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INDIAN AIR FORCE SHOULD
BECOME AN 'AEROSPACE FORCE' —
RAJNATH SINGH, DEFENCE MINISTER

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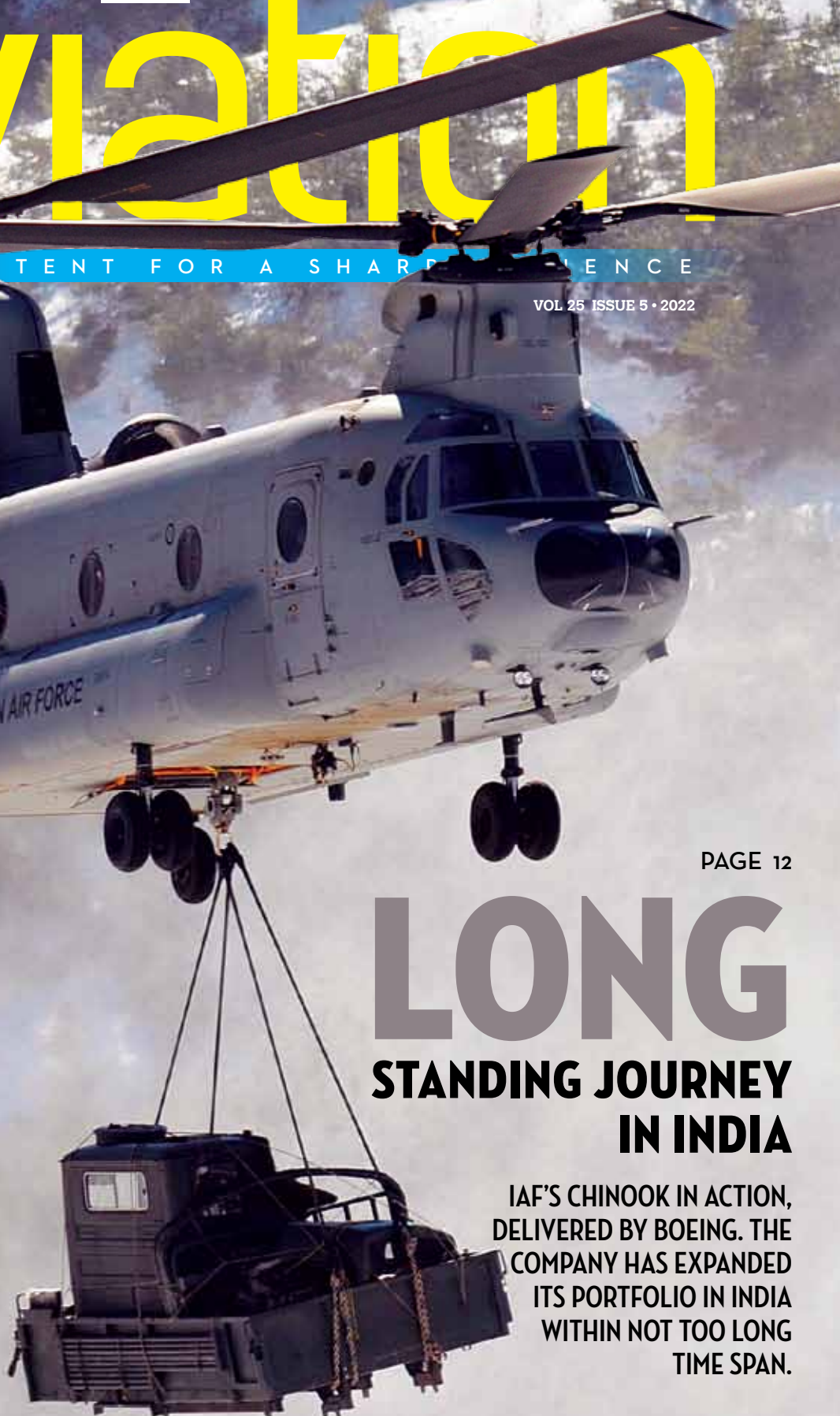


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LONG STANDING JOURNEY IN INDIA

IAF'S CHINOOK IN ACTION,
DELIVERED BY BOEING. THE
COMPANY HAS EXPANDED
ITS PORTFOLIO IN INDIA
WITHIN NOT TOO LONG
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Boeing has emerged as a leading prime contractor serving the Indian Armed Forces and is helping develop aerospace manufacturing in India in partnership with local companies through its commitment to the Atmanirbhar Bharat initiative for a robust domestic manufacturing ecosystem.

Cover Photo: IAF_MCC / Twitter

COVER DESIGN BY: SP's Team



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NEXT ISSUE: EBACE 2022 Report



There have been a number of significant developments within the country towards indigenisation in the domain of defence production. Hopefully, the 'Atmanirbhar Bharat' philosophy of the Government of India will usher in a new dawn for the Indian Armed Forces

DURING THE EXISTENCE OF A BI-POLAR WORLD, INDIA WAS practically tethered to the Soviet Union for procurement of military hardware. With the breakup of the Soviet Union in the early 1990s, India began to explore the possibility of obtaining modern military equipment including combat aircraft from the United States (US). Over the last decade, there has been considerable strengthening of the Indo-US military relationship. One of the major beneficiaries of this has been the US aerospace and defence major, Boeing Defense, Space and Security. This issue of the magazine carries an in depth analysis by Air Vice Marshal Sanjay Bhatnagar (Retd) of the strengthening relationship between India and the US and how it has helped Boeing Defense, Space and Security to emerge as a major supplier of military hardware to the IAF as also to the Indian Army and the Indian Navy. With Boeing completely supporting India's 'Atmanirbharta' programme, how this long standing collaboration pans out in next few years would be interesting to watch.

In the recent past, there have been a number of significant developments within the country towards indigenisation in the domain of defence production. This has been inspired by the measures adopted by the government under the philosophy of 'Atmanirbhar Bharat' which hopefully will usher in a new dawn for the Indian Armed Forces. This issue of *SP's Aviation* carries an in depth analysis by Air Marshal Anil Chopra (Retd) of the state of affairs today in respect of domestic production of military hardware and the measures that need to be adopted by the government in power to boost self reliance in the defence production ecosystem.

On May 5 this year, the Air Force Association in New Delhi organised the 37th Air Chief Marshal P.C. Lal Memorial Lecture. Rajnath Singh, the Minister of Defence was the Chief Guest at the event and delivered the keynote address. He advised the Indian Air Force to draw important lessons from the military conflicts in the recent past in Syria, Iraq, Afghanistan as well as

from the ongoing war in Ukraine that would help the IAF to be prepared for wars in the future. The Defence Minister urged the IAF to become an 'Aerospace Force' and be prepared to protect the country from the challenges that are looming large on the horizon. **We at SP's welcome such forward looking visionary statements from the Defence Minister.** A report on the Defence Minister's Keynote address is included in this issue of the magazine.

France has also emerged as a major supplier of modern military aircraft such as the Rafale jets to the IAF as well as Scorpene submarines for the Indian Navy and many other high technology subsystems. Prime Minister Narendra Modi met with Emmanuel Macron, President of France on May 4, 2022 in Paris. A joint statement issued after the meeting stated that India and France have built one of the premier strategic partnerships for advancing peace, stability and prosperity in the Indo-Pacific region. A report by Ranjit Kumar on the meeting between the leaders of the two nations figures in this issue of the magazine.

All this and more in this issue of *SP's Aviation*. Welcome aboard and we wish you many happy landing!

JAYANT BARANWAL
PUBLISHER & EDITOR-IN-CHIEF





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NEWS

SCALING NEW HEIGHTS IN DEFENCE PRODUCTION

In the beginning of April this year, Hindustan Aeronautics Limited (HAL) declared that it has recorded the highest ever revenue of over ₹24,000 crore in the financial year ending March 31, 2022, registering a six per cent growth over the previous fiscal. The corresponding figure for the previous year stood at ₹22,755 crore. "Despite the challenges of the second wave of COVID-19 during the first quarter of the year and the consequent production loss, the company could meet the targeted revenue growth with improved performance during the balance period of the year," said R. Madhavan, Chairman and Managing Director of HAL. The company achieved record revenue with the production of 44 new helicopters/aircraft, 84 new engines and overhauled 203 aircraft.



VIEWS

THE FACT THAT DESPITE THE ONSLAUGHT OF THE COVID-19 pandemic that had a crippling effect on the practically all segments of the industry and economy in countries across the globe, the Indian aerospace major HAL has indeed put up a commendable performance, scaling a new peak in its financial earnings for the year gone by. However, while this has been an encouraging development, the aerospace and defence industry of the nation has still a long way to go to develop the capability to meet with the requirements of the Indian Armed Forces for most, if not all, modern military hardware. Today, the nation is branded as the largest importer of modern weapon systems and other items of equipment that the Indian Armed Forces require to maintain the desired level of operational capability. This is extremely important and critical especially in view of the intimidating presence of the enemy both on the Northern and Western fronts of the country.

Over the past several decades since the nation attained independence, despite the heavy investments by the Government of India in the nation's aerospace and defence industry, the Indian Armed Forces have been heavily dependent on foreign sources for the acquisition of military hardware. Initially, the list of nations from where weapon systems were procured, included primarily three nations namely the Soviet Union, France and Israel. With the breakup of the Soviet Union in the early 1990s and the emergence of a uni-polar world, the Soviet Union was replaced by Russia and later on, the United States was added to the short list of suppliers of military hardware. Today, the nation has the dubious distinction of being the largest importer of weapon systems and other military hardware accounting for more than ten percent of total global imports.

However, certain developments in the recent past, one of these being the ongoing war between Russia and Ukraine, have resulted in some new developments in this segment of acquisition of military hardware by the nation. The Government of India now appears to have understood the need for and the paramount importance of self reliance in the sector pertaining to the defence industry. As a first step, the Indian Ministry of Defence has released a number of negative import lists that contain a total of 310 items of military hardware. The Government of India will no longer permit

the import of items of military hardware that figure on the lists. Henceforth, it will be incumbent on the Indian defence industry to produce the items on the banned lists within the country. The list of items on the banned lists for which import licence will not be granted, is fairly exhaustive. This appears to be the initial positive step towards building self reliance that the Government of India has taken to propel the nation to embark on a journey towards the radical transformation of the defence industry infrastructure in the country in the decade ahead to begin with.

It is quite clear that for the Indian defence industry in the public sector that has well developed infrastructure, this decision comes as a boon as it will give the industry the opportunity to finally make productive use of the manufacturing facilities and the related infrastructure that have been set up in the country over the last seven decades or so. But what is also important is that this decision by the Government of India will provide a fresh window of opportunity for the aerospace and defence industry in the private sector which is still in a nascent stage. The first lot of companies in the private sector that will be in the lead in the exploitation of fresh opportunities arising in the wake of the decision by the Government of India to boost the indigenous segment in the private sector would be the Tatas, Larsen and Toubro and Mahindra Aerospace. The smaller companies in the Indian aerospace and defence industry that have the capability to provide the required engineering services which include the Information Technology services and the startup companies will be the major beneficiaries of this move by the Government of India towards indigenisation of the Indian aerospace and defence industry sector through its 'Make in India' programmes.

India is a rising power both economically and militarily. The nation has to be well equipped to be able to take on both Pakistan and China that are military allies and are capable of posing threat not only from conventional weapons but from nuclear weapons as well. It is necessary for India to indigenise defence production and not continue to depend on foreign sources as the nation has been doing so far. SP

—BY AIR MARSHAL B.K. PANDEY (RETD)

DEFENCE MINISTER RAJNATH SINGH
DELIVERING THE KEYNOTE ADDRESS
FOR THE 37TH AIR CHIEF MARSHAL
P.C. LAL MEMORIAL LECTURE

IAF SHOULD BECOME AN 'AEROSPACE FORCE' — RAJNATH SINGH, DEFENCE MINISTER

By NEETU DHULIA

PHOTOGRAPHS: PROSHILLONG / TWITTER

The Defence Minister added that to protect our assets from space-guided attacks, IAF should operate on technology, developing expertise and human resource management

RAJNATH SINGH, DEFENCE MINISTER OF INDIA, DELIVERED the Keynote Address for the 37th Air Chief Marshal P.C. Lal Memorial Lecture on May 5, 2022, in New Delhi. The lecture was organised by the Air Force Association. Sharing the dais with the Defence Minister were Chief of the Air Staff Air Chief Marshal V.R. Chaudhari, President of the Air Force Association Air Chief Marshal R.K.S. Bhadauria and other key officials. The event saw a full house with senior officers of the IAF, both serving and retired, in attendance.

Remembering Air Chief Marshal P.C. Lal, Rajnath Singh stated, "Since, before independence, P.C. Lal witnessed the evolution of the Indian Air Force. Integration and Joint-ness are the major lessons from his life." Air Chief Marshal P.C. Lal was commissioned in the IAF in 1939. As the 7th Chief of the Air Staff during the 1971 war, his outstanding leadership proved to be a decisive factor in India's victory and the liberation of Bangladesh. He was awarded the Padma Bhushan in 1966 and the Padma Vibhushan in 1972 for his contributions during the two wars.

On the occasion, the Defence Minister also released a book titled 'INDO-PAK WAR 1971- Reminiscences of Air Warriors'. The book hosts 50 articles contributed by the veterans who have elaborated on their experiences. The book has been edited by Air Marshal Jagjeet Singh and Group Captain Shailendra Mohan. Rajnath Singh quoted a few incidents from the book and mentioned that it is a praiseworthy collection of experiences of the Air Warriors. He mentioned, "What was commendable was the cooperation between the services, the two services (IAF and the Indian Army) worked together and impressive was the bold and imaginative use of the Air force to win the war."

The Minister also made a special mention of aviator and former Odisha Chief Minister Biju Patnaik, "his role during the conflict with Pakistan over Jammu and Kashmir in 1947 can never be forgotten."

The Defence Minister touched on the ongoing conflict and future warfare, "the Ukrainian conflict has lessons for future wars and the Indian Air Force must gear up for it". He urged the Indian Air Force to become an "Aerospace Force" and be prepared to protect the country from the challenges of the future. "If we look at some of the recent conflicts in Syria, Iraq and Afghanistan, and more recently, Ukraine, we will get many insights from them to plan for future wars, although these

trends are suggestive, but we can gain a deeper understanding by correlating them with our local threats," he said. He added that to protect our assets from space-guided attacks, IAF should operate on technology, developing expertise and human resource management. "Technology has had a massive impact on not just wars but even our daily lives. It is not necessary that advanced weapons systems and platforms will ensure victory. Technology is a force multiplier, but without innovative employment, it will be reduced to a showpiece," Singh said.

Rajnath Singh asserted that a greater synergy can be established through the process of integration, joint vision, training, planning and execution of operations between forces. "The ongoing process of integration of the Armed Forces is aimed at not only increasing the combined capability but also efficiency. We have to keep in mind that its long term success will

depend on the vision of the planners just as much as it depends on those who implement it. I have full faith that in future more unity will be established not just ideologically, but also in action," he said.

Sharing his outlook on being self-reliant (Atmanirbhar), Defence Minister described self-reliance as critical, "Our past experiences have taught us that India cannot depend on imports for its safety and security for long. Recent conflicts, especially the situation in Ukraine, have taught us that not just defence supplies, but commercial contracts are also prone to

be affected when it comes to national interests." He mentioned that domestic capability building is not an easy path and may not be cost-effective initially, but it will offer a middle and long-term benefit in building the foundation of a robust industrial base not only in the defence sector but in every sphere of the industry.

He listed out some of the recent initiatives taken by the Government, terming them as building blocks of a self-reliant structure which will empower the domestic manufacturers and help India emerge as an exporter of defence equipment.

Defence Minister Rajnath Singh reiterated that the Government is leaving no stone unturned to ensure the safety and security of the people of the country. He added that India has emerged as the foremost responder for out of area contingencies across the region. He commended the Armed Forces and other organs of the State for their combined contribution in achieving the objective. **SP**



ON THE OCCASION, DEFENCE MINISTER RAJNATH SINGH, ALONG WITH AIR CHIEF MARSHAL V.R. CHAUDHARI AND PRESIDENT OF THE AIR FORCE ASSOCIATION AIR CHIEF MARSHAL R.K.S. BHADAURIA (RETD) RELEASED A BOOK TITLED 'INDO-PAK WAR 1971- REMINISCENCES OF AIR WARRIORS'



PRIME MINISTER MODI DROPPED IN TO PARIS TO CONGRATULATE PRESIDENT ELECT MACRON ON HIS SECOND CONSECUTIVE ELECTION VICTORY. INDIA AND FRANCE HAVE BUILT ONE OF THE PREMIER STRATEGIC PARTNERSHIPS FOR ADVANCING PEACE, STABILITY AND PROSPERITY IN THE INDO-PACIFIC REGION.

INDIA AND FRANCE – NEXT PHASE OF STRATEGIC PARTNERSHIP

Both sides agreed to find creative ways for France's deeper involvement in the 'Atmanirbhar Bharat' efforts in advanced defence technology, manufacturing and exports, through increased industry to industry partnerships

By **RANJIT KUMAR**

THOUGH DEFENCE IS A STRONG PILLAR OF INDIA-FRANCE relations, this was not the only item on the menu of Modi-Macron meeting in Paris on May 4, 2022. President Emmanuel Macron, who till then had not taken oath for his second Presidential term, received Indian Prime Minister Narendra Modi in his Presidential Elysee Palace and held extensive discussions not only on bilateral relations but international issues, especially Ukraine, were deliberated. The comfort level of strategic relations between European and Asian giants are so high that strategic observers have already started comparing India's relations with Russia during cold war days to the present state of ties between India and France.

Though India's dependence on Russia for defence equipment continue, France has emerged as a major supplier of top-notch military platforms ranging from Mirage 2000s and Rafale to Scorpene submarines and many other high-tech subsystems. Like Russian support to India in manufacturing major weapon systems, India is urging France to expand this cooperation in other sensitive areas also and help India become Atmanirbhar (Self Dependent) in defence equipment. In the backdrop of reports relating to French Naval Group withdrawal from Indian Navy's RFP for six submarines and Indian Navy's plan to acquire naval versions of French Rafale maritime fighters, Indian officials denied having such issues coming for summit level interaction.



Narendra Modi
@narendramodi



Delighted, as always, to meet my friend President @EmmanuelMacron. We talked at length about bilateral as well as global issues. India and France are proud developmental partners with our partnership spread across different sectors.



Emmanuel Macron
@EmmanuelMacron



Tonight, with @NarendraModi, we discussed the different ongoing international crises as well as our strategic partnership. We also talked about food security issues and the FARM initiative, in which India will play a key role.

Giving details of the Modi-Macron discussions on defence cooperation, Indian Foreign Secretary Vinay Kwatra said, "When two strategic partners speak, it covers the discussions in a format which is not necessarily focussed on transaction or individual platforms. India and France are very strong strategic partners and also have very strong defence partnership. The context of defence partnership is defined in case of our two countries by not just trade in different platforms, but it also extends to co-development, co-designing, co-manufacturing. This is very much sync and in line with our own domestic policy of Atmanirbharta, which also of course extends very strongly into the field of defence. So, discussions focussed more on how the two countries can partner more strongly in the field of co-designing, co-development, co-production of different defence equipment in India."

Later in a joint statement, India and France underscored that the long-standing armament cooperation is testimony to the mutual trust between the two sides. The six Scorpene submarines built at MDL in Mumbai illustrates the level of transfer of technology from France to India, in line with the "Make in India" initiative. As seen in the timely delivery of the Rafale despite the pandemic, the two sides enjoy synergy in the field of defence. Taking forward this momentum, and based on their mutual trust, both sides agreed to find creative ways for France's deeper involvement in the "Atmanirbhar Bharat" (Self-reliant India) efforts in advanced defence technology, manufacturing and exports, through increased industry to industry partnerships.

India and France have agreed on setting up a bilateral strategic dialogue to address the contemporary challenges that have arisen in space, in particular, maintaining its secure access. This dialogue will see the corroboration of various experts from space and defence agencies. Furthermore, the first India-France strategic dialogue on space issues will be held in 2022 at the earliest. "India and France have agreed on setting up a bilateral strategic dialogue on space issues," read a joint statement by the Ministry of External Affairs after the talks between the two countries during Prime Minister Narendra Modi's visit. "It will bring together experts from space and defence agencies, administration and specialised ecosystem to discuss security and economic challenges in outer space, the norms and principles applicable to space as well as unveil new areas of cooperation. The two sides agreed to hold the first dialogue this year at the earliest," the statement added.

In an increasingly digitalised world, India and France have strengthened cooperation between their cyber security agencies. Based on a convergent outlook, they agree to join forces in promoting cyber norms and principles in order to counter cyber threats and agree to upgrade their bilateral cyber dialogue with a view to contributing to a peaceful, secure and open cyberspace.

The two sides also launched a number of initiatives to connect their Start-up ecosystems and welcome recent public-private engagement to work together, based on their respective successes, on building standards and protocols for free, inclusive, innovative and open public digital infrastructure and solutions to transform the lives of the people and for the larger global good. India will be the first Country of the Year at this year's edition of Vivatech, Europe's largest digital fair, in Paris.

Building on this solid foundation of ties cemented by strong French support on various forums of United Nations, Prime Minister Modi discussed the next phase of strategic partnership with France as India is assured of continuity in French policy towards India, with the re-election of Emmanuel Macron as President. Foreign Secretary Vinay Kwatra rightly said India and France are strong strategic partners and the two leaders are also good friends. So, it was a golden opportunity for Prime Minister Modi to drop in Paris on his return journey from Berlin and Denmark for a brief working visit to congratulate President elect Macron on his second consecutive election victory. Prime Minister Modi had last visited Paris in August, 2019. As the corona pandemic put a brake on international relations and high level visits, India and France have now resumed summit level in-person visit. President Macron has accepted Prime Minister Modi's invite to visit India as soon as possible.

Strategic relations with France assumed special significance in the post cold war era, when France came to India's rescue on many occasions. In the post Ukraine crisis era, the world will see vastly changed geo-political equations and in this context, India and France will be more important for each other. The strategic ties are expected to go deeper and deeper with both countries increasingly getting dependent on each other for promotion of each other's strategic interests.

Accordingly, the Joint Statement released after Modi-Macron talks said India and France have built one of the premier strategic partnerships for advancing peace, stability and prosperity in the Indo-Pacific region. They share a vision of a free, open and rules-based Indo-Pacific region, based on commitment to international law, respect for sovereignty and territorial integrity, freedom of navigation and a region free from coercion, tensions and conflicts.

Presently India and France are engaged in intense cooperation across all defence domains. Joint exercises (Shakti, Varuna, Pegase, Desert Knight, Garuda) illustrate efforts towards better integration and interoperability wherever possible. The two leaders asserted that maritime cooperation between India and France has reached new levels of trust and will continue through exercises, exchanges and joint endeavours throughout the Indian Ocean. SP



THE LCA MK2 IS UNDER DEVELOPMENT AND WOULD BE AN ENLARGED VARIANT OF MK1. THE 'ROLL OUT' OF THE FIRST PROTOTYPE IS SCHEDULED FOR DECEMBER 2022 AND IAF PLANS TO INDUCT 200 AIRCRAFT BEGINNING IN 2028.

FIGHTER ACQUISITION FOR THE IAF: OPTIONS FOR INDIA

At the current pace of acquisitions and indigenous development, the Indian Air Force can at best restore the authorised strength of 42 fighter squadrons earliest by 2038

By AIR MARSHAL ANIL CHOPRA (RETD)

IN A MEDIA INTERACTION IN OCTOBER 2021, AFTER TAKING over as the Chief of the Air Staff, Air Chief Marshal V.R. Chaudhari said, "The Indian Air Force (IAF) is focused on future warfare. Offensive strike capability will become even more potent with the induction of weapon systems of cutting edge technology. With the upcoming induction of Tejas Mk1A and S-400 missiles, the IAF will be even stronger. Restoring the strength of fighter squadrons is a priority. Meanwhile, the serious show-

down with China in Ladakh that continues has brought greater focus and discussion on the IAF's growth and its challenges.

STATE OF IAF FIGHTER FLEET

The IAF is today at a low of 32 fighter squadrons vis-a-vis the authorised 42. The numbers would go down further when MiG-21 Bison are phased out. The Jaguar will be in service for at least another decade. The process to acquire 126 Medium Multi-Role

Combat Aircraft (MMRCA) initiated in 2007 was finally cancelled. Instead, the government sanctioned emergency procurement of 36 Rafale jets from Dassault of France. Most of these have arrived and remaining will be inducted by mid-2022. Meanwhile, after 21 years since the first flight of the indigenous Light Combat Aircraft (LCA) 'Tejas', only around 32 LCA Mk1 aircraft of the 40 ordered have been delivered. Other than two LCA squadrons, the IAF today has two squadrons of Rafale, 12 of Su-30 MKI, three of Mirage 2000, three of MiG-29s, four of MiG-21 Bison and five of Jaguar.

THE AIR THREAT

China is investing heavily into the aerospace industry and today the People's Liberation Army Air Force (PLAAF) has two home-grown stealth fighters, the J-20 and the J-31 and is to induct the H-20 stealth bomber. It currently has 50 J-20s and targets to have 200 by 2027. It also has 24 Su-35, 500 J-10s and a large number of Su-27 and Su-30 variants. Pakistan has nearly 20 combat units, and is inducting the JF-17 Block III. It has also placed orders for 25 Chinese J-10C in fly-away condition. It is imperative that the IAF quickly rebuild its fighter fleet.

UNFOLDING FIGHTER INDUCTIONS

Delivery against the IAF's order of 40 LCA Mk1 will get completed by mid-2022. The Jaguar fleet is being modernised to DARIN III standard. The fleet of MiG-29 and Mirage 2000 have also been upgraded and 21 upgraded MiG-29s are being procured. The IAF is planning to acquire few second-hand Mirage 2000 to cater for the requirement of spares.

272 Su-30 MKI air-superiority fighters ordered have been delivered and 12 additional Su-30 MKI are being acquired, primarily to replace those that had crashed over the years. Initially, 40 Su-30 MKI aircraft will be upgraded to include the ability to carry the BrahMos cruise missiles and nuclear-capable Nirbhay missiles, get an Active Electronically Scanned Array (AESA) radar, more powerful on-board computers and a new Electronic Warfare (EW) suite. The process is still evolving.

THE LCA MK1A

An operationally better, version called the LCA Mk1A has been evolved. It would have an advanced AESA Radar, an EW suite, mid-air refuelling capability and incorporate weight reduction along with easier maintainability. The order for 83 LCA Mk1A was placed in February 2021. The first flight of the Mk-1A aircraft was earlier scheduled for March 2022, is now rescheduled for June 2022.

LCA MK2

The LCA Mk2 under development would be an enlarged variant of Mk1 with the more powerful General Electric F-414-GE-INS6 engine. The 'roll out' of the first prototype is scheduled for December 2022 with its first flight in 2023. The IAF plans to induct 200 aircraft beginning in 2028.

The Tejas Mk2 Medium Weight Fighter will have a compound delta wing with close-coupled canards. The longer fuselage will allow for more internal and external fuel. The weapon stations will increase from seven to 11, with carrying capacity increase from 5.3 to 6.5 tonnes. It will also feature an indigenous integrated life support system, a built-in integrated electro-optic electronic-warfare suite and other improvements to avionics. It will have an infra-red search and track system and a missile approach warning system and a modern AESA radar. It is said to



CONTENDERS FOR THE IAF MRFA PROGRAMME:
(TOP) DASSAULT RAFALE; (MIDDLE) LOCKHEED MARTIN F-21; (ABOVE) MIG-35.

be designed for swing role, with BVR and close-combat capability and precision strike.

The Aeronautical Development Agency (ADA) completed Mk2 Critical Design Review on November 15, 2021. From 62 per cent in Tejas Mark 1A, 70 per cent indigenisation is targeted for Mk2. Also, the Mk2 will imbibe some of the technologies being developed for Advanced Medium Combat Aircraft (AMCA). The aircraft is meant to replace the Jaguar, Mirage 2000 and MiG-29 in the IAF.



CONTENDERS FOR THE IAF MRFA PROGRAMME:

(TOP) BOEING F-15 EX; (MIDDLE) SAAB GRIPEN NG; (ABOVE) SUKHOI SU-35.

LCA PRODUCTION

HAL currently has a production capacity of 12 aircraft a year. HAL has indicated that they will be able to deliver 12 to 14 aircraft in financial 2021-2022. The Ministry of Defence (MoD) had set a target of 16 aircraft per year. The rate at which IAF squadrons are depleting, the desired rate is at least 18 to 20 per year. Even though the indigenous content of the Tejas is increasing, major systems such as engine and radar are still of foreign make.

AMCA – INDIA'S FIFTH GENERATION AIRCRAFT

The AMCA is the fifth generation fighter aircraft being developed for the IAF. Being designed by ADA, it is expected to be produced by a public-private joint-venture between the DRDO, HAL and the private sector. It will be a single-seat, twin-engine, stealth, all-weather, swing-role fighter aircraft. Two variants of AMCA are planned. AMCA Mk1 will come equipped with fifth generation technologies and Mk2 will have the incremental sixth generation technology upgrades. It would one day be a replacement for the Su-30 MKI.

The AMCA design will have shoulder-mounted diamond-shaped trapezoidal wings and an all-moving Canard-Vertical V-tail with large fuselage mounted tail-wing. ADA is working on major technological issues like thrust vectoring engine, an advanced AESA radar and low radar cross section and super-cruise capability. The AMCA will initially fly with two GE-414 engines. Eventually, it is planned to be powered by two GTRE, 90 kN thrust, K9 or K10 engines which are successor to the troubled Kaveri engine.

The project entered the detailed design phase in February 2019. The first flight is expected to be by around 2025 and serial production might begin by 2030. The IAF is planning for two squadron of AMCA Mk1 and five squadron of Mk2 variant. There is also plan for a light combat aircraft variant of AMCA. After consultations in November 2021 between IAF, HAL, DRDO, ADA, MoD and Ministry of Finance, the final design of AMCA prototype is getting ready for approval from Cabinet Committee.

RAFALE NUMBERS

Operationally, for a large air force, just 36 aircraft is too low a figure. The IAF has the infrastructure in place for two more squadrons. Also, considering India has made many one-time payments such as for India-specific modifications, that expenditure will get amortised and the cost of additional orders should be lower.

Many countries have ordered Rafale fighter jets recently, with Indonesia becoming the new entrant. One scenario could be that 36 more Rafale are acquired and thereafter, India puts all its energies on developing an indigenous aircraft. It is time to make the appropriate call.

114 NEW FIGHTERS

Responses for the IAF's Request for Information for 114 4th generation plus fighters were received in July 2018. The seven contenders are Dassault Rafale, Eurofighter Typhoon, Lockheed F-21, JAS 39 E/F Gripen NG, MiG-35 and Su-35. The Request for Proposal (RFP) has still to be issued. Even if the process is hastened, the earliest these aircraft can arrive is 2027. The US is pushing the case of Boeing F-15 EX. It is time that the RFP is sent out without further delay.

THE TASK AHEAD

At the current pace of acquisitions and indigenous development, the IAF can restore the authorised 42 squadrons earliest by 2038. If India were to succeed, the IAF's end state should be two squadrons of Mirage 2000, two of Jaguars, 14 of Su-30 MKI, two of Rafale, 14 of LCA Mk1 & II, two of AMCA and six of the newly selected fighter, making a total of 42 squadrons. The LCA and AMCA projects need to be hastened. The variables and anxieties will continue to hit the AMCA. Joint ventures or technology transfers may be required for the engine, AESA and EW systems. Time to act is now, lest India be left behind in its global ambitions.

BOEING DEFENSE — A LONG STANDING JOURNEY IN INDIA

With a local sustainment footprint, indigenous execution and local training, Boeing Defense India (BDI) ensures the high availability of platforms for missions at a competitive cost structure

By AIR VICE MARSHAL SANJAY BHATNAGAR (RETD)

IN A RECENT DEVELOPMENT, ON APRIL 22, 2022, INDIAN Finance Minister Nirmala Sitharaman met Ted Colbert, CEO, Boeing Defense and discussed opportunities for investments and growth in maintenance, repair, and operations (MRO) and aircraft leasing in India. The Finance Minister was visiting the US to attend IMF-WB Spring Meetings 2022.

Last decade has witnessed increased Indo-US military engagement. Enhanced defence partnership has translated into Indian defence supplies from the US rising to approximately over \$20 billion. Most of it has come from the US aerospace and defence major, Boeing Defense, Space & Security (BDS). It is emerging to be a key partner to Indian armed forces. It has been offering defence equipment for the Indian Air Force (IAF), Indian Navy (IN) and the Indian Army, across various domains of operations.

C-17 GLOBEMASTER IIIs

In 2009 the IAF had selected the C-17 Globemaster IIIs for its requirement of 'very heavy lift transport aircraft'. The \$4.5 billion contract was signed in 2011 and the first C-17 Globemaster IIIs was inducted in 2013. With the last aircraft delivered in 2019, the IAF now has a fleet of 11 C-17 Globemaster IIIs, becoming the biggest operator of these aircraft in the world, outside of the US.



BOEING PRESIDENT AND CEO DAVE CALHOUN MET WITH INDIA'S PRIME MINISTER NARENDRA MODI TO DISCUSS BOEING'S COMMITMENT TO HIS ATMANIRBHAR BHARAT VISION



The C-17 Globemaster III is the most flexible aircraft, capable of rapid strategic delivery of troops and all types of cargo to main operating bases or directly to forward bases in the deployment area. The aircraft can perform tactical airlift and airdrop missions and can transport ambulatory patients during aeromedical evacuations.

The C-17 Globemaster has proven to be the backbone of IAF's heavy lift capability. In recent rescue and evacuation efforts, the aircraft had carried a large number of passengers and huge quantities of material over large distances. Noteworthy has been the several sorties undertaken to evacuate Indian citizens from Afghanistan and most recently, during the Russian-Ukrainian war, the aircraft was deployed under Operation Ganga to evacuate thousands of Indian nationals stranded in the war-torn region. During COVID-19, the aircraft was employed for transporting Liquid Medical Oxygen cylinders and other medical supplies. Earlier, during the stand-off in Eastern Ladakh, the C-17 Globemaster III were extensively employed by the IAF to airlift heavy tanks, army personnel as well as armoured carriers to high altitude.

POSEIDON P-8I

Poseidon P-8I is an aircraft designed for long-range anti-submarine warfare, anti-surface warfare and intelligence, surveillance and reconnaissance missions. It was inducted into the Indian Navy's (IN) fleet in 2013 and is now the mainstay of IN and has undertaken numerous missions clocking more than 35,000 hours. IN had initially ordered eight aircraft and it was the first international customer of P-8I aircraft. Later, under the 'Options Clause' another four were ordered, with the last aircraft being delivered on February 23, this year, the fleet is now complete with 12 aircraft.

CH-47 CHINOOK HELICOPTERS

In September 2015, India placed a \$3.1 billion order for 15 Chinooks and 22 Apache attack helicopters. All the platforms have been inducted.

Boeing completed the delivery of 15th Chinook helicopters to the IAF in October 2020. Prior to this, the IAF relied on a small fleet of Russian Mi-26 heavy transport helicopters for heavy-lift purposes.

Chinooks are being extensively employed by the US Army and by the militaries of more than 19 countries around the world. It is a twin-engine, tandemrotor, heavylift helicopter (payload capacity of 10 tonnes), capable of airlifting diverse military and non-military loads into remote locations. It has a fully integrated glass cockpit for mission management, a digital advanced flight control system to enhance aircrew safety and advanced cargo handling capabilities. All these systems enable aircrew to swiftly change roles from moving cargo to transporting army personnel, vehicles, and other material to meet the mission demands.

The Chinook has strategic airlift capability to deliver heavy payloads to high altitudes operations in the Himalayas. It can carry the Army's new M777 ultra-light howitzers as underslung load for swift deployment in the mountains.

On April 11, 2022, the Chinook helicopter set a record by flying more than 1,900 kms, non-stop, from Chandigarh to Jorhat. The IAF variant does not have mid-air refuelling capability and carried additional internal tanks.

AH-64E APACHE

The Apache attack helicopters were delivered in India by

BOEING'S EXPANDING FOOTPRINT IN INDIA



DAVE CALHOUN, PRESIDENT AND CEO OF BOEING MET Prime Minister Narendra Modi on his recent visit to India and highlighted Boeing's continuing efforts to strengthen India's growing aerospace and defence industry through their investments in engineering, manufacturing and research, and the work to improve skills and grow the supplier-partner network across India and on a global scale.

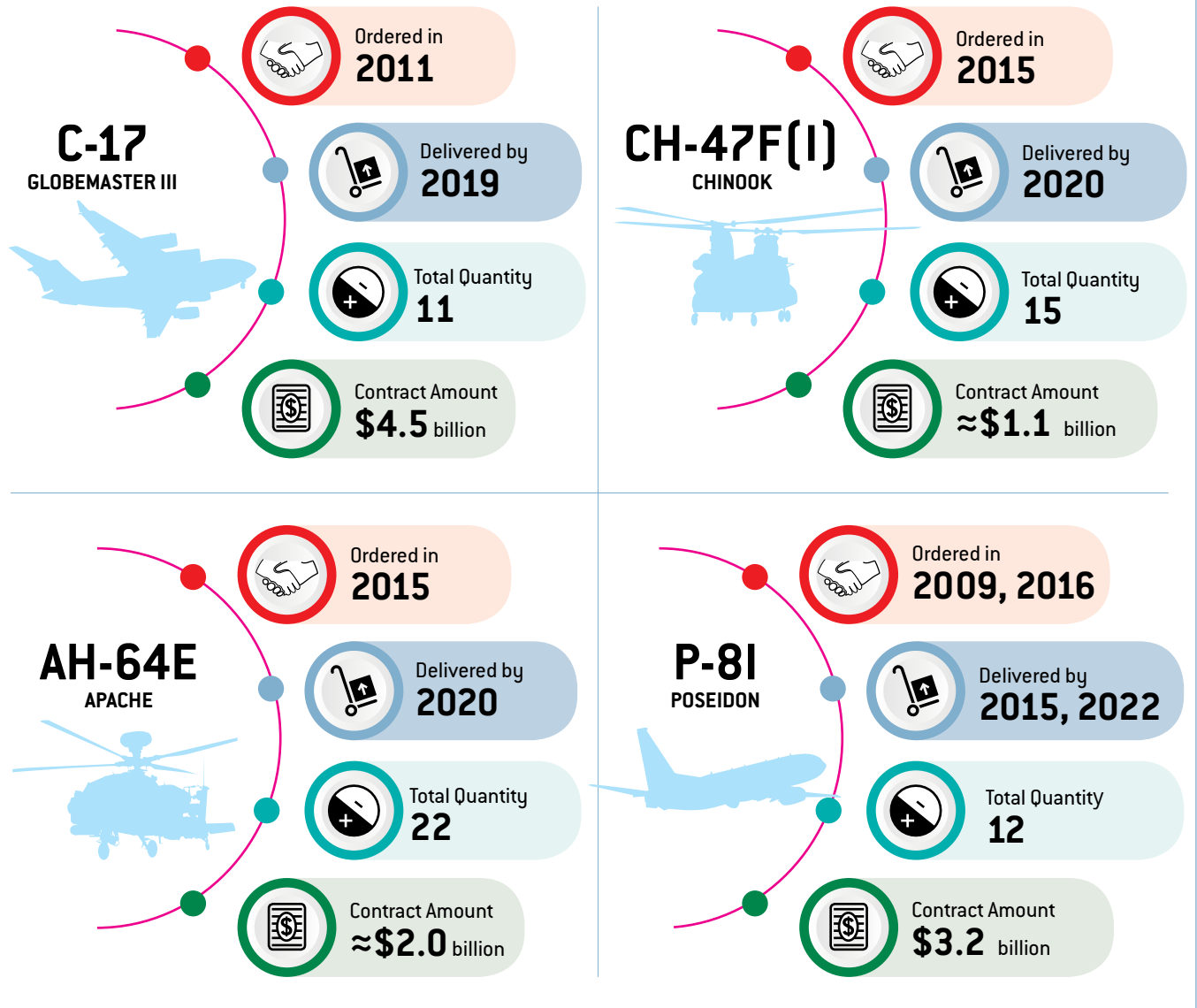
Calhoun also met with India's Finance Minister and discussed Boeing's growing presence in India, the nation's innovative policy framework, and how Boeing can support the growth of India's leasing industry at GIFTCity. [SP](#)

June 2020, thereby making India the 16th nation to possess this advanced multi-mission helicopter with the latest technology.

The Apache is equipped with the latest communications, navigation, sensor and weapon systems. It has an improved modernised Target Acquisition and Designation System that provides day, night and all-weather target information, as well as night vision navigation capability. It is a multi-role helicopter meant to undertake reconnaissance, security, peacekeeping operations and lethal attack, across different terrains, without reconfiguration.

During the stand-off with China in Eastern Ladakh, the AH-

BOEING DEFENSE, SPACE & SECURITY – LONG STANDING JOURNEY IN INDIA



64E Apaches were deployed at the Leh air base as part of the forward movement of assets.

The IAF has 22 Apache attack helicopters. In early 2020, India and the US have signed a contract for the acquisition of six Apaches for the Indian Army.

BOEING 777

The custom-made Boeing B777 VVIP aircraft, with call sign Air India One, was inducted in 2020 to replace the ageing 747. The state-of-the-art retrofitted Air India One is used to fly the President, Vice President and the Prime Minister on international state visits.

Two Boeing 777s have been retrofitted with two systems major self protection systems, viz. Large Aircraft Infrared Countermeasures and Advance Integrated Defensive Electronic Warfare Suites. Besides this, the aircraft has radar warning sensors, missile warning receivers, anti-missile flares, intruder detection systems and a countermeasure dispensing system. The aircraft has been fitted with the most advanced communication technology which will enable the VVIP on-board the aircraft to be connected to the outside world, at all times.

The aircraft is configured with a well-equipped conference room, an operation theater, a spacious bedroom and a special lounge for long duration international flights. The Air India One

BOEING AND AIR WORKS ACCELERATE MRO CAPABILITIES FOR THE INDIAN NAVY'S P-8I FLEET

BOEING AND AIR WORKS ARE CURRENTLY UNDERTAKING heavy maintenance checks on three P-8I long-range maritime patrol and anti-submarine warfare aircraft operated by the Indian Navy at Air Works, Hosur. This dramatically increases the scope and scale of Maintenance, Repair and Overhaul (MRO) undertaken in the country and demonstrates both the companies' commitment in making India Atmanirbhar in aerospace and defence.

Boeing India and Air Works will commemorate their collaboration at the Boeing India Atmanirbharta in Defence Conference being organised in New Delhi on Tuesday, May 10, 2022, with participation from dignitaries from the Indian Navy, Air Works Group, and other key supplier-partners.

Surendra Ahuja, Managing Director, Boeing Defence India, said, "We are proud to build on our existing collaboration with Air Works that enables us to generate significant value for our defence customers in India, and contribute towards the Government's vision of making India an MRO hub for the region. The ongoing satisfactory execution of heavy maintenance checks on three P-8I platforms concurrently by Air Works is a remarkable achievement."

Boeing's strategic collaboration with Air Works was an important first step under the Boeing India Repair Development and Sustainment (BIRDS) hub launched last year. The BIRDS hub

envisions a collaboration with key local companies and businesses to develop India into an aviation and defence repair and sustainment hub.

"The heavy maintenance checks on Indian Navy's P-8I complement our vision of creating stronger and sustainable MRO capabilities, within the country. Maintaining such mission-critical plat-

forms for the nation's defence forces is a matter of immense pride for Air Works. At the same time, it also reflects the "coming-of-age" or maturing of indigenous MRO capabilities in aviation, defence and aerospace, which can deliver huge advantages for the country. We thank Boeing for their trust in us and look forward to expanding our strategic partnership to eventually deliver operational excellence on other critical platforms of our defence forces to their complete sat-



BOEING'S P-8I AIRCRAFT OF THE INDIAN NAVY

isfaction," said D. Anand Bhaskar, Managing Director & CEO, Air Works Group.

The Boeing and Air Works collaboration has already been enabling faster turnarounds and enhanced operational capability within the country for the country's key defence platforms. The partnership began with the first P-8I aircraft Phase 32 checks, and has grown to include Phase 48 checks and MRO on the landing gear of the Indian Air Force's 737 VVIP aircraft. **SP**

jet can fly from India to the US without the need to stop for refuelling. Once refueled, this aircraft will be able to fly continuously for 17 hours. The Air India One aircraft is operated by specially-trained pilots from the Indian Air Force and maintained by Air India Engineering Services Limited (AIESL), which is a subsidiary of the Air India.

₹8,400 crore is known to be the total cost of purchase and configuration of these B777 aircraft.

FOLLOW ON SUPPORT, MAINTENANCE REPAIR OVERHAUL (MRO) AND LOGISTICS SUPPLY LINES

Various follow on support, logistics supply lines, training and other services for various platforms purchased by India are being offered by another division of The Boeing Company, viz. Boeing Global Services (BGS).

In February 2021, Boeing has signed a strategic collaboration with aviation services provider Air Works for the maintenance, repair and over-

haul (MRO) of its VIP transport aircraft fleet operated by the IAF. This partnership is a first under the newly launched Boeing India Repair Development and Sustainment (BIRDS) hub initiative.

BIRDS hub is a Boeing-led 'in-country network and alliance of supplier' in India to provide engineering, maintenance, skilling, repair and sustainment services for defence aircraft operated by both the IAF and the IN. This partnership also includes MRO support to the IN operated Poseidon P-8I long-range maritime patrol aircraft.

114 MULTI-ROLE FIGHTER AIRCRAFT (MRFA)

In 2018, IAF had issued a Request for Information (RFI) for the procurement of 114 Multi-Role Fighter Aircraft (MRFA). The new fighters are expected to replace the aging MiG-21s, Mirage 2000s, and the Jaguars. In October last year, Chief of Air Staff (CAS), Air Chief Marshal V.R. Chaudhari had announced

Boeing Defense, Space & Security (BDS) is emerging to be a key partner to Indian armed forces by offering defence equipment for the Indian Air Force, Indian Navy and the Indian Army, across various domains of operations



(CLOCKWISE FROM TOP LEFT) TATA BOEING AEROSPACE DELIVERS FIRST AH-64 APACHE COMBAT HELICOPTER FUSELAGE; BOEING INDIA REPAIR DEVELOPMENT AND SUSTAINMENT (BIRDS) SIGNS THE FIRST BIRDS PARTNERSHIP WITH AIRWORKS INDIA TO SUPPORT THE ATMANIRBHAR BHARAT VISION OF INDIA AS A MRO HUB; BOEING IS CONTENDING THE IAF'S MRFA PROGRAMME WITH THEIR F-15EX FIGHTER PLANES; BOEING HAS ANNOUNCED A PARTNERSHIP WITH HAL AND MAHINDRA DEFENCE SYSTEMS FOR MANUFACTURING THE SUPER HORNET F/A-18 E/F IN INDIA

that the ambitious procurement must adhere to the 'Make in India' initiative.

The competition is tough with leading fighter aircraft manufacturers from across the globe participating in the programme, Boeing contending with their Super Hornet F/A-18 E/F and F-15EX fighter planes. Boeing has been proactive and has announced a partnership with HAL, along with Mahindra Defence Systems for manufacturing the Super Hornet F/A-18 E/F in India.

IAF is yet to issue the request for Proposal (RFP) for its 114 MRFA. It would be worth closely monitoring as to how this estimated \$18 billion acquisition progresses.


TOWARDS ATMANIRBHAR BHARAT ABHIYAAN

It is worth mentioning that during his recent visit to the US for the 2+2 ministerial dialogue, Defence Minister Rajnath Singh met senior executives of Boeing Defense on April 11, 2022 and asked them to take advantage of policy initiatives in India to steadily march from 'Make in India' towards 'Make for the World'.

With reference to increased Indo-US military engagement, the Defence Minister said, "It's a reflection of the growing depth and scale of our defence partnership. In a decade, our defence supplies from the US rose from negligible to a cumulative amount of over \$20 billion. We look forward to US com-

panies investing in India and supporting the 'Make in India' programme."

Boeing is cognizant of the policies being steered by the Indian Ministry of Defence (MoD) and has taken certain proactive steps that provide impetus to the Indian Atmanirbhar Bharat scheme. Boeing has already made some good progress by taking a lead in supplying certain equipment to meet not only the Indian demand but to also meet global demand. In that Tata Boeing Aerospace Limited (TBAL), a joint venture between Boeing and Tata Advanced Systems Ltd (TASL), was established in 2016 over a 14,000 sqm facility at Hyderabad for manufacturing of fuselages for the AH-64 Apache (production commenced since May 2018) and vertical fin structures for the 737 family of aircraft. Estimated annual sourcing by Boeing from India currently stands at approximately \$1 billion. This state-of-the-art advanced manufacturing facility hopes to eventually become the sole producer of AH-64 Apache fuselages in the world. There is certainly more scope for growth in this field, opening up more opportunities for micro small and medium enterprises in the Indian defence sector.

Boeing Defense partnership with Indian armed forces is a befitting saga of taking forward the Indo-US strategic partnership. How this long standing collaboration pans out in next few years would be interesting to watch. 

The armed forces have recently signed contracts for drones with Indian defence companies and start-ups under the fast-track process for acquisition of new-age weapons

By AIR MARSHAL ANIL CHOPRA (RETD)



THE C295W MILITARY TRANSPORT AIRCRAFT WILL BE THE FIRST TIME THAT A TRANSPORT AIRCRAFT WILL BE BUILT IN INDIA AND THAT TOO BY AN INDIAN PRIVATE SECTOR COMPANY

BOOST TO INDIA'S AIRCRAFT PRODUCTION ECOSYSTEM

IN THE ANNUAL BUDGET FOR 2022-2023, THE ALLOCATION FOR defence is ₹5.25 lakh crore, a 9.82 per cent jump from the previous year. It is 13.3 per cent of the total union budget of ₹39.45 lakh crore and 2.03 per cent of India's GDP for 2022-2023. The defence allocation excluding pensions is ₹4.05 lakh crore. Of this, ₹1.52 lakh crore is for capital expenditure for the modernisation of the armed forces. This is an increase of 12.82 per cent from previous year. A sum of ₹1.03 lakh crore or 68 per cent of the defence capital budget is allocated for acquiring locally produced weapons. This would thus give a boost to indigenous defence production and 'Atmanirbhar Bharat'. Major amounts would go towards Tejas Light Combat Aircraft (LCA) Mk-1A, Light Combat Helicopters (LCH), basic trainer aircraft HTT-40, Arjun Mk-1A tanks, missiles and other weapons.

BOOST TO DEFENCE INDUSTRIAL ECO SYSTEM

25 per cent of the defence research and development budget has been set aside for funding the academia, start-ups and private industry. There are additional amounts for the newly created seven Defence Public Sector Undertakings, an Emergency Authorisation Fund and funding of Innovations for Defence Excellence to support innovation and technology development. There is special funding for Defence Testing Infrastructure Scheme to create international standard testing infrastructure. Special Purpose Vehicles will be encouraged between DRDO and private players. Private industry would also be supported for testing and certification through a nodal umbrella. Simplified customs tariffs have been introduced. Existing exemptions on import of defence and security items will be petered off.

All this should support the target of ₹1,75,000 crore defence production by 2025, and achieve the \$5 trillion economy by 2025. In the high technology areas, foreign equipment manufacturers would be more inclined to form Joint Ventures (JV)

and bring in Foreign Direct Investment (FDI). Some of these JVs will also support defence exports. With defence manufacturing corridors already in place, the nation is getting seriously into defence production.

THE C295 CONTRACT GETS SIGNED

After nearly ten years of waiting, the ₹21,000 crore Airbus-Tata project for 56 C295W military transport aircraft for replacing the ageing HS-748 aircraft of the Indian Air Force (IAF) was cleared. An additional six may be acquired by the Indian Coast Guard. 16 C295W aircraft will be delivered in fly-away condition by Airbus Defence and Space (Spain) within two years. The rest 40 will be manufactured in India by the Tata Consortium. It will be the first time that an operational transport aircraft will be built in India and that too by an Indian private sector company.

INDIA'S SUCCESS IN BUILDING FIGHTER AIRCRAFT

The state-owned HAL began aircraft manufacturing as early as 1942. HAL has been involved in designing and manufacturing of fighter jets, helicopters, jet engine, avionics, software development, spare supply, overhaul and upgrade of Indian military aircraft. HAL licence-produced over 300 de Havilland Vampires, 800 MiG-21 variants, Folland Gnat, MiG-27 M, Jaguar, BAE Hawk and Su-30 MKI.

The HF-24 Marut was the first indigenous fighter-bomber of which 200 were built in India. ADA-HAL Light Combat Aircraft (LCA) "Tejas" is currently under production. It is a fourth generation plus aircraft for which the IAF has committed to procure over 300. 40 Mk1 are already under delivery and 83 Mk1A have been ordered. LCA Mk2 is under development and its first flight is expected by 2024. A fifth-generation stealth fighter, the Advanced Medium Combat Aircraft (AMCA) is under develop-



(LEFT) INDIGENOUSLY MANUFACTURED LIGHT COMBAT AIRCRAFT (LCA) "TEJAS" IS CURRENTLY UNDER PRODUCTION. 40 LCA MK1 ARE ALREADY UNDER DELIVERY AND 83 MK1A HAVE BEEN ORDERED; (RIGHT) NEARLY 400 INDIGENOUS ADVANCED LIGHT HELICOPTER "DHURUV" HAVE BEEN BUILT BY HAL

ment with a targeted first flight around 2025. India has finally come of age in its fighter aircraft manufacturing eco-system.

HELICOPTER PRODUCTION

For many decades, HAL license-built over 300 Aerospatiale Alouette III variants called Cheetah, Lancer and Cheetal Variants, Chetak and Chetan. The big success came with the indigenous Advanced Light Helicopter "Dhruv" nearly 400 of which have been built by HAL. The weaponised variant is the "Rudra", with over 70 built. Also in production now is the Light Combat Helicopter, the attack helicopter variant. The Light Utility Helicopter variant is under trial. HAL is also developing an Indian Multi-role Helicopter. Clearly, India may not need to import military helicopters.

OTHER MAJOR AERO-STRUCTURE PROJECTS

Large private industrial houses have entered defence manufacturing in a big way. Tata Aerospace and Defence have been making the AH-64 Apache combat helicopter fuselage and aero-structures for Boeing's CH-47 Chinook helicopters. All C-130Js delivered to customers around the world have major aero-structure components from India where 24 C-130 empennages are produced annually. Sikorsky, a Lockheed Martin company, also relies on Hyderabad-based Tata Advanced System Limited (TASL) as the manufacturing base for its global supply of cabin for the S-92 helicopter. The Tata group is working with GE to manufacture CFM International LEAP engine components in India. Lockheed Martin selected TASL to produce F-16 wings in India. There are many private companies making defence electronics, large aero-components, advanced technology components and sub-systems. Dynamatic Technologies makes assemblies of vertical fins for Su-30 MKI fighters. They are also supplying aero-structures to Airbus for A320 aircraft and the wide-body A330 aircraft. Hyderabad's VEM technologies manufactures centre fuselage for LCA Tejas. Many Indian MSMEs and start-ups are entering defence production.

C295 PLATFORM

The CASA C295 is a medium tactical transport aircraft that was originally designed by the Spanish company CASA in the 1990s as Nurtanio CN-235. CASA joined the European aeronautical group EADS in 2000. The now designated C-295 made its first flight on November 28, 1997, and entered operational service

in 2001. The aircraft has a rear ramp door for para-dropping of troops and cargo. All 56 aircraft will be installed with indigenous electronic warfare suites. The C295W is the enhanced performance version with winglets and uprated engines. It is powered by Pratt & Whitney PW127 engines, a part of the PW100 family. The C295 also has an AEW&C variant among many other roles.

Of the 40 C295s that Tata will build, eight will be from semi-knocked down kits and another eight from completely knocked down kits. The remaining 24 are to be built with incrementally indigenising the assemblies and sub-assemblies. Before completion of deliveries, a D-level MRO facility will be set up in India which will act as a regional MRO hub for various variants of C295 aircraft. Over 165 C295 variants are in service in 30 countries.

INDIGENOUS TRANSPORT AIRCRAFT PRODUCTION

The Saras is the first Indian multi-purpose civilian aircraft in the light transport aircraft category designed by the National Aerospace Laboratories (NAL). The Saras prototype completed its maiden flight at Bengaluru on May 29, 2004. On March 6, 2009, as the first prototype crashed during a test flight, the programme was put on hold but revived in 2016. The new version is a 14-seater instead of 19 and has many improved features. The IAF has contracted with NAL for the purchase of 15 Saras aircraft and may need 45 more later. NAL is also engaged development of Saras Mk2, a 19-seater version of the airliner.

HAL successfully conducted ground-run and low-speed taxi trials of the made-in-India Hindustan-228 aircraft end August 2021. It is a look-alike of the 19-seater DO-228 aircraft which was so far being manufactured under licence from RUAG for Indian defence forces and European markets.

THE WAY AHEAD

The HAL/NAL Indian Regional Jet is an airliner being designed by NAL and to be manufactured by HAL. The aircraft is planned to be a turboprop or a jet with a capacity of 80-100 passengers. The 90-seater variant of the aircraft is under design and is targeted to enter service in 2026. Unmanned systems are already being manufactured in the country. The armed forces have recently signed drone contracts with Indian defence companies and start-ups under the fast-track process for acquisition of new-age weapons. India would thus become a global player in all genres of aircraft building. SP



THE GROWTH IN BUSINESS AVIATION ACTIVITY HAS MODERATED IN 2022, BUT IS STILL AT A RECORD HIGH, AND WELL AHEAD OF 2021

BIZJETS' ELEVATED TAKE OFF IN 2022

Carrying forward from the holiday high, business jets began 2022 on a record New Year demand, reported WingX Advance

By AYUSHEE CHAUDHARY

BUSINESS JETS HAD A RELATIVELY RELIEVING SIGH AS THE END of 2021 saw a rise in activity even amid speculations of the new variants of COVID-19 virus. The optimism has managed to continue even in this New Year. The holiday season's fervour to explore winter destinations seems to be on a continuum. For the first ten days of January 2022, business jets flew 26 per cent more flights than two years ago, on the eve of the pandemic, noted global data management and analysis company, WingX Advance. Compared to January 2019, business jet activity in the beginning of January this year is up 18 per cent. While in comparison to the virus-affected slowdown last year, this year is already up by 38 per cent.

Three weeks into January 2022, global business aviation traffic has surpassed last January by 17 per cent, and is tracking 10

per cent up versus January 2019. Scheduled passenger airlines have operated 29 per cent more flights than in January 2021, but 30 per cent fewer than in January 2020. Since business aviation demand rebounded in mid-2021, flights have exceeded the same pre-pandemic period by 12 per cent. This month's numbers were boosted by the New Year holiday, flights up 20 per cent on the New Year week in 2019. Things have cooled down since the world went back to work, but even the latest week was the busiest ever for mid-January, up 31 per cent on last year, up nine per cent on 2020 and five per cent higher than in 2019.

NORTH AMERICA NAILS

Despite raising Omicron concerns, North America has come out as the strongest bizjet market, with flights up almost 30 per



GROWTH IMPETUS IS COMING FROM AIRCRAFT OWNERS, WITH PRIVATE AND CORPORATE FLIGHT DEPARTMENTS FLYING 21 PER CENT MORE THAN 2 YEARS AGO

cent so far. The stellar rebound that the business jet utilisation experienced in 2021 is continuing in the United States(US) even through January, with the first ten days of 2022 seeing flights increase by 31 per cent compared to January 2020. On a rolling 7-day basis, flights were up 45 per cent on January last year, up 30 per cent on January 2019, reported WingX. January 2nd was relatively the high point; business jet holiday makers flew over 7,000 flights on January 2nd 2021, compared to 4,500 sectors on January 2nd in pre-pandemic 2019.

Florida continued the demand as the global hub of business jet travel in 2022, with the traffic going up 21 per cent on an already strong 2021, and 45 per cent ahead of January 2020. It was further interesting to note that international connections are up 47 per cent on last year, domestic flights up 24 per cent. The strongest international connections were with Canada, Mexico, and Bahamas, well up this year compared to last year. International travel suffered last year majorly due to the travel restrictions which are still not entirely open as in the pre-pandemic world but are relatively accessible in certain regions.

EUROPE SKIING TO THE TOP

Europe is also buoyant in bizjets, with sectors up 20 per cent. With its regional airline traffic down almost 50 per cent during the initial days of January compared to 2020, bizjet traffic is running at early 2020 levels, reported WingX.

The ski season which has been known to normally elevate Geneva in the European bizjet ranking, proved no exception this January. Compared to

January 2021, business jet departures from Geneva are up 91 per cent this year, and up 29 per cent versus January 2020.

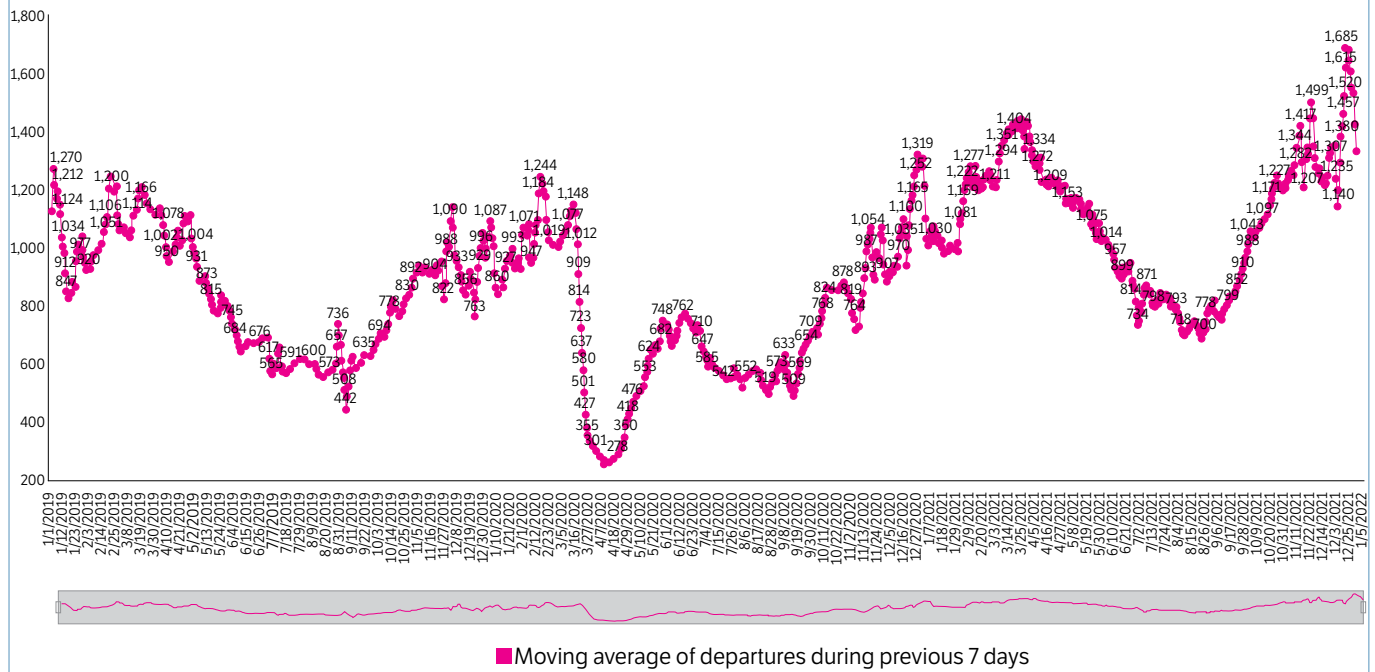
Business jet demand in Europe powered ahead in January 2022, going up 53 per cent on January last year, and up 16 per cent on January 2020. International traffic rebounded on last year's lows, with sectors up by 69 per cent as the most severe cross-border restrictions are lifted. Even in comparison to January 2019, international flights are up 16 per cent. France has emerged as the busiest European market, witnessing 25 per cent up domestic flights on last year. The busiest international connection is from Switzerland to the UK, with almost four times as many flights as January last year. The UK has seen a strong recovery from the rut of January 2021, with outbound bizjet flights up by 87 per cent. In Europe, the Omicron wave and associated lockdowns did slow flight activity in some countries towards the latter part of January but those trends were relative to January 2020; compared to January 2021, the traffic volumes are up. Overall, the European region is seeing 13 per cent more activity in January 2022 versus January 2020, with strongest growth in Spain, Russia, Turkey, Sweden.

Busiest airports in the UK saw a strong comeback, with Farnborough seeing 339 business jet departures in January, more than double the traffic last year. Biggin Hill traffic is up 140 per cent on last year, which is rebounding well above pre-pandemic levels, flights up 40 per cent on January 2020.

Outside Europe and the US, the busiest business jet markets include Canada,

**Three weeks into
January 2022,
global business
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January by 17 per
cent, and is tracking
10 per cent up
versus January 2019**

MOVING AVERAGES/DAILY DEPARTURES



Source: WINGX

Australia, Brazil, New Zealand, Russia, Turkey, UAE, and Colombia. Most of these markets are ahead of where they were last year. UAE, where business jet traffic is still way ahead of pre-pandemic, but slightly down vs January 2021. Business jet departures from the Maldives are 78 per cent up on two years ago but almost 50 per cent lower in January year on year.

GROWTH ROUTES TOWARDS AIRCRAFT OWNERS

However, WingX also noted that towards the end of January, the growth in business jet flights saw a shift towards aircraft owners. The growth in business aviation activity has moderated in 2022, but is still at a record high, and well ahead of January 2021. Stronger growth may resume as Omicron dissipates, although there are increasing risks in the macroeconomic and geopolitical environment which could easily undermine flight demand in the next few months.

Midway into January 2022, just over 200,000 business aviation sectors flown globally, 25 per cent more than in January 2021, and 16 per cent more than in January 2020. The impetus now appears to be coming from aircraft owners, with private and corporate flight departments flying 21 per cent more than January two years ago, the report highlighted. Charter and Fractional operators are still flying at record highs, but with growth moderating compared to the end of last year.

There is clear evidence of a shift in the recovery toward owned and man-

aged aircraft even in the US, with these operators flying respectively 24 per cent and 32 per cent more than two years ago. Florida has been the departure point for more than 10 per cent of all business jets and turboprops this January, with outbound flight hours trending 51 per cent higher than January two years ago. Business aviation departures from Florida to Bahamas are up 45 per cent, to Canada, up 15 per cent, to Dominican Republic, up by 64 per cent.

The leisure demand had a further boost in the flight activity during the Martin Luther King (MLK) Jr Day holiday. There were 23,171 business jet sectors flown between 14th and 17th January 2022, compared to 18,410; 20,609, and 20,897 flights during the previous years' holidays, marking this year's activity as a record high point.

The growth trend for the European region in Q421 compared to Q419 was 24 per cent. The trend varies significantly across cabin size, with Midsize and Very Light Jets operations up more than 25 per cent, whereas Heavy and Ultra-Long Jet activity is back to 2019 levels.

Outside the US and Europe, there have been 20,000 business jet sectors flown in the first half of January, trending up by 7.5 per cent compared to January 2020. The emphasis remained on midsize and light jet demand, with longest-range jets flying less than pre-pandemic. Mexico has shown the strongest recovery in the last six months, with early January maintaining a growth trend versus 2019. SP

Compared to January 2021, business jet departures from Geneva are up 91 per cent this year, and up 29 per cent versus January 2020; adding to the buoyant Europe



FILE PHOTO OF EBACE IN ALL ITS GLORY BEFORE THE PANDEMIC

EBACE RETURNS TO TAKE OFF BIZAV INDUSTRY

Hosted by EBAA and NBAA, the event is scheduled to be held from May 23-25, 2022
in Geneva

By AYUSHEE CHAUDHARY

ONE OF THE BIGGEST BUSINESS AVIATION EVENTS IS BACK after two years of pause due to the pandemic. The 2022 European Business Aviation Convention & Exhibition (EBACE2022), “Europe’s premier on-demand aircraft and advanced air mobility event” is all set to bring the business aviation world together from May 23, 2022 to May 25, 2022 at Palexpo in Geneva, Switzerland, and the Geneva International Airport.

The event comes as an opportunity to experience new and future-forward aviation technologies including everything from high-tech small aircraft through ultra-modern intercontinental jets, advanced air mobility and eVTOL aircraft, state-of-the-art avionics and much more from all of the top aircraft manufacturers. This year’s show promises to highlight what the future holds for the industry, from advanced air mobility to new tech-

nology to promote sustainability and more. Taking forward from the previous editions’ focus on sustainability, innovation and a new generation of professionals, EBACE2022 envisions to chart a flight path for the future of the industry.

An EBACE preview webinar was organised on May 11, 2020 where the officials announced that over 250 exhibitors had registered for the event and the number is increasing each day.

EBACE2022 assembles the latest aircraft and aviation equipment manufacturers and suppliers, industry leaders, emerging technologies and more in one venue. Hosted by European Business Aviation Association (EBAA) and National Business Aviation Association (NBAA), this is not just an exhibition but also a platform that allows the stakeholders an insight into the busi-

PHOTOGRAPH: EBACE



FILE PHOTOS (ABOVE): EMBRAER AIRCRAFT ON DISPLAY AT EBACE;
(LEFT): JETHQ PRESENTS A DASSAULT FALCON 7X.

ness aviation world. It provides an opportunity to:

- Find out how new advanced technologies will impact your business.
- Explore which innovations can help make your business more profitable and sustainable.
- Engage with companies that are paving a new way in the business aviation marketplace.
- View and compare what's on the market and the latest in avionics at the side-by-side aircraft display.
- Hear about the latest product innovations and advancements from OEMs and other aviation companies.

EBACE2022 promises a full lineup of sessions focused on the latest trends, featuring experts and providing solid take-aways and forward-looking education highlighting:

- Aircraft product evolution – driven by research and development.
- New sustainable technologies on display, demonstrated, and launched into existence.
- New approaches to managing safety, innovations in protocols and avionics, and give an update on safety legislation

Key issues like Ukraine issue, supply chain disruptions etc are expected to be discussed. The event will also witness significant keynote sessions and opening remarks from renowned names including, Martina Navratilova, Tennis Champion as well as an aviation enthusiast; Maya Ghazal, the first female Syrian

refugee pilot and UNHCR Goodwill Ambassador, and Zara Ruth-erford, the youngest woman to fly solo around the world.

INNOVATION

The EBACE2022 Innovation Pavilion will highlight the industry's ongoing investment and development in bringing electric vertical takeoff and landing (eVTOL) and advanced air mobility (AAM) aircraft to market, featuring nearly a dozen models from companies including Aeromobil, Lilium and Pipistrel. "There's a lot of excitement surrounding AAM and we're pleased to showcase these pioneering technologies at EBACE," said Rachel Clementi, senior conference and innovation lead manager with EBAA. The Innovation Zone will feature AAM and innovation-focused education sessions and expert panels. There will also be nearly a dozen models from game-changing companies, including Hang, EVIATION, Hydroplane Ltd, Lilium, PAL-V, Pipistrel, SAMAD Aerospace, VoltAero.

SUSTAINABILITY

A new sustainability standards program is to be introduced at EBACE, called S.T.A.R.S. – Standards & Training for Aviation Responsibility and Sustainability. The program was initiated by young business aviation professionals from half a dozen companies in Europe who want to take a holistic approach to sustainability, going beyond emissions reductions and extending the concept to such "social" concerns as workplace diversity and inclusion, said Róman Kok, EBAA communications manager.

The pilot S.T.A.R.S. programme in Europe is now underway, and early participants have devised a three-tier programme of goal-setting, progress monitoring and full implementation. They are working toward development and introduction of industry-wide sustainability standards "and an accompanying label," according to EBAA.

Kok notes that key to the programme's success will be the integration of the S.T.A.R.S. label into existing requirements for IS-BAO, and IS-BAH, two sets of best practices produced by the International Business Aviation Council. Beyond Europe, EBAA's Young Ambassadors, who are heading up the programme, see



FILE PHOTOS (ABOVE): GULFSTREAM AIRCRAFT ON DISPLAY;
(RIGHT): EHANG AUTONOMOUS AIR VEHICLE.

application of S.T.A.R.S., in North America, and ultimately in the Middle East, Africa, Latin America and Asia.

AIRCRAFT

More than 50 of the most advanced business aircraft, from high-tech small aircraft through ultra-modern intercontinental jets are expected to be on display at the show. The show's outdoor aircraft display will feature the latest offerings from renowned manufacturers such as Airbus, Dassault Falcon, Pilatus, and other global aircraft OEMs including Embraer, Gulfstream, Honda Aircraft Company and Textron Aviation. A full range of helicopters, turbo-props, jets, large intercontinental business jets, to smaller turbine-powered aircraft, as well as several piston engine aircraft is expected to be showcased.

First-time aircraft on display will include:

- Bombardier Global 7500
- Gulfstream G700
- Dassault Falcon 6X
- Tecnam P2012 Traveller
- VoltAero Hybrid powered CASSIO
- 1 Démonstrator

OPPORTUNITY

Along with other general networking opportunities, students interested in learning more about business aviation, and the possibilities the industry holds, have a golden opportunity with Careers in Business Aviation Day, taking place on May 25, at EBACE. "Students are encouraged to engage with the exhibitors, ask questions and network," said Rachel Clementi. "This is a unique opportunity to engage with companies in all sectors of the industry, tour the latest business aircraft and get practical advice on how to best become a part of a thriving industry."

Careers in Business Aviation Day will include:

- A dynamic panel discussion on how to break into the industry and the types of opportunities available
- A guided tour for high school students of company exhibitions and aircraft
- A university student roundtable with recruiters offering practical advice on CV writing, interviewing and networking



- The opportunity to meet with business aviation companies actively seeking fresh talent.

MOBILE APP

The official EBACE mobile app allows attendees to prepare for the show, enhance their event experience and serves as a useful reference all year long. The free mobile app – available for the iPad, iPhone and Android smartphones – includes the following:

- Full convention agenda with locations and descriptions of education sessions and key events
- An exhibitor directory with stand locations, company descriptions and product and service categories
- An interactive exhibit floor plan of Palexpo
- Ability to create a personal profile visible to other app users so you can network with fellow attendees before, during and after the event
- A timeline displaying the latest posts and photos from fellow attendees in real time and the ability to upload your own status updates and photos.

NBAA President, Ed Bolen remarked during the preview, "EBACE is about engagement; with products; with people. It is an opportunity to celebrate business aviation, for the future has never looked so bright. We have gone forward and it is the future that will be on display at EBACE. The magic of being together with the people who share same passion." SP



THE PANDEMIC RESULTED IN A SURGE IN INTERNATIONAL AIR CARGO YIELDS, WHICH INCREASED 3.3 TIMES IN 2021 FROM THE 2019 LEVEL

CAPA INDIA SKETCHES INDIA'S AIR CARGO LANDSCAPE

The cargo industry witnessed good yields during the pandemic, however, demand fluctuations are anticipated ahead and structural shifts are required for industry's scaling

By AYUSHEE CHAUDHARY

GIVEN THE HIGHLY INTERESTING JOURNEY THAT AIR CARGO has had during and after the pandemic, across the globe, its growth and structural transition are among the most anticipated talked about subjects. India's air cargo industry also witnessed an interesting shift as the demand arose.

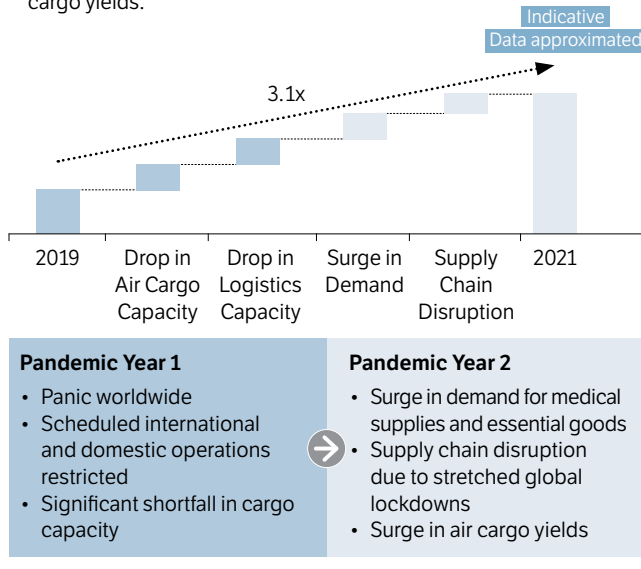
During COVID times, cargo proved to be the savior that was responsible for the survival of much of the industry. Despite serious capacity constraints, the remarkable strength of yields meant that cargo revenue quickly returned to, and in many cases exceeded, pre-COVID levels. The performance of air cargo during the pandemic upheld it as of critical strategic impor-

tance to airlines, especially in India. All major operators saw strong contribution from cargo:

- SpiceJet turned into serious cargo operator and its survival was due to cargo revenue, registering revenues closer to ₹3,700 crores during 2021-2022
- IndiGo outperformed the market, even in absence of freighters, clocking revenues closer to ₹3,000 crores in cargo revenue during 2021-2022
- Even Air India Express achieved exceptional cargo performance, with revenues closer to ₹250 crores during 2021-2022

REASONS FOR INCREASE IN AIR CARGO YIELD, 2019-2021

In 2021, the shortfall in industrial and logistics capacity, along with an increase in demand for essential goods, led to a surge in air cargo yields.

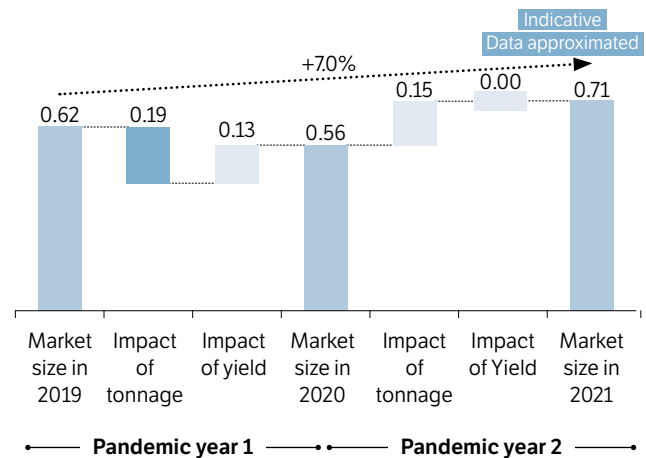


Source: CAPA Advisory research and analysis

INDIA'S DOMESTIC AIR CARGO INDUSTRY, 2019-2021

The pandemic resulted in a surge in domestic air cargo yields, with a 14.4% CAGR which led to a 7.0% CAGR in market size between 2019-2021

Market size grew up at a 4.3% CAGR over 2015-2019 as opposed to a 2.6% CAGR drop in air cargo yield



Source: CAPA Advisory research and analysis

However, prior to COVID, air cargo was largely considered to be non-strategic by Indian airlines especially in the domestic market. The domestic express market largely revolved around Blue Dart, operating just five freighters pre-COVID, highlighted Kapil Kaul in a CAPA India session. He brought in limelight the attempts to launch other dedicated cargo and express airlines which quickly failed in India. Despite several serious attempts including inter-ministerial efforts to remove structural barriers, cargo remained non-strategic to most. Only perhaps airports, freight forwarders and the supply chain were interested in cargo, but overall outcomes remained sub-optimal.

The key reasons for failure to realise the full potential from cargo operations as highlighted in the session included:

- A casual and ad hoc approach towards people issues, distribution, sales and marketing, technology, and possible lack of understanding of the market.
- Cargo not being a priority in airline board room discussions.
- Structural and systemic issues related to infrastructure, policy and regulation, security, logistics, customs, and competitiveness.

However, India's dedicated freighter fleet has increased from 5 to 28 in last few years particularly last two as cargo has now become a boardroom agenda item. After COVID-19 though, the new found strategic importance of cargo was reflected in:

- IndiGo ordered 4x A321XLR freighters and plans for a JV with UPS
- SpiceJet increased focus on cargo and induction of more freighters - current fleet size being more than 20
- Blue Dart responding to increased competition by expanding its 757 fleet

CARGO IN INDIA DURING PANDEMIC

India faced a significant capacity drop relative to demand during pandemic. This led to an increase in cargo load factors in line with the global air cargo trend. In 2021, the shortfall in industrial and logistics capacity, along with an increase in demand for essential goods, led to a surge in air cargo yields.














India witnessed stable trade during the pandemic and did not see any significant change in its air export and import trade baskets. India is a leading pharmaceutical exporter, with a 20 per cent share of the global supply based on volume catering to about 40 per cent of generic demand in the US and 25 per cent of all medicine demand in the UK. However, India's pre-COVID supply chain for pharma and electronic sectors shows China as a high concentration zone, indicating risk for procurement. India is primarily dependent on China for key raw materials and components supplies for manufacturing electronic products. The other key suppliers are Hong Kong, Taiwan, and South Korea. China accounted for 37 per cent of the overall imports of India before COVID-19. COVID broke global value chains creating industry-wide disruptions. India's heavy reliance on China for imports led to exposure to supply shocks during the pandemic.

The pandemic resulted in a surge in international air cargo yields, which increased 3.3 times in 2021 from the 2019 level, which led to the market increasing 76.2 per cent CAGR (compound annual growth rate) over 2019-2021. The pandemic also resulted in a surge in domestic air cargo yields, with a 14.4 per cent CAGR which led to a 7 per cent CAGR in market size between 2019-2021.

OPPORTUNITY FOR INDIAN CARGO

Pricing inefficiencies, operational bottlenecks and a relatively low penetration of technology in air cargo had rendered India somewhat uncompetitive against global peers. However, going

INTERNATIONAL AIR CARGO SNAPSHOT, FY2020

Air cargo trade indicators, FY2020		Key air cargo trade partners, FY2020			<div><div></div><div></div><div></div><div></div></div>			
<div></div> <div>\$155.3 billion Total trade value</div>		<div></div> <div>Value: \$28.9 Share: 18.7%</div>	14.0%		45.1%	20.6%	10.5%	2.3%
<div></div> <div>25.4% Air cargo penetration by trade value</div> <div>India's air cargo penetration is lower than the average global air cargo penetration of 35.0%</div>		<div></div> <div>Value: \$19.2 Share: 12.4%</div>	7.5%		48.5%	38.4%		
		<div></div> <div>Value: \$17.7 Share: 11.4%</div>	7.8%			57.3%	4.9%	4.1%
		<div></div> <div>Value: \$9.5 Share: 6.1%</div>	4.5%		77.6%	11.3%		
		<div></div> <div>Value: \$7.9 Share: 5.1%</div>	0.9%		79.8%		5.1%	2.4%
<div></div> <div>16.5% Penetration of air cargo carried by volume of Indian carriers</div>		<div></div> <div>Value: \$6.8 Share: 4.4%</div>	10.2%			37.7%	5.6%	4.4%

Share of top commodities by trade partner, FY2020

Note: 1) The total trade value excludes the values of crude oil and petroleum products

Source: CAPA Advisory research and analysis; DGCA

ahead, there is a significant opportunity in cargo, especially on international routes as Indian carriers only capture around 10 per cent of international cargo to and from India (12 from India) 90 per cent is carried by foreign airlines. India's leading passenger markets also align with many of its largest trade partners. In markets such as the US, Canada, UK and Australia; India has a surplus in trade volumes. Airlines can build long haul connectivity to core markets with the support of cargo which can significantly strengthen route economics.

According to CAPA Advisory, even in the domestic market significant opportunities exist and those airlines that invest in understanding the market in terms of industries commodities distribution and marketing-supported by integrated partnerships will benefit.

POSSIBLE DEMAND SUPPRESSION

Although many factors contributed to surge in yields for India's air cargo business, CAPA suggests that this still is a temporary glitch majorly due to pandemic.

- All key pivots that contributed to the surge in air cargo yields during COVID-19 are temporary.
- When the impact of these pivots recede, yields should stabilise and the current euphoria may dissipate.
- Planned investments in people, infrastructure and digitalisation, and expanded operations will drive higher revenue. However, CAPA Advisory does not see structural shifts in the near to medium term.
- In fact, the market may possibly saturate in the next 1-2 years with normalisation of belly capacity in FY2022/23, permission for international freighter operations, investments in shipping capacity, supply-side excess.

- Meanwhile, inflation of the prices of goods and services, increased interest rates, higher fuel prices, possible recessionary conditions, and geo-politics issues may all converge simultaneously to suppress demand.
- The new shipping capacity that is expected to come online in the medium term and the potential correction in the input costs of all industries, including aviation, could put pressure on air cargo yields.
- Surge in available industrial and logistics capacity would put pressure on air cargo yields.

Air cargo yields will stabilise in the coming quarters, primarily due to an increase in capacity and the stabilisation of demand. In this regard CAPA identified some deflationary factors and some inflationary factors.

Deflationary factors include:

- Increase in industrial capacity due to easing of mobility restrictions
- Increase in air cargo capacity owing to opening up of international borders
- Entry of new players
- Expansion of shipping and trucking capacity
- Demand stabilisation due to increased consumption of services relative to goods

Inflationary factors include:

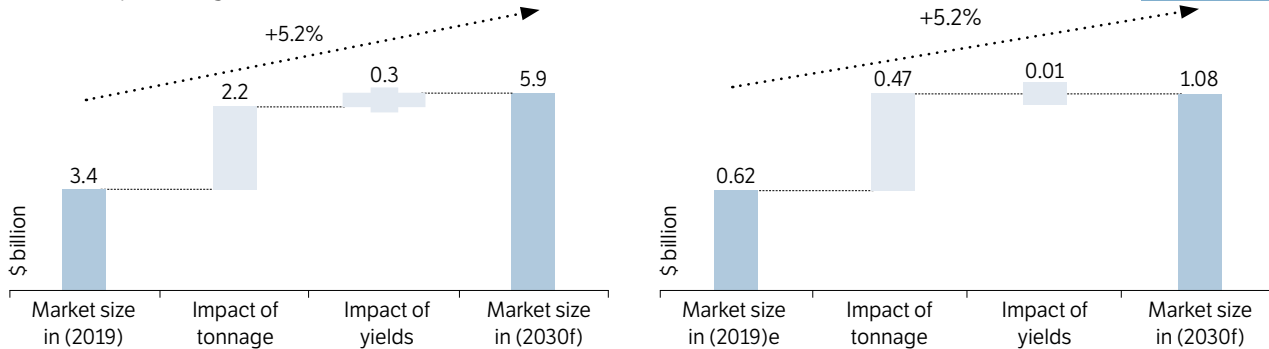
- High crude oil prices would render the stabilisation of cargo yields difficult
- High crude oil prices
- Inflationary pressures due to the increase in the cost of both goods and services

Although these factors will place upward pressure on air

INDIA'S INTERNATIONAL AIR CARGO INDUSTRY SIZE, 2019E-2023F AND INDIA'S DOMESTIC AIR CARGO INDUSTRY, 2019E-2023F

Although air cargo yields are expected to stabilise by 2023 (which will lead to a correction in the air cargo market size), the market size is expected to grow at a 5.2% CAGR over 2019-2030.

Indicative
Data approximated



Yield (\$/kg)	2019e	2021e	2023f	2025f	2030f
International air cargo	1.6	5.4	2.4	1.7	1.7
Domestic air cargo	0.45	0.60	0.45	0.43	0.45

The variation in air cargo yields is estimated based on the crude oil price forecast. When crude oil prices stabilise, prices should remain stable in the long term. Hence, air cargo yields are likely to be stable between 2025 and 2030.

Note: 1) 'E' stands for estimated, 2) 'F' stands for forecast

Source: CAPA Advisory research and analysis; AAI

cargo yields, inflation will weaken demand further, which will, in turn, force carriers to reduce freight rates. Despite the expected growth in cargo throughout, the value of India's international air cargo market will decline relative to the pandemic due to the normalisation of yields. CAPA believes that the market size which soared to about 10.5 billion by 2021 should start stabilising soon and there should be a correction and it should be about 5.4 billion by 2023. The very high air cargo yields that everyone earned during the two years of COVID should start stabilising soon and because of stabilisation increase, the market size between 2021 and 2030 should drop by about 6.2 per cent CAGR.

The high cargo revenue growth achieved by many airlines, especially Indian carriers, despite a decline in the overall cargo tonnage, was due to surge in yields. This surge was largely due to the dual impact of supply constraints and an increase in demand due to a shift in the consumption basket. Although these factors helped carriers earn higher revenue and profits from the cargo segment, they are temporary. It is unlikely that these shifts and constraints are structural due to the following reasons:

- With the world recovering to the pre-COVID-19 level of mobility, the consumption of services is expected to increase, thereby reversing the shift in the consumption basket
- With international borders opening up and scheduled commercial airline operations growing, the supply constraints too shall diminish
- The industry may in fact experience strong headwinds, in contrast to the conditions since April 2020. There is a possibility that recessionary economic conditions may emerge, characterised by further decline in the demand for goods due to high inflation and elevated crude oil prices.

FUTURE OF CARGO IN INDIA

However, there is still an opportunity for Indian carriers to expand their footprint in the air cargo industry, by fixing structural imbalances and by focusing on markets with high potential for passenger and cargo revenues. Although it must be noted that many of these markets are long-haul and only a few Indian carriers will be in a position to seize this opportunity.

The emphasis that Airlines are now placing on cargo is a fundamental shift and will alternately be a positive for the aviation industry and for the Indian economy. Realisation of the cargo potential is a mindset shift but on ground the structural shift will take time. Structural shifts in underlying demand-driven by the governments serious to teaching focus on make in India, trade competitiveness, re drawing of FTAs, PLI scheme will occur but over a period of time.

Many structural shifts are required to provide a much-needed boost to the air cargo industry in India including:

- Enhance competitiveness of Indian industries: Various initiatives undertaken to promote manufacturing in India, in addition to reforms in India's regulatory regimes to ease doing business in India
- Eliminate tariff & non-tariff barriers faced by Indian companies: Discussions ongoing with various countries such as Japan and South Korea to fix the structural imbalances in India's trade with all countries
- Change in regulatory regime to increase trans-shipment cargo: Simplification of the processes to aid industries
- Enhance competitiveness of air cargo industry. 

(The article content is based upon CAPA India's research shared during a webinar organised by the advisory.)



BOEING B-29 BOMBER – NUCLEAR NEMESIS

While the B-29 initially failed as a conventional high-altitude daylight strategic bomber, it met significant success as a low-altitude night-time bomber, perhaps because the Japanese air defences were weak

THE BOEING B-29 SUPERFORTRESS IS FAMOUS ON MANY counts, but chief among them is that it is the only aircraft ever to have delivered nuclear bombs in war. This American, four-engine, propeller-driven heavy bomber was operated mainly during the Second World War and the Korean War. It was designed for high-altitude strategic bombing, but was far more deadly when utilised for low-altitude night incendiary bombing. It was built with the European theatre in mind, but was finally deployed in the Pacific theatre and used to mount devastating attacks against Japan.

What ultimately turned out to be one of the most important aircraft programmes of World War II began in June 1939, when the United States (US) Army Air Corps felt the need for a new long-range bomber. Boeing had been working on an advanced bomber design and submitted its proposal for the B-29 in early 1940. It received an initial contract in September 1940 and the first prototype of the B-29 flew on September 21, 1942. Meanwhile the US had entered World War II in December 1941.

The B-29's design was extremely advanced for the period, yet it went from drawing board into battle in under four years. It had a long, narrow, high-aspect ratio wing with large Fowler flaps, allowing it to cruise at high speeds at high altitudes, but maintain comfortable handling characteristics during takeoff and landing. It was powered by four Wright R-3350 Duplex-Cyclone twin-row, supercharged, air-cooled, radial aircraft engines with 18 cylinders each and rated at 2,200hp each.

The B-29 had a cruise speed of 190 knots, maximum speed of 310 knots and range of 2,820nm. It was the first bomber to house its 11-man crew in pressurised compartments which gave it a high operating ceiling of 31,850 ft. When it entered production, it was one of the world's largest aircraft and undoubtedly the heaviest. It had a dual-wheeled tricycle landing gear. Quite amazing for the 1940s was an analogue computer-controlled fire-control system that allowed a gunner and a fire-control officer to direct four remote machine gun turrets.

Four main-assembly factories and thousands of subcontractors were involved in the B-29's manufacture. However, it soon became apparent that the bomber's highly advanced design, coupled with its hurried development and intense pressure for rapid production, would create problems. In December 1942, a test flight of a prototype had to be abruptly terminated due to a serious engine fire. And in February 1943,

the same aircraft again experienced engine fire and crashed, killing Boeing test pilot Edmund Allen, his 10-man crew and 21 people on the ground. Of the first 96 aircraft built, only 16 were rated as flyable. Still with the War in a critical phase the pressure to get the B-29s into combat continued and its teething troubles were gradually resolved.

In December 1944, the US began employing B-29s based at the Mariana Islands to bomb Japan. The initial high-altitude, supposedly precision bombing missions, were largely ineffective. The prevailing jet streams rendered the bombing computers highly inaccurate and cloud cover meant that visual target acquisition was rarely possible. In March 1945, Major General Curtis LeMay changed the strategy to low-level attacks with incendiary bombs. These night-time raids carried out by hundreds of B-29s, destroyed much of Japan's industrial and economic infrastructure. In fact, a single attack on the night of March 9, 1945, in which 334 B-29s participated, dropped 1,667 tonnes of incendiary bombs on Tokyo, destroying 41 square kilometres and killing an estimated 1,00,000 civilians. It remains the single deadliest bombing operation ever, deadlier than the nuclear attacks that came just months later.

A B-29 named 'Enola Gay', piloted by Colonel Paul Tibbets, dropped the first atomic bomb on Hiroshima on August 6, 1945. Three days later, another B-29 named 'Bockscar', piloted by Major Charles Sweeney, dropped the second bomb on Nagasaki. The devastation caused by these two attacks is too well known to need repetition.

When production ended in 1946, 3,970 B-29s had been built. Each aircraft was hugely expensive and the programme ultimately cost \$3 billion, equivalent to around \$48 billion today. As against this, the Manhattan Project that developed America's nuclear bomb cost just \$1.9 billion. While the B-29 initially failed as a conventional high-altitude daylight strategic bomber, it met significant success as a low-altitude night-time incendiary bomber, perhaps because the Japanese air defences were weak. Its place in history is assured mainly because of its record as the only bomber to have delivered a nuclear weapon in anger. In fact no other aircraft of the period could have brought the proud Japanese practically to their knees. The last B-29 retired from squadron service in the USAF in September 1960. SP

— JOSEPH NORONHA

APPOINTMENTS

AIR HEADQUARTERS

On May 1, 2022, Air Marshal Sanjeev Kapoor assumed the appointment of Director General (Inspection and Safety) of the Indian Air Force (IAF) at Air Headquarters, New Delhi.

BOEING

Boeing announced the following:

- Ted Colbert as President and Chief Executive Officer of its Defence, Space and Security business effective April 1, 2022.
- Stephanie Pope, currently Boeing Commercial Airplanes Chief Financial Officer as President and CEO of Boeing Global Services.

MTU AERO ENGINES AG

The Supervisory Board has unanimously appointed 46-year old Lars Wagner who is the Chief Operating Officer of MTU, as future CEO of MTU as of January 1, 2023.

LOCKHEED MARTIN

On March 14, 2022, Lockheed Martin announced the appointment of John Clark as the Vice President and General Manager of Advanced Development Programmes also known as Skunk Works effective from April 4, 2022. He succeeded Jeff Babione who retired end of March 2022.

RAYTHEON TECHNOLOGIES

Raytheon Technologies has appointed Barbara Borgonovi as Senior Vice President of Corporate Strategy and Development, effective April 1, 2022.

SATCOM DIRECT

Satcom Direct, the business aviation solutions provider has made the following appointments in the recent past:

- Brian Roos as the Asia Pacific, Regional Director.
- Kaviraj Nadarajah as the Regional Sales Manager.

QUICKROUNDUP

AIRBUS

On April 27, 2022, Airbus signed a Memorandum of Understanding (MoU) with Tata STRIVE, a skill development initiative of Tata Trusts and the Aerospace and Aviation Sector Skill Council (AASSC) to train young Indians for employment in aviation and aerospace sectors. The AASSC is the apex body in skill development in aerospace and aviation sector under the aegis of National Skill Development Corporation (NSDC). The MoU was signed by Rémi Maillard, President and Managing Director, Airbus India & South Asia, Anita Rajan, CEO - Tata STRIVE and Wg Cdr Rachit Bhatnagar CEO, AASSC.

The Airbus Global Market Forecast which is well known for its evaluation of the airline industry's aircraft needs during a 20-year time frame, also assesses the sector's workforce and the most recent survey estimated a need for over 7,00,000 new technicians and engineers for aircraft maintenance by 2040. To assist the airline and maintenance industry, Airbus has launched a programme to support academies for training technical manpower.

BOEING

On May 2, 2022, Boeing reported increased stability and growth for aircraft finance sector as 100 percent of Boeing deliveries were financed by third parties with the top sources of delivery funding coming from cash, capital markets and sale leasebacks for second consecutive year. Capital markets continued to play a key role in shoring up liquidity for the sector, close to pre-pandemic levels for most issuers as spreads tightened throughout the year.

On April 28, 2022, Boeing unveiled the first T-7A Red Hawk advanced trainer jet to be delivered to the US Air Force. The jet, is one of 351 Red Hawk trainers the US Air Force plans to order. The fully digitally designed aircraft was built and tested using advanced manufacturing, agile software development and digital engineering technology, significantly reducing the time from design to first flight.

On April 26, 2022, Boeing Global Services announced a new agreement with Spirit AeroSystems, Inc and its affiliates to combine aftermarket resources, expanding the MRO footprint in support of nacelle and flight control repairs for the global Boeing 737 MAX fleet. The agreement will enhance Boeing support for nacelle and flight control surface removals with a more robust MRO footprint while combining Boeing's industry-leading asset pool with the hands-on repair experience of Spirit AeroSystems.

NORTHROP GRUMMAN

On May 4, 2022, Northrop Grumman Australia announced that it will offer space technology capabilities to the Commonwealth for JP9102, the Australian Defence force's Satellite Communication System project. Northrop Grumman, Inmarsat, L3Harris, AECOM, Blacktree Technologies, EM Solutions and Vocus will draw on decades of collective experience to invest in and grow an Australian sovereign satellite communications capability.

MILITARY

ASIA-PACIFIC

SUCCESSFUL FIRING OF EXTENDED RANGE VERSION OF BRAHMOS AIR LAUNCHED MISSILE FROM SU-30 MKI AIRCRAFT

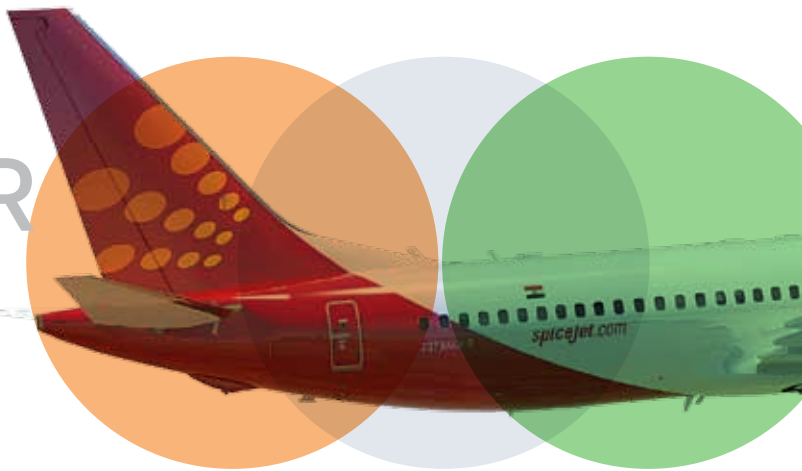
India, today successfully fired the Extended Range Version of BrahMos Air Launched missile from Su-30 MKI fighter aircraft. The launch from the aircraft was as planned and the missile achieved a direct hit on the designated target in the Bay of Bengal region.

It was the first launch of Extended Range version of BrahMos missile from Su-30 MKI aircraft. With this, the IAF has achieved the capability to carry out precision strikes from Su-30 MKI aircraft against a land/ sea target over very long ranges. The dedicated and synergetic efforts of the IAF, Indian Navy, DRDO, BAPL and HAL have proven the capability of the nation to achieve this feat. The extended range capability of the missile coupled with the high performance of the Su-30 MKI aircraft gives the IAF a strategic reach and allows it to dominate the future battle fields.

INDIA, FRANCE TO COLLABORATE FOR ENGINE OF ADVANCE MEDIUM COMBAT AIRCRAFT

India and France are close to finalising a deal, for the joint development of a 125Kilonewton (Newton is defined as the force which gives a mass of 1 kg an acceleration of 1 metre per second per second) thrust engine, for India's fifth-generation fighter aircraft programmed named AMCA. The deal is between DRDO and aero engine manufacturer Safran of France. The matter has been discussed with the Defence and Foreign Ministers of India and France to expedite the contract. It is hoped that the contract will be signed soon. ●

NO ROOM FOR COMPROMISE IN AIR SAFETY



While operating across the skies, it is quite normal for Airliners to encounter turbulence caused by rising columns of air which is a consequence of natural heating of the atmosphere

By AIR MARSHAL B.K. PANDEY (RETD)

THERE IS NO DOUBT THAT AIR TRAVEL IN INDIA IS REASONABLY safe and is regarded not only the fastest, but also the safest mode of travel in the country today. However, accidents or even minor incidents involving Indian carriers always attract considerable media attention. The most recent case of an Indian carrier being involved in an incident while on a scheduled flight with a total of 195 persons on board including members of the flying and cabin crew, was that of a Boeing 737 MAX held on the inventory of the Indian low cost carrier SpiceJet. The initial part of the SpiceJet flight that was operating from Mumbai to the Kazi Nazrul Islam Airport in Durgapur in West Bengal, was free of any problem. However, the aircraft encountered severe turbulence towards the end of its flight when it was in a descent to land at the destination. Based on the information on weather pattern available, the pilot in command had assessed the possibility of severe turbulence and had deviated towards the left of the flight path. Unfortunately, the pilot in command was not aware of the air pocket that caused the turbulence after deviating from the original track.

This episode was possibly a case of clear air turbulence which is very difficult for a pilot to detect. While a developing thunderstorm that would cause severe atmospheric turbulence can be detected by the radar mounted on the aircraft which can be seen by the pilot in command or by the ground based radar, there is no possibility of a pilot in command detecting the possibility of clear air turbulence visually or by weather radar mounted on the aircraft. Also, not all possibility of turbulence can be forecasted accurately by the department of meteorology. In this particular case, the turbulence was unusually violent and was so severe that it unfortunately resulted in injuries to a number of passengers on board. This incident took place on May 1 this year.

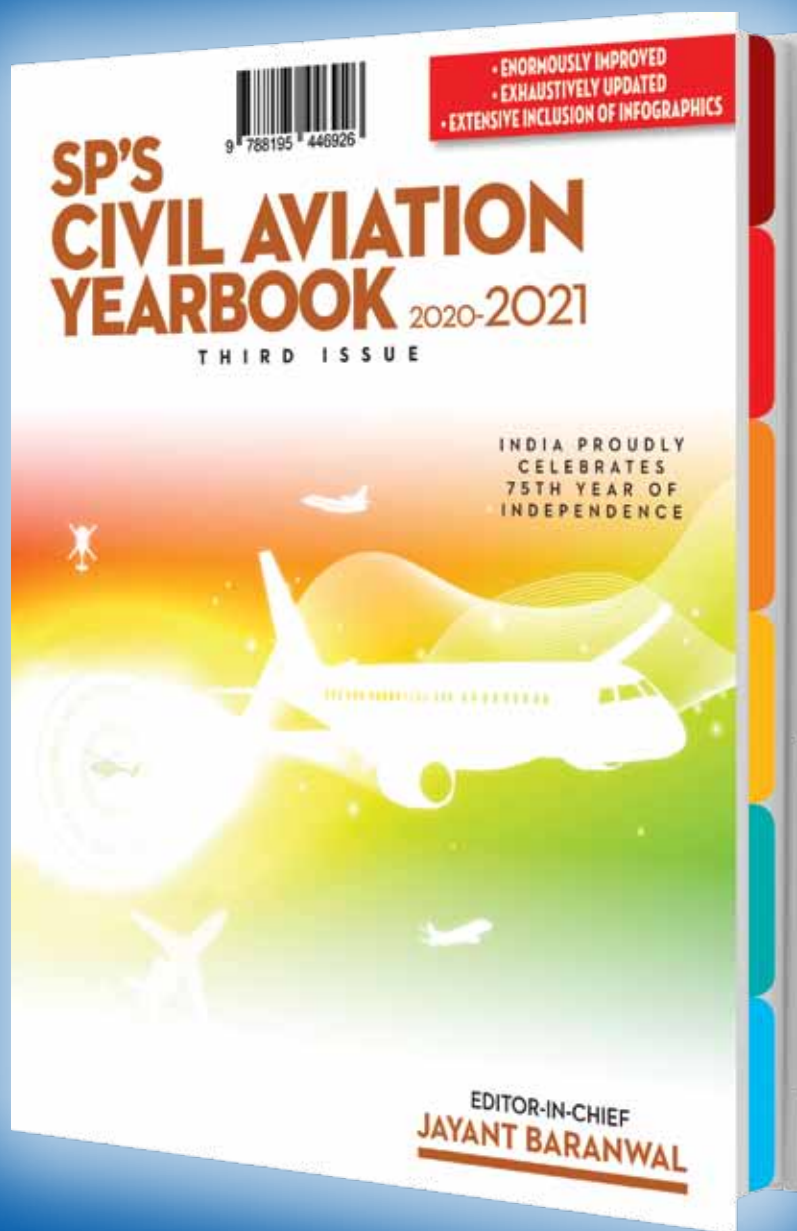
While operating across the skies, it is quite a normal phenomenon for Airliners to encounter turbulence that is caused by rising columns of air which is a consequence of natural heating of the atmosphere. While in most cases the atmospheric turbulence only results in minor bumps and jerks for the aircraft resulting in only minor discomfort for passengers on board. During instances of moderate turbulence, the pilot in command would not face any problem in maintaining control of the aircraft. However, in the case of severe turbulence, it could lead to abrupt changes in altitude and attitude of the airplane along with variations in airspeed

of the aircraft. In the case of extreme turbulence, the aircraft can be tossed around violently and hence it could become extremely difficult if not impossible for the pilot in command to maintain control of the aircraft and retain stable flight conditions.

Turbulence caused by atmospheric instability can sometimes be so severe that it can create serious difficulties not only for the crew in handling the aircraft, but also a high level of discomfort for the passengers as well. In this particular case, the aircraft was so violently shaken and tossed around on account of the turbulence encountered that hand baggage stored in the shelves above the rows of seating on both sides of the aisle got dislodged and fell on the passengers. As per reports, at least 17 persons including 14 passengers and three cabin crew members were injured in the incident. In some cases, the injuries were severe in nature. The pilot in command of the aircraft had cautioned the passengers of the possibility of severe turbulence and had instructed all to fasten their seat belts. Most passengers normally unfasten their seat belts during flight till such time the aircraft commences its descent for landing which was so in this case. With the exception of a few, most passengers in all likelihood, would have responded to the instructions by the pilot in command of the aircraft and would have fastened their seat belts. Most of the injuries sustained by passengers were on account of hand baggage falling on their heads. It is also possible that some careless passengers may have been indifferent to the instructions by the pilot in command and had neglected to fasten their seat belts. These passengers would have been tossed around violently resulting in more serious injuries. One of the 14 passengers hospitalised on account of injuries sustained did have severe spinal injury. The turbulence was so severe that in some cases, even the seat belt tore off resulting in the passenger being tossed around and sustaining severe injuries.

An extremely important consideration in the airline industry is the quality and level of professionalism displayed by the air crew operating the aircraft in their response to an emergency. Two days after the episode in question, the Aircraft Accident Investigation Board took over the responsibility to probe into the episode primarily to assess the professional quality of response of the crew to the emergency. In the final analysis, there is absolutely no room for any compromise in air safety in the civil aviation industry. SP

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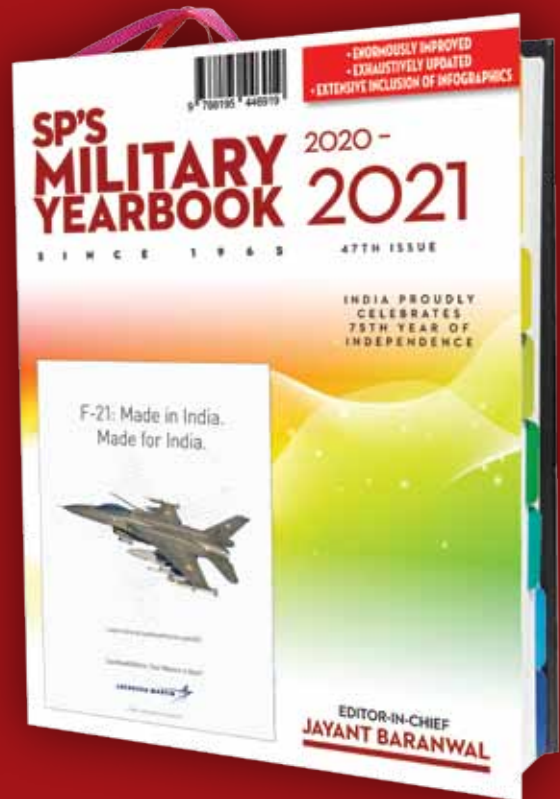
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