuvre through 360 degrees, and look at a whole range of targets over a large area. It can be left in the water rather than needing to be retrieved by the ship to be rearmed," says Lade. Add to that its ability to operate from an Unmanned Surface Vessel, a 12-metre-long platform that is remote controlled.

Once the MuMNS charge is attached, a radio receiver floats up to the surface, the charge is then fired remotely from the mother ship on the horizon or beyond. It is essentially taking the man out of the minefield. MuMNS will change the nature of mine warfare around the world and keep a lot of ships and people safe. ●

RE-FORMING THE SPACE

With new models, new arms and new approach, Indian space sector is advancing towards tapping the global space economy

AYUSHEE CHAUDHARY

Over a half-a-century back, humans stepped on the moon and the space exploration beyond our home planet has only expanded ever since. Space based applications and services have grown in multitude over the years than it was originally anticipated. Many new applications are being developed world wide to meet the growing user demands and requirements and the activities are only on a growth trajectory with huge commercial potential.

More and more countries are now emerging in the space league to study our planet, and other cosmic bodies. India's space agency, Indian Space Research Organisation (ISRO) has continued to add feathers to its hat with many successful and over-arching missions often taking the world by awe. As ISRO continues its advancements, the space sector in India much like globally is also harnessing attention and looking for growth to tap into the global space economy. There are also many reforms that are taking place in the space sector. Here we look at some of those reforms awaited in the times to come.

In India, many Non-Government-Private-Entities (NGPEs) have also started engaging in space activities for commercial gains. Many startups and industries have started making launch vehicles and satellites and are eager to provide space based services. Participation of NGPEs including academic institutions, startups and industries in end-to-end space activities is expected to expand the space economy.

In order to enhance the diffusion of space technology and boost space economy within the country, the Department of Space (DoS) is encouraging the participation of private companies in space activities. ISRO shall complement DoS in its objective of opening up the space sector to private industries. In this regard, the following reforms are proposed in the mode of execution of space activities in the country:

- In order to enhance utilisation and maximise benefits from the space assets, it is proposed to change the approach from "Supply Based Model" to "Demand Based Model". NewSpace India Limited (NSIL) will act as the aggregator of user requirements and obtain commitments.
- NSIL to take ownership from DoS for operational launch vehicles, commercialise launches, satellites and services.
- Permit NGPE's to carry out space activities through an Indian National Space Promotion and Authorisation Center (IN-SPACe)
- ISRO to carry out capacity building in Space domain through development of new technologies and capabilities and enable sharing of facilities by NSIL and NGPE's.
- Announcement of opportunities for NGPE's offering challenges in new domains of technology.

ISRO had also highlighted the gamut of space activities being considered to be taken up by NGPEs, including:

- Production of components and subsystems of a launch vehicle, launch vehicle integration and testing which is meant for space launch
- Production of components of a spacecraft, spacecraft Integration and testing for the purpose of space launch.
- Space launch of spacecraft on board a launch vehicle and establishment/operation of launch infrastructure.
- Providing space based services including operation, control and station keeping of spacecraft by establishing and operation of ground segment/ stations.
- Development of space based applications using satellite data and rolling out of commercial services.

These reforms, that are being considered and explored not just by the depart-

ment or the space agency but also the government, are likely to aid India's progress in developing a competitive space market globally. In an interaction in December 2020 with the space community, Prime Minister Narendra Modi also pointed out the same. "I had a productive interaction with industry leaders, academicians and the start-up community associated with the space sector. India is making remarkable strides in this sector. This sector has also witnessed path-breaking reforms this year," the Prime Minister had tweeted.

ISRO Chairman K. Sivan, Bharti Enterprises Chairman Sunil Bharti Mittal, L&T Senior Executive Vice President for L&T's defence business Jayant Patil, Agnikul Cosmos founder Srinath Ravichandran, Pawan Kumar Chandana from Skyroot Aerospace Ltd, Colonel H.S. Shankar from Alpha Design Technologies Pvt Ltd, Rakesh Verma from MapMyIndia, Awais Ahmed from Pixxel India and Srimalthy Kesan from Space Kidz India were present during the interaction.

Adding that developing such market can help replicate the success of the IT industry in India, the Prime Minister said, "Private investment in the (space) sector will lead to the creation of hi-tech jobs, which will provide a host of opportunities to the talent pool in IITs/NITs and other technical institutions."

The reforms in the space sector will not only ensure the ease of doing business, but also provide necessary mechanisms in place to help participants at each stage, including the availability of testing facilities and launch pads, Modi said, adding that these reforms are to make sure that India becomes a competitive space market and also that the benefits of the space programme reach all.

In June, India had opened up its space sector, to let private firms and startups build satellites and rockets, besides offering space services to customers in the country and across the world. The government had also shifted all operational assets of ISRO to New Space India Ltd (NSIL), a commercial entity, and formed the Indian

National Space Promotion and Authorisation Centre (IN-SPACe) as a regulator to ensure a level-playing field for the private sector. At that time Sivan had pointed out the requirement for navigation policies to make the space sector more accessible to private players.

Going further, several ventures had submitted proposals with IN-SPACe under the DoS, pertaining to a vast range of activities including satellite constellation, small satellite launch vehicles, ground station, geospatial services, propulsion systems and application products.

During the interaction the ISRO chairman also briefed the Prime Minister on various proposals received from the industry for obtaining permission from IN-SPACe and support from the DoS. He informed that over 25 industries have already approached DoS for undertaking their space activities.

The first quarter of 2021 is expected to witness the launch of ISRO's rocket Polar Satellite Launch Vehicle-C51 (PSLV-C51). The primary payload will be the Brazilian satellite called Amazonia, an earth observation satellite. However, the significant highlight is that the rocket will also be carrying the earth observation satellite Anand, an advanced earth observation satellite, which has been made by the Indian startup called Pixxel (Incorporated as Syzygy Space Technologies Pvt Ltd). The Bengaluru-based private space technology company plans to have its constellation of 30 small earth observation satellites up in the sky by the end of 2022.

The reforms ahead are aimed at standardising as well as enhancing the space sector missions as well as manufacturing to become a hub for the world especially as more and more countries are entering the space sector and looking for low-cost launch vehicles. While indigenous production will certainly hail advantages for India but if we can manufacture and export these especially to the countries who don't have the manufacturing infrastructure, there is a significant growth and development possibility that awaits. ●



(LEFT) PSLV-C49 SUCCESSFULLY LAUNCHES EOS-01 AND NINE CUSTOMER SATELLITE;
(RIGHT) PSLV-C50 SUCCESSFULLY LAUNCHES CMS-01 FROM SATISH DHAWAN SPACE CENTRE



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