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RECENTLY CONDUCTED NEXA STUDY IN US HAS REINSTATED THAT USERS OF BUSINESS AIRCRAFT SCORE BETTER THAN THE NON-USERS IN TERMS OF THEIR ENTERPRISE'S GROWTH AND BUSINESS OBJECTIVES

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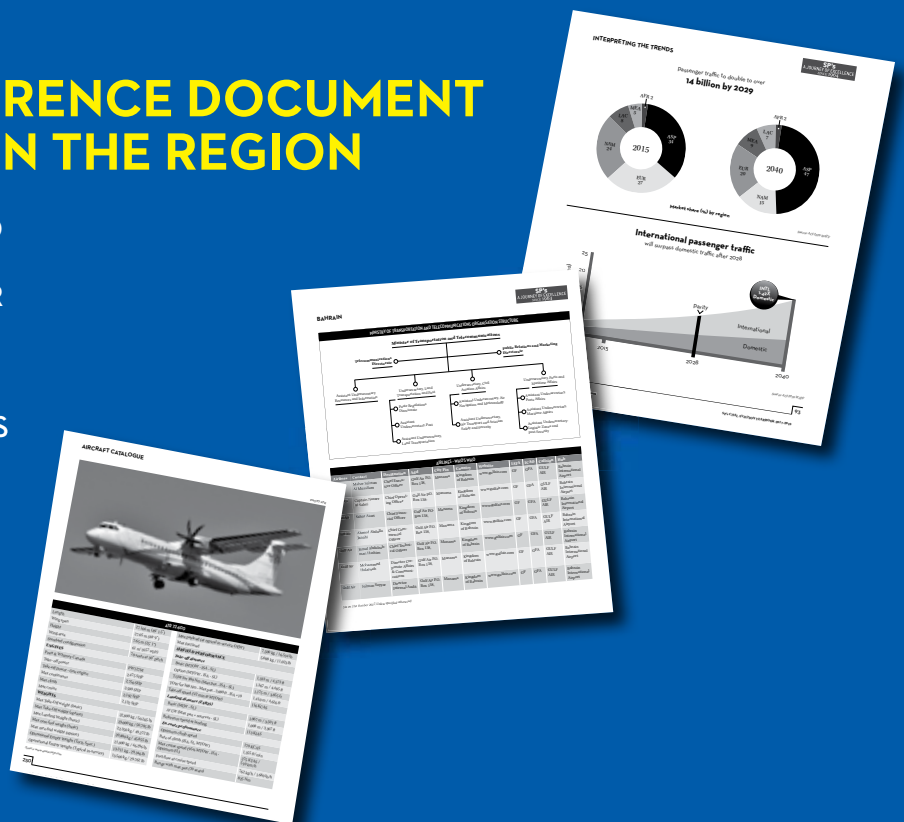


# SP'S CIVIL AVIATION YEARBOOK 2017-18

INAUGURAL ISSUE

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- PAGES FULL OF INFORMATION WITH DATA, TRENDS, ANALYSIS, SUMMARIES, EXPERT VOICES, OUTLOOK.



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*Gulfstream G280 during static display at Dubai Air Show 2017. Business jets including G series from Gulfstream, have been instrumental in helping large corporations meeting their business targets faster than those corporations who have been non-user of business jets.*

**Cover Photograph by:**  
SP Guide Publications



BUSINESS AIRCRAFT HELP GROWING BUSINESS FASTER HAS AGAIN BEEN REINSTATED BY A STUDY THAT HAS NOW BEEN CONDUCTED BY NEXT IN USA.

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## PUBLISHER AND EDITOR-IN-CHIEF

Jayant Baranwal

## SENIOR EDITOR

Air Marshal B.K. Pandey (Retd)

## DEPUTY MANAGING EDITOR

Neetu Dhulia

## SENIOR TECHNICAL GROUP EDITOR

Lt General Naresh Chand (Retd)

## CONTRIBUTORS

### INDIA

Group Captain A.K. Sachdev (Retd)

Group Captain Joseph Noronha (Retd)

### EUROPE

Alan Peaford

### USA & CANADA

LeRoy Cook

## CHAIRMAN & MANAGING DIRECTOR

Jayant Baranwal

## PLANNING & BUSINESS DEVELOPMENT

Executive Vice President: Rohit Goel

## ADMIN & COORDINATION

Bharti Sharma

## ASST – ADMIN, HR & INFRA

Pooja Tehlani

## DESIGN

Holistic Directions: Jayant Baranwal

Creative Director: Anoop Kamath

Designers: Vimlesh Kumar Yadav,

Sonu Singh Bisht

Designer (3D animation): Kunal Verma

Research Assistant: Graphics

Survi Massey

## DIRECTOR: SALES & MARKETING

Neetu Dhulia

## SALES & MARKETING

General Manager Sales: Rajeev Chugh

## SP'S WEBSITES

Sr Web Developer: Shailendra P. Ashish

Web Developer: Ugrashen Vishwakarma

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## SUBSCRIPTION/ CIRCULATION

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E-mail: [subscribe@spguidepublications.com](mailto:subscribe@spguidepublications.com)

[subscribe@sps-aviation.com](mailto:subscribe@sps-aviation.com)

## LETTER TO EDITOR

[editor@sps-aviation.com](mailto:editor@sps-aviation.com)

[expert@sps-aviation.com](mailto:expert@sps-aviation.com)

## FOR ADVERTISING DETAILS, CONTACT:

[neetu@spguidepublications.com](mailto:neetu@spguidepublications.com)

[rajeev.chugh@spguidepublications.com](mailto:rajeev.chugh@spguidepublications.com)

## SP GUIDE PUBLICATIONS PVT LTD

A-133 Arjun Nagar

(Opposite Defence Colony)

New Delhi 110003, India.

Tel: +91 (11) 24644693,

24644763, 24620130

Fax: +91 (11) 24647093

E-mail: [info@spguidepublications.com](mailto:info@spguidepublications.com)

## REPRESENTATIVE OFFICE

BENGALURU, INDIA

204, Jal Vayu Vihar, Kalyan Nagar

Bengaluru 560043, India.

Tel: +91 (80) 23682204

## MOSCOW, RUSSIA

LAGUK Co., Ltd., (Yuri Laskin)

Krasnokholmokskaya, Nab.

11/15, app. 132, Moscow 115172, Russia.

Tel: +7 (495) 911 2762

Fax: +7 (495) 912 1260a

## MEMBER OF:



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## PRIME MINISTER OF INDIA NARENDRA MODI, OPENED DOORS TO NEW OPPORTUNITIES FOR THE REGIONAL CONNECTIVITY SCHEME BY INAUGURATING A SEAPLANE SERVICE IN GUJARAT

A MAJOR DEVELOPMENT ON the global scene in the recent past has been the strengthening of relationship between India and the United States (US), the largest and the oldest democracies in the world. The process began during the tenure of President Obama during which Indo-US bilateral relations developed into a global strategic partnership based on shared democratic values and increasing convergence of interests on bilateral, regional and global issues, security being the primary concern. Towards the end of the tenure of President Obama, India was elevated to the status of a “major defence partner”. Under the new leadership in the US, there has been further consolidation of relations between India and the US. For the Indian armed forces that are embarked on a comprehensive modernisation programme that would involve induction of modern weapon systems and platforms, this development is of special significance. This issue of *SP's Aviation* has an analysis of the subject by Dr Vivek Lall, Chief Executive, US and International Strategic Development, General Atomics.

The Indian Air Force (IAF) is currently grappling with the problem of a dwindling combat fleet. Efforts are on to select a suitable combat platform, single or possibly twin-engine, for production in India in large numbers. The US has platforms that would meet the requirements of the IAF and one of these is the F/A-18 Super Hornet from Boeing. Although the carrier-based version of this aircraft would meet with the requirements of the Indian Navy for which a Request for Information (RFI) has already been floated, the land-based version equipped with the latest avionics, radar and weapon systems, would serve the needs of the IAF and help it restore its combat potential that has been eroded substantially. A detailed report on the F/A-18 Super Hornet by Eugene J (Gene) Cunningham Jr, Vice President, Global Sales for Boeing Defence, Space & Security is a part of this issue of *SP's Aviation*.

Dubai Air Show 2017, the 15th edition of this biennial event held from November 12 to 16 this year, showcased the latest in commercial and general aviation as also in military aviation. As usual, the event was dominated by the two leading global aerospace majors Boeing and Airbus. However, others players such as Embraer and Bombardier were not far behind. Altogether, business deals worth \$113.8 billion were concluded during the Air Show. This issue of *SP's Aviation* carries a detailed report by Bikram Vohra on the Air Show. Writing from Dubai, Bikram

Vohra also has an analysis of the business jet market in the Middle East as was evident from the deals finalised by the leading global players. Analysing a report from NEXA on business aviation, Group Captain A.K. Sachdev (Retd) concludes that the study has an unequivocal message about the importance of this segment of the global civil aviation industry and its uniqueness as a tool for providing a clear advantage to the user companies in contrast to those that neither wish to invest in aviation assets nor hire aircraft for business purposes.

In a detailed review of the Maintenance, Repair and Overhaul (MRO) facilities available in the country in the domain of military and civil aviation, Air Marshal Sukhchain Singh (Retd) concludes that the need of the hour is interaction and collaboration between the two as this will go a long way towards the enhancement of the air power potential of the nation.

On the civil aviation front, the Prime Minister of India Narendra Modi, opened doors to new opportunities for the Regional Connectivity Scheme by inaugurating a seaplane service in Gujarat. Given the huge coastline, inland waterways and lakes in the country, there is undoubtedly immense potential to develop this segment which will provide the much needed impetus for growth of general aviation in the country.

All this and more in this issue of *SP's Aviation*. Welcome aboard and happy landings!

Jai Hind!

A handwritten signature in blue ink, appearing to be 'Jayant Baranwal', written over a light blue circular graphic element.

**JAYANT BARANWAL**  
PUBLISHER & EDITOR-IN-CHIEF

## NEWS:

### COLLABORATION WITH THE PRIVATE SECTOR IN SPACE

The Indian Space Research Organisation (ISRO) aims to undertake 60 to 70 satellite vehicle launch programmes in the next five years by private operators in order to make up the deficiency in the number of satellites, A.S. Kiran Kumar, Chairman, ISRO said. "Currently there are 42 satellites providing various services, but we need more than double that number. In the next five to six years, we envisage 60



to 70 rocket launches for our requirement. For a bigger pie in the world space market, we need bigger industry participation," he said. ISRO seeks to set up a joint venture company with a consortium of industries. "The launch of the first PSLV on behalf of this JV is likely around 2020-21," Kumar said. The PSLV has so far launched 209 satellites from 28 countries on commercial basis.

## VIEWS:

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**AFTER THE NATION ACHIEVED** independence seven decades ago, the initial focus of the government of the day with regard to investment for rapid economic growth, was on the public sector. This was for entirely justifiable reasons as at that time, the fledgling private sector was in a nascent stage of development and neither did they have the financial capability to make large investments nor had access to the required cutting-edge technologies. The government thus took charge and through the investment of public money, created huge public sector establishments as also research and development organisations both in and outside the defence sector. On account of the massive investments of public funds involved, these institutions and agencies had to remain exclusively in the domain to the government. The Indian Space Research Organisation (ISRO) was one such entity and was solely responsible for space exploration and development of space technology. However, unlike other public sector undertakings that functioned more as departments of the central government and were afflicted with the associated maladies of poor work culture and no accountability, ISRO delivered and over the years, notched up remarkable achievements in space exploration. In the initial years, the private sector had no particular interest in the regime of space exploration as there appeared to be little or no scope for commercial activity in this area. However, there has been a profound change in the scenario making it relevant and financially attractive for the private sector to make inroads into the regime of space.

The space agency of the United States, NASA, as also of other major nations of the world, have already made much headway in exploiting the capabilities of the private sector to manufacture launch vehicles and satellites as also to send these into space utilising the launch facilities provided by state-owned agencies. NASA delegates these tasks which it regards as "mundane", to the companies in the private sector that have developed the capability, infrastructure and competent manpower to execute these. NASA concentrates its efforts and resources largely on research and development as also on planning and guiding future projects.

Although, in India, there are already over 500 small and medium enterprises engaged in the manufacture of hardware used in space technology, Chairman of ISRO still describes the role of

the private sector in space exploration so far as 'baby steps'. However, he is also of the view that the potential for the private sector in the regime of space technology is enormous. In the past, some of the leading firms in the private sector that have contributed to the projects of ISRO, have been Avasara Technologies, Larsen and Tubro and Godrej Aerospace. However, their contribution has been limited to the supply of components. If the private sector companies have to play a significant role they need to develop the capability to deliver integrated systems and sub-systems, structures and power plants for launch vehicles, electronic control systems, satellites etc. However, to develop such capabilities, the companies involved will need considerable support from the government as also transfer of technology that is currently available not only with ISRO, but also with the space agencies of the world.

In the recent past, one of the private companies based in Bengaluru that is known by the name Alpha Design Technologies, led a consortium of companies and built the Indian Regional Navigation Satellite System (IRNSS) 1H weighing 1425 kg, to replace one of the seven satellites in the NAVIC system that is malfunctioning. NAVIC powers the nation's Global Positioning System (GPS). Working under the supervision of a team of 70 scientists from ISRO, it took Alpha Design Technologies eight months to ready the satellite for launch that took place on August 31, 2017, on board the PSLV C 39, ISRO's most dependable workhorse. This was the first time that a company in the private sector was involved in the assembly and testing of a spacecraft for ISRO and went beyond merely supplying components.

As per the Chairman of ISRO, while all the systems of the launch vehicle performed extremely well, unfortunately, the heat shield did not separate. As a result of this technical malfunction, the satellite remained attached to the fourth stage of the PSLV and hence could not be placed in the desired orbit. Undoubtedly, this will be seen as a setback to ISRO's effort to galvanise the private sector. However, failure of a mission must only inspire ISRO and the private sector to confront together, the challenges ahead with grit and determination. **SP**

*—By Air Marshal B.K. Pandey (Retd)*





PRIME MINISTER NARENDRA MODI WITH THE PRESIDENT DONALD TRUMP AT THE WHITE HOUSE IN WASHINGTON DC, ON JUNE 26, 2017

# INDO-US RELATIONS



PHOTOGRAPH: PIB

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Both countries have discovered common ground and shared concerns, which have propelled them towards discarding old mistrusts and misconceptions, and adopting methods to establish renewed faith and confidence in each other

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BY DR VIVEK LALL

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**FROM A NEUTRAL STANDPOINT**, the relations between the US and India have always been influenced by the regional hegemonies of South-East Asia. While the US has sought to protect and assert its influence in the region since the early 1950s to contain the spread of Communism, India has constructed its global perspectives built around the more immediate threats across its borders from Pakistan and China. However, since the demise of the Soviet era, the rapid intermingling of economies built on fast flowing trade, and the emergence of China has added new constructs to the US-India equation, albeit with new challenges. Since the dawn of the new millennium, both countries have discovered common ground and shared concerns, which have propelled them towards discarding old mistrusts and misconceptions, and adopting methods to establish renewed faith and confidence in each other.

The increased frequency of exchanging visits in the recent past by the respective Heads of State and top government officials signals the intent from both sides. The US interest in the region is only magnified by its rising concerns over China's purposes and North Korean military ventures. Looking at India as a stabilising force, US think-tanks have sounded an 'Engage India' clarion. The Diplomat recently reported that, "US Secretary of Defence Ashton Carter's visit to India coincided with the statement by Vice Admiral Joseph P. Aucoin, Commander, US Seventh Fleet, that the US will look at keeping the sea lanes of communication open and also keep a check on North Korea." Aucoin stated, "The best and the brightest are being shifted to this part of the world. Almost 60 percent of our submarines are in the Indo-Asia-Pacific region. Within the next couple of years, 60 percent of our surface ships will be here too .... North Korea is a threat. Our number one concern is to protect Japan, South Korea and our country."

Ashton Carter, while as Under Secretary of Defence for Acquisition, Technology and Logistics, had managed to convince the Indians for the Defence Technology and Trade Initiative (DTTI) in 2012. During his visit in June 2015, both the countries signed the Framework for the US-India Defence Relationship. Carter met the then Defence Minister Parrikar four times in the space of a single year. Under the aegis of DTTI, the US-India defence collaboration initiative oversaw the emergence of various joint working groups. The Jet Engine Technology Joint Working Group (JETJWG) and the Joint Working Group on Aircraft Carrier Technology Cooperation (JWGACTC) allowed Indian officials at critical positions to engage directly. Parrikar and Carter also initiated two new DTTI pathfinder projects on Digital Helmet Mounted Displays and the Joint Biological Tactical Detection System, during the progress review of DTTI while agreeing to cooperate in more avenues. The US Embassy issued a statement to this effect, "They agreed to work towards greater cooperation in fields of cutting-edge defence technologies, including deepening consultations on aircraft carrier design and operations, and jet engine technology. They noted the understanding reached to conclude an information exchange annex (IEA) to enhance data and information sharing specific to aircraft carriers."

Under the DTTI arrangement, both sides have mutually agreed to extend collaboration in littoral maritime security and Maritime Domain Awareness (MDA). This arrangement also includes a "white shipping agreement" for data sharing on commercial shipping traffic in the Indian Ocean region (IOR), explore procedures to develop



US SECRETARY OF DEFENCE JIM MATTIS WITH PRIME MINISTER MODI IN WASHINGTON DC ON JUNE 26, 2017

joint working groups on submarine safety and anti-submarine warfare and further their partnership at an international level. Importantly, the two sides also shared a joint statement regarding maintenance of freedom of navigation and over flight in the IOR, including the South China Sea, and working towards establishing a rules-based order and regional security architecture in the Asia-Pacific and Indian Ocean. Many other project agreements in the area of science and technology were also concluded.

In order to fruitfully gain from the recent military – diplomatic exchanges with India, the US commissioned the Logistics Support Agreement (LSA) as part of military cooperation, under the umbrella of the Communication Inter-operability and Security Memorandum of Agreement (CISMOA) on transfer of technology, and the Basic Exchange and Cooperation Agreement (BECA) for sharing geospatial intelligence - mapping data and imagery. This effort has been on for the past decade and on the lips of every Indo-American inter-government meet.

There are also various realities that have emerged as truths from the ashes of the political burn out over Syria, North Korea and the Chinese angle. There is no denying that the Chinese-Pakistan-North Korea nuclear axis poses the most potent threat to peace in the modern world. Thomas Reed, a former US Air Force Secretary, addressed this in his book 'The Nuclear Express: A Political History of the Bomb and its Proliferation',

that China had deliberately proliferated nuclear technology to unstable regimes, particularly Pakistan. He stated to US News that under Deng Xiaoping, China decided to proliferate nuclear technology to communists and radical Muslims in the third world based on the strategy that if the west started getting nuked by Muslim terrorists or another communist country without Chinese fingerprints, it would be good for China. Lately, 60 percent of US Naval assets are being relocated to Asia-Pacific, since China has been demonstrating aggressive expansionist intentions to control and blockade the South China Sea,

**THE INCREASED FREQUENCY OF EXCHANGING VISITS IN THE RECENT PAST BY THE RESPECTIVE HEADS OF STATE AND TOP GOVERNMENT OFFICIALS SIGNALS THE INTENT FROM BOTH SIDES**





DR VIVEK LALL WITH PRESIDENT DONALD TRUMP

with the ultimate objective to position SSBNs in the Pacific via the South China Sea.

To rebut the rhetoric, the US Asia-Pacific Rebalance should also focus on the China-Pakistani nexus stretching through Gwadar, albeit threatening both India and Afghanistan.

Though this may be a late starter, but from the Indian standpoint, there are many apprehensions yet to be addressed. Continuing the agendas of past US Governments, Ashton Carter brought up the "US Rebalance to Asia and the Pacific" policy and India's recent 'Act East' policy. However, it needs to be said that while the US dialogue reiterates China and North Korea; India's strategic anxieties, concentrated on her western and north-western flanks are less focused upon. The Trump administration's recent crack-down on the Pakistani terrorist factions and acknowledgement of state support to regional subversive organisations signals the long-expected turn-around. This is probably the first of many confidence-building measures which will strengthen the Indo-American strategic partnership. Secretary Mattis's meetings with the Indian top echelons in the US and his recent outstanding visit to India will surely address these concerns.

Yet another reality that both the countries have to contend with are optimistic agreements being let down by bureaucracy on both sides. The DTTI announcements pronounced no holds barred cooperation by diplomats on both sides, but nothing substantial has been achieved yet. Equipment sought through the Foreign Military Sales (FMS) channel is still to materialize to its fullest potential. On the Indian side, the Ministry of Defence will have to ensure that acquisition cases are progressed rapidly. The issue of the Indian MoD Defence Procurement Procedure (DPP) 2016 after years of deliberations needs to address standards for choosing strategic partner.

The spark in Indo-American relations today is the rapport between the two char-

ismatic heads of state. After speculations at various levels by US political analysts that India was low priority for the Trump administration, further edified by the delay in the first meeting (five months), the status quo today is anything but. Prime Minister Modi's efforts with the Obama administration, having invested enormous political capital and effort over the last three years, were assuaged by the high level of official and personal interactions between the two leaders. Almost all political pundits have termed Prime Minister Modi's visit as an unqualified success. Numerous substantial decisions were taken during the visit. The major takeaway in functional terms was the public rebuke to Pakistan and the declaration of Syed Salahuddin (the leader of the Kashmiri militant outfit Hizb-ul-Mujahideen) as a Specially Designated Global Terrorist. Further, Pakistan has been mentioned repeatedly in the Joint Statement issued at the end of the visit, to ensure that its territory is not used to launch terror strikes against other countries, and to expeditiously bring to justice the perpetrators of the 26/11 Mumbai, Pathankot, and other cross-border terrorist attacks perpetrated by Pakistan-based groups. The Joint Statement also named terrorist groups such as Lashkar-e-Taiba, Jaish-e-Mohammed and others, and urged the international community to take united, stringent action against them.

Understandably, defence is a major area of cooperation between India and the US, with the US being the second largest supplier of defence equipment to India, after Russia. The acquisition of Guardian aircraft is high on the immediate agenda. Also, news reports have stated about a possible tie-up between Lockheed Martin and the Tata group to indigenise and manufacture F16 aircraft in India. This will prove to be an important incentive to the 'Make in India' initiative and can transform the landscape of the Indian aerospace industry. Trade has also formed an important keystone of this bridge. President Trump, in his Statement to the Press, referred to a fair and reciprocal trading partnership between the two countries. In a response to Trump's worries about creating jobs in US, Prime Minister Modi mentioned in an op-ed in the Wall Street Journal (WSJ), that Indian investments totalling \$15 billion in US will create jobs in 35 US States, including the states from where President Trump received massive support in his election campaign. Both sides discussed the sale of approximately 100 civil airliners to an Indian airline, export of natural gas, enhancing bilateral partnership on issues including Afghanistan, North Korea, Middle East, Pakistan, Indo-

Pacific Region, India's membership in export control agreements and UN Security Council, cyber space, Malabar naval exercises, reaffirmation of India's designation as a Major Defence Partner, support to United States to join as an Observer in the Indian Ocean Naval Symposium, etc.

The trial-by-fire of the commitments promised by the two countries can be assessed only by positive actions. Good intentions aside, it is prime time for both sides to start delivering on the many fronts opened. With strong leaderships and robust economies, both the countries have only to overcome their own inertias and set the ball rolling for fostering peace, harmony, and financial wellbeing in the Indo-Pacific. SP

*—The writer is Chief Executive, US and International Strategic Development, General Atomics.*

**THE TWO SIDES ALSO  
SHARED A JOINT STATEMENT  
REGARDING MAINTENANCE  
OF FREEDOM OF NAVIGATION  
AND OVER FLIGHT IN THE  
IOR, INCLUDING THE SOUTH  
CHINA SEA, AND WORKING  
TOWARDS ESTABLISHING  
A RULES-BASED ORDER  
AND REGIONAL SECURITY  
ARCHITECTURE IN THE  
ASIA – PACIFIC AND INDIAN  
OCEAN**



# FINALLY: A NEW DAWN FOR GENERAL AVIATION

With the patronage by the central government for the launch of seaplane services, the general aviation segment of the Indian civil aviation industry will finally witness a new dawn!

ON DECEMBER 12, 2017, the last day of the second and final phase of campaign related to the assembly elections in the state of Gujarat, Prime Minister Narendra Modi flew in a seaplane, the Kodiak 100, from Sabarmati river in Ahmedabad to Dharoi Dam in Mehsana district. The Kodiak 100, a product from the Quest Aircraft Company of the United States, is a small high-wing transport aircraft that is capable of carrying up to 15 persons and is powered by a single Pratt & Whitney Canada PT6A 34 750 hp engine.

Not only did this flight by the Prime Minister aboard a single-engine aircraft raise concerns among the agencies responsible for his security, it also generated a minor political storm, something that appears to have become a matter of routine and an integral part of the political machinations by the opposition. While the flight by the Prime Minister on board a seaplane was projected as a part of the development agenda of the government in power, for the Indian civil aviation industry, it has rekindled hopes of imparting a fresh impetus to the Regional Connectivity Scheme (RCS) or UDAN that has been an area of major focus of the NDA Government. Use of seaplanes can open up a new and vibrant segment for regional aviation and consequently provide it the much needed boost.

While there are plans to progressively commission hundreds of new low-cost airports to enhance connectivity across the nation and bring affordable air travel to the masses and thereby boost economic growth, the potential of seaplane services in the country has so far remained unexploited. The nation including the island territories, has 21,000 km of waterways which consist of 7,500 km of coastline and 14,000 km of inland waterways by way of major rivers. Apart from these, there are around 200 lakes across the country. There is therefore immense scope for the rapid expansion of seaplane services to boost RCS without the need for heavy investments that would be required for building and maintaining runways.

Efforts in the past to exploit this segment of the Indian civil aviation industry have, for one reason or another, not met with

success. In January 2011, for the first time in India, seaplane services were launched by Maritime Energy Heli Air Services Pvt Ltd (MEHAIR) in the Andaman and Nicobar Islands to primarily support the tourism industry, but closed down after three years. MEHAIR also planned to launch similar operations in Maharashtra and Goa as well, but never took off. Kerala Seaplane, a commercial seaplane service promoted by Kerala Tourism Infrastructure Limited, was launched on June 2, 2013, at Kollam with the inaugural flight being operated by Kairali Aviation. However, commercial operations could not commence due to opposition from the local fishing community. In 2014, a seaplane service was launched to connect Mumbai to tourist destinations in the Western Ghats, providing an alternative to four or five hour long drives on the Mumbai-Pune expressway. However that service did not find a market as it failed to draw clientele.

However, things are now set to change. All initiatives in the past to exploit this segment of the civil aviation industry were undertaken and supported locally without the involvement of the government at the centre. There is now a paradigm shift as is evident from a statement by Nitin Gadkari, Minister for Shipping, who said, "All players are welcome to enter the market once the gates are opened. We will formulate a policy for this in three months.



**REKINDLING HOPE:** PRIME MINISTER NARENDRA MODI BEFORE BOARDING THE KODIAK 100 SEAPLANE IN AHMEDABAD

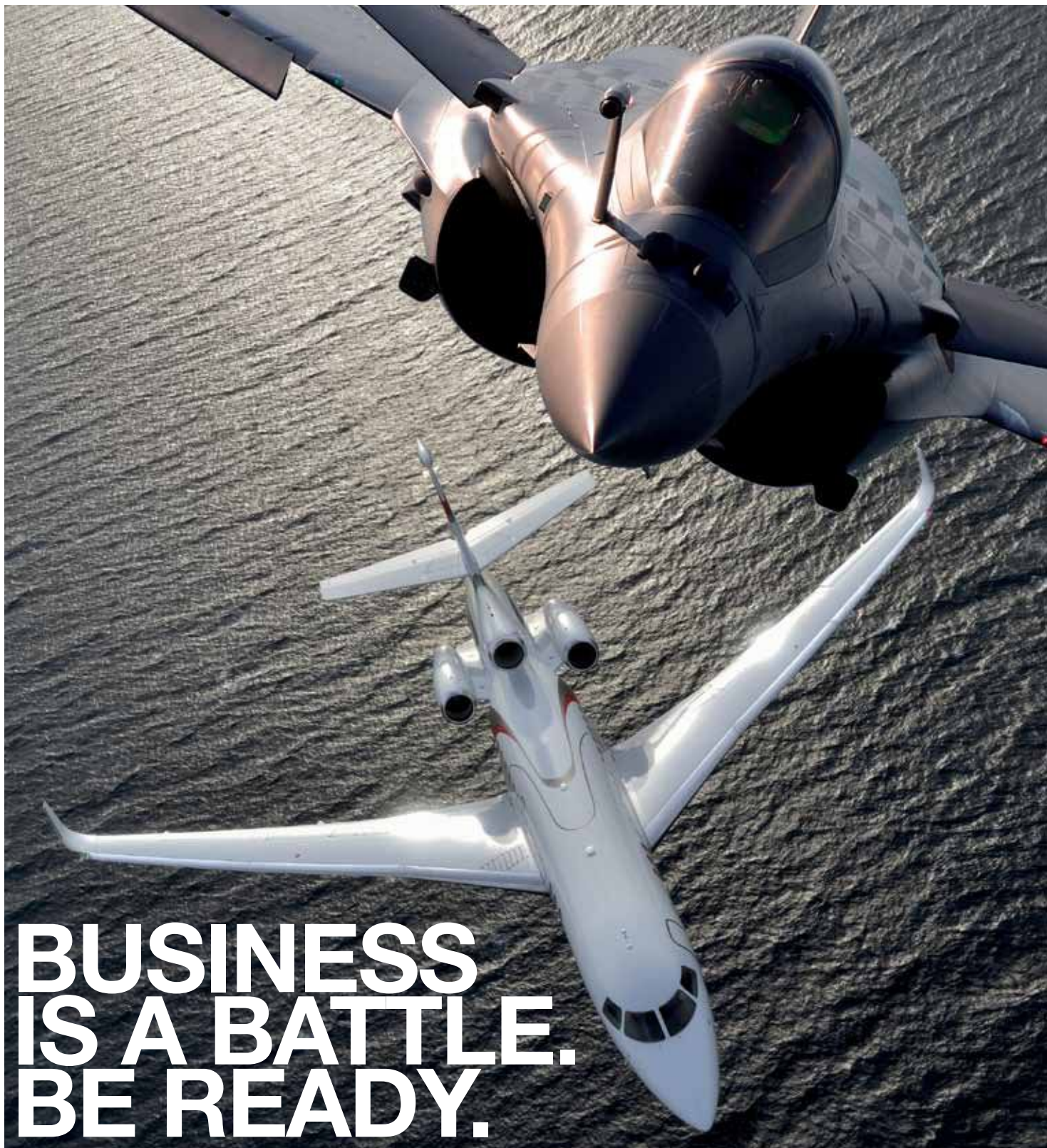
It has been a dream that I have nurtured. Conversion of rivers into waterways and the availability of lakes and dams that can be converted into airports with minimal expenditure on small floating jetties." Ashok Gajapathi Raju, Minister for Civil Aviation, termed the move as an extension of UDAN scheme. He said, "If all goes according to what we think we are capable of, in the third round of bidding for UDAN, these aircraft can also come in."

With the patronage by the central government for the launch of seaplane services, the general aviation segment of the Indian civil aviation industry will finally witness a new dawn! SP

— *By Air Marshal B.K. Pandey (Retd)*

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CRJ900 AIRCRAFT IN CHINA EXPRESS AIRLINES' LIVERY



# MAKING WAVES

The regional airline has opened over 80 routes, thus aiding social and economic development of the undeveloped regions, besides helping in tourism activity

BY R. CHANDRAKANTH

**CHINA EXPRESS, ALSO KNOWN** as Huaxia Airlines, is China's first private regional airline and it is already a decade old. Indeed, China has taken the lead over India in starting a regional airline and has continued to look at ways of expanding airline network across the vast geographical expanse. With improved multi-modal transportation network, China has been significantly moving people and goods across the country, thus accelerating development.

China Express is based in Guizhou, a province in the People's Republic of China, located in the South Western part. Its capital city is Guiyang. Though Guizhou is economically undeveloped, it is rich in natural resources. China Express operates services from its hub at Chongqing Jiangbei International Airport, as well as secondary hubs at Guiyang Airport, Dalian

Airport, Hohhot Airport and Xi'an Airport. The carrier is using a fleet of Bombardier CRJ900 series aircraft and Airbus A320. The airline came into existence in May 2006 and is owned by Cathay Fortune (40 per cent), High Zerio (25 per cent), Tampines International (24 per cent) and others 11 per cent.

**BOMBARDIER'S NEXTGEN AIRCRAFT**

In 2013, Bombardier Aerospace announced that China Express had placed a firm order for three CRJ900 NextGen airliners, as well as entered into conditional purchase agreements for another five with an option for additional eight. At that time it had a fleet of five CRJ200 and six CRJ900 aircraft. In 2012, it made history by being the first to operate the CRJ900 aircraft in the country. According to Planespotters,

PHOTOGRAPHS: BOMBARDIER

the airline has 33 aircraft besides two on order and the average fleet age is 2.7 years.

The regional airline has opened over 80 routes, thus aiding social and economic development of the undeveloped regions, besides helping in tourism activity. It is following the strategic approach of small to big through opening up of regional routes. From its maiden flight in Liping, Guizhou, in September 2006, China Airlines has come a long way. The very next year, it entered into a partnership with a state-owned airline and the 'One Pass' cross-linking model between China and Hong Kong's first airlines, had lot of synergies. Its first Bombardier aircraft was the CRJ200 which it bought in June 2008. It created a record in the same year with aircraft flight reliability of 99.78 per cent. It was in December 2009 that the airline made annual profit for the first time and that with a minimum fleet size. In 2010, it bought over Eastern Airlines and in the following year, it commenced direct flights to form a network covering the South West, East, North and South China. The next year, it had direct flights connecting the South West region to the East, North and South China.

### EXPANDING NETWORK

It was in July 2012 that China Airlines launched the first domestic CRJ900 regional aircraft which flew to Chongqing Jiangbei International Airport, thus opening a new chapter in regional aviation. It kept expanding its network and by 2014, it had over 100 sorties a day. In the same year, it entered into a code-sharing agreement with China International Airlines and Shandong Airlines. For Bombardier, 2014 was a landmark year as both the Chinese and Canadian Prime Ministers witnessed the signing ceremony wherein China Airlines ordered 24 Bombardier aircraft.

China Airlines retired the CRJ200 aircraft on April 30, 2015. The last flight was Shanghai Pudong to Chongqing route as G52006. The next year, the Civil Aviation Authority of China formally approved the adjustment of the scope of air transport business in China to include Hong Kong, Macao and Taiwan, to tap into both international passenger and cargo markets.

### FOCUS ON PASSENGER COMFORT

With the coming of the CRJ900NG regional aircraft, China Airlines was offering additional one inch leg space, enhanced cockpit comfort, new cabin interiors including a larger overhead luggage compartment and larger windows. The idea was to give passengers a good flight experience and the airline has stated that with growing popularity, it was expecting to increase its fleet size to 66 by the year 2020.

Based on the list price for the CRJ900 NextGen aircraft, the firm order of China Airlines was approximately valued at \$134 million. The value of the entire contract (five CRJ900 NextGen and options for additional eight CRJ900 NextGen) was \$733 million. "By 2016, we anticipate that the total number of routes flown by China Express will reach approximately 90, three times as many as the number of existing routes, and will cover 60 per cent of China's regional cities," said Wu Longjiang, President, China Express. "We are confident that our fleet of Bombardier aircraft will be a very efficient and reliable asset in achieving these objectives."

"With China's growing economy, improved support infrastructure and expanding middle-class, regional air travel will be more accessible to Chinese citizens in more regions," said Mike

Arcamone, President, Bombardier Commercial Aircraft. "As demonstrated by China Express, the outstanding economics of Bombardier's CRJ NextGen aircraft will allow airlines to profitably enter smaller tier-two and tier-three markets, providing efficient service to a growing demand from business and leisure travelers. We are delighted that China Express has once again put its trust in Bombardier."

### BANKING ON BOMBARDIER

In 2015, Bombardier Commercial Aircraft announced that China Express Airlines had placed a firm order for ten CRJ900 regional jets, raising its total orders for this model of the aircraft to 38. With this transaction, China Express had exercised eight previously acquired options for CRJ900 aircraft. To date, 20 of the CRJ900 aircraft ordered by China Express have been delivered. Based on the list price of the CRJ900 aircraft, the order announced was valued at approximately \$462.6 million.



TO DATE, 20 OF THE CRJ900 AIRCRAFT ORDERED BY CHINA EXPRESS HAVE BEEN DELIVERED

"China Express is committed to providing air services to people in Tier-III and Tier-IV cities in China. Our mission is to improve the connectivity by air for those communities," said Wu Longjiang, President, China Express Airlines. "The CRJ900 is the right aircraft for our cooperation with major airlines on code-sharing and connecting flights. It offers excellent economics and reliability and is well liked by our passengers. We continue to expand our fleet with these fine aircraft to serve both current and future demand as well as destinations."

"We are very pleased with China Express Airlines' continuing confidence in the CRJ900 jetliner and its role in expanding regional airline services in China," said Andy Solem, Vice President, Sales, China and North Asia, Bombardier Commercial Aircraft. "Our 2015 to 2034 Commercial Aircraft Market Forecast expects delivery of some 900 60- to 100-seat airliners to China during the forecast period and the CRJ900 regional jet is proving to be a perfect fit in that market segment." <sup>SP</sup>

**THE OUTSTANDING ECONOMICS  
OF BOMBARDIER'S CRJ  
NEXTGEN AIRCRAFT WILL  
ALLOW AIRLINES TO  
PROFITABLY ENTER SMALLER  
TIER-TWO AND TIER-THREE  
MARKETS, PROVIDING  
EFFICIENT SERVICE**



**POTENTIALLY A GREAT CONTRIBUTOR:**  
E195-E2 CAN BE A SUITABLE AIRCRAFT TO SERVE THIN LONG ROUTES IN INDIA HELPING IN THE REDUCTION OF CHAOS AT THE HUB AIRPORTS



**KEY HIGHLIGHT**

**THE MOCA MAY CONSIDER APPROPRIATE LEGISLATION THAT WOULD MANDATE INDIAN CARRIERS TO TAKE ON AT LEAST A PART IF NOT ALL, OF THE OPERATIONS IN THIS SEGMENT FOR THE OVERALL BENEFIT OF THE INDIAN AIRLINE INDUSTRY AND THE TRAVELLING PUBLIC.**

PHOTOGRAPH: EMBRAER





IN OPERATIONS: AIR INDIA REGIONAL BOMBARDIER CRJ700 AT DEHRADUN JOLLY GRANT AIRPORT

# OPERATING ON THIN LONG ROUTES

For a healthy growth of the Indian airline industry as well for enhanced convenience to passengers, there is no option but to provide direct point-to-point aerial connectivity

BY AIR MARSHAL B.K. PANDEY (RETD)

**THERE IS NO DOUBT** that air travel provides the level of convenience that other modes of transportation do not. A journey on board an aircraft, whether an airliner or a business jet, helps save time especially when travelling over long distances even within the country. Sometimes, air travel could be the only means to reach remote areas or those locations that are not connected by other means of surface transport such as road or rail networks. In India, the facility to travel by air for the general public has undergone a sea change from the time the Indian airline industry which had been totally under the control of the Government of India since it was nationalised on August 1, 1953, was thrown open to the private sector in the early 1990s.

The Indian airline industry received a further impetus with the emergence on the scene of low-cost carriers (LCC), a concept introduced by Captain G.R. Gopinath in 2003. And more recently, the NDA Government has launched a campaign to bring the facility of air travel to the masses at affordable costs

through major changes in the National Civil Aviation Policy (NCAP) the latest version of it was unveiled in June 2016. The newly introduced policy changes have been designed to exploit the immense potential of growth that lies in the regional aviation segment of the industry. In pursuit of this objective, the Ministry of Civil Aviation (MOCA) has also crafted the Regional Connectivity Scheme (RCS) as part of the NCAP, which entails the building and bringing into the operating network in a phased manner, a large number (reported to be around 200) of no-frills airports in the hinterland including remote and inaccessible areas of the country, to provide aerial connectivity to Tier-II, Tier-III and Tier-IV cities that currently do not figure in the existing aerial connectivity network.

The Indian airline industry has come a long way since its inception and especially over the last two and a half decades. However, despite the impressive growth, some frustrating gaps in the air transportation system do continue to linger thereby

adversely affecting both its efficiency and productivity. Amongst the stakeholders, the worst sufferers of the adverse consequences of this malaise are those that travel by air and not the airlines themselves. There is no doubt that these gaps need to be plugged to make the air transportation system more efficient, dynamic as well as to reduce the level of inconvenience for the travelling public.

**THIN LONG ROUTES**

In a conversation in the recent past with Jayant Baranwal, Editor-in-Chief, *SP's Aviation*, Rajiv Nayan Choubey IAS, Secretary in the Ministry of Civil Aviation, while commenting on the Indian airline industry, spoke of "thin long routes" and the reluctance of Indian regional carriers to operate on these. In his perception, if Indian carriers begin to operate on thin long routes, it would help airlines to avoid transiting through heavily congested major hub airports making it more convenient for the travelling public. In the process, it would also help in reducing the crippling congestion at the six major hub airports that currently handle around 65 per cent of the civil air traffic in the country. As Indian carriers further expand their fleets with the passage of time and increase the number of flights, movement of aircraft through the six major hub airports will continue to increase thus further aggravating the problem of congestion at the major hub airports that have already reached or even crossed the saturation point. This has already become a serious issue for all stakeholders and the air passenger being the worst affected.

The expression "thin long routes", not commonly used in civil aviation parlance, are those routes that are not "heavily travelled" on. In effect, it implies that the number of passengers travelling on these thin long routes is not large enough to generate passenger load factors of the level required to financially justify deployment of large capacity airliners such as the Airbus A320 or the Boeing 737 family of aircraft on these routes. Also, in the Indian context, distance-wise, these routes are so long that that these are clearly beyond the range of lower capacity aircraft such as the ATR family or the Bombardier Q400, both types of aircraft powered by turboprop engines with maximum ranges between 1,500 to 1,700 km. These aircraft are currently deployed for enhancement of regional connectivity. As neither the large capacity Airbus A320 nor the Boeing 737 family of aircraft, both at the higher end of the spectrum and the turboprop airliners at the lower end, operating with Indian carriers, are suitable to operate on thin long routes that would require the airliners to fly distances of 2,000 to 2,500 km. As the thin long routes do not provide adequate passenger load factors, this segment of the operating network remains practically unsubscribed. Passengers desirous of travelling on these segments have no option but to transit through one of the major hub airports. Consequently, apart from the problems associated with congestion, they have to bear the burden of higher air fares, time penalty and avoidable harassment of changing aircraft at the major hub airport they are required to transit through. In the final analysis, it is the public travelling by air that has to suffer the consequences of this yawning gap and the anomalies in the operational paradigm of Indian carriers.

**PERSPECTIVE OF INDIAN CARRIERS**

It is a well known fact that one of the primary aims of airlines is to be profitable which indeed is a prerequisite for their


very survival. To achieve this objective, the regular airlines operate large jet powered aircraft such as the Airbus A320 or the Boeing 737 family of twin-jet airliners with a capacity of seating around 200 passengers, over longer routes that that invariably provide connectivity between the major hub airports as also to other points or destinations. These sectors provide respectable and remunerative passenger load factors. The regional airlines on the other hand, operate fleets of smaller aircraft such as the ATR or Bombardier Q400 turboprop platforms. These are of much lower seating capacity of around 70 to 75 passengers and with much lower range that are between 1,500 and 1,700 km and aim to connect smaller airports with the nearest major hub airport. This has led to the development of the hub-and-spoke concept and in effect, the regional carriers thus serve only as feeder airlines for the regular carriers. Under the existing pattern, regional carriers have not been providing connectivity amongst regional airports primarily because operations on the regional routes are not remunerative owing to low passenger traffic and load factors that do not justify the heavy investments required.

**THE WAY FORWARD**

For a healthy growth of the Indian airline industry as well for enhanced convenience to passengers, there is no option but to enhance direct point-to-point aerial connectivity. This will help eliminate unnecessary transit stops for passengers at the major hub airports translating into lower air fares, mitigate the level of congestion and reduce total fuel burn thus benefitting the environment as well through lower emissions. There is therefore the need for Indian carriers to look at options beyond the hub-and-spoke model and consider operating direct point-to-point and especially on thin long routes. It goes without saying that to break out of the hub-and-spoke model and focus on thin long routes, the airlines would have to induct aircraft with range higher than what the ATR family and Bombardier Q400 are capable of. For better passenger load factors, it would also be desirable to select a platform with seating capacity lower than the 180 to 200 seats that the Boeing 737 and Airbus A320 offer. In other words, for operations to be financially viable on thin long routes, the airlines will need an aircraft that has range and seating capacity that lies between the two categories of platforms currently being operated for regional and regular operations. Fortunately, two new platforms that could well meet with these requirements are on the horizon. These are the regional airliners from Embraer of Brazil especially their latest product, the E195-E2 as also the Mitsubishi MRJ from Japan.

While the need for airlines to operate on thin long routes is an inescapable necessity, in view of the heavy investment required to induct a fleet of a new class of aircraft, the leading Indian carriers would understandably be reluctant to take on this task regarding it as an additional financial burden. The

Ministry of Civil Aviation (MoCA) would have to consider expanding the scope of RCS to include operations on thin long routes and provide adequate financial incentives to offset losses suffered by the Indian carriers who opt to operate on these routes. Alternatively, the MoCA may consider appropriate legislation that would mandate Indian carriers to take on at least a part if not all, of the operations in this segment for the overall benefit of the Indian airline industry and the travelling public. ■ **SP**

  
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Moscow, Russian Federation

Phone: +7 (495) 534 61 83  
Fax: +7 (495) 534 61 53

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EMIRATES BOEING 777 AND AIRBUS A380 OPEN DUBAI AIRSHOW FLYING DISPLAY IN A SPECTACULAR FLY PAST WITH AL FURSAN AT THE DUBAI AIRSHOW 2017



# BIG 2 SHARE SPOILS, BELL TOLLS FOR THE A380

For Airbus, the Dubai Air Show 2017 was an occasion to celebrate as it packaged a gift for sales chief John Leahy days before his retirement

BY BIKRAM VOHRA, DUBAI

**ARMED WITH THEIR CHEQUE** books, Aviation's faithful came to Dubai Air Show 2017 for the 15th aero exhibition and recorded deals worth \$113.8 billion. According to data compiled by financial consultants Mubasher, the event which is held once every two years in Dubai, had logged an all-time record high of \$206.1 billion in its 13th edition held in 2013, whereas the second record high at \$155.5 billion was achieved in 2007. The event in 2017 marked a 175 per cent surge in the value of deals signed compared to the previous edition held in 2015, which saw only \$39.8 billion in agreements.

The first two days belonged to Boeing and it looked all but over for Airbus. Even their chalet was relatively silent and gloomy as the American manufacturer reeled in the orders. Emirates, as host carrier, set the pace by ticking the box for 40 Boeing 787-10 Dreamliners and this investment worth \$15.1 billion, will replace the fleet of Boeing 777 as Emirates increases its frequency on the under ten-hour routes. Any misgivings over the ability of the Dreamliner to perform at peak levels in the heat of the desert, were set aside and the Airbus A350 which still has residual affection and a better range and

cost-per-passenger aggregate, fell by the wayside. As Airbus saw no more than the shadow of a smile on the opening day, there came the double whammy with flydubai, now a registered adjunct of Emirates, picking up a \$27 billion deal to purchase 225 Boeing 737 MAX aircraft, with options to buy an additional 50.

Airbus could by then, have packed its bags and skulked off, but wait, there was a major trick left in the bag and souring the bubbly at Boeing was on the cards. Hours later, even as media and the aviation industry was empathising over the mauling Airbus was getting, came the mega announcement. It was the biggest deal in history and Indigo US was making it. Airbus gently and yet with a dash of *soigné* announced the securing of an order valued at nearly \$50 billion for 430 planes from its single-aisle Airbus A320neo line. Suddenly the dimmed lights at Airbus went bright and life was good again.

While the agreement added to the lure of Dubai as a leading venue for the bi-annual gathering and gave it a full chapter in modern aviation history, it also allowed Airbus to pump up a bottom line hurt badly by the loss of love for the Airbus A380. Actually it really is not a loss of love as much as it is a pragmatism reflected by Airbus having to guarantee Emirates ten-year production of the behemoth if there was any chance of getting Emirates to buy more aircraft.

For the moment, despite the excitement, it was an in-house celebration for Airbus as it packaged a gift for sales chief John Leahy days before he flies into retirement. The pair of giants had shared the spoils again. One calls them a pair advisedly because they work it out so they end up with equal shares of the market. Of course what all this means is that the show is a success. The main stars have their lines right and everyone who is anyone, is engaged in an orgy of backslapping one another on a job well done.

Many factors will kick in before the planes materialise in the skies with the livery of those who have gone in for them. As of now, the hard facts are that the bells you hear could well be the death knell for the A380 production line. Airbus has to be sorely wounded by the loss of the A350 option to Emirates when they could have had a solid deal in the bag that would have cold compressed the A380 bruising. But without it, the scuttling of the

**BOEING SAID IT SECURED  
TOTAL COMMITMENTS  
FOR 302 AIRCRAFT  
INCLUDING 50 OPTIONS  
WITH A VALUE OF ABOUT  
\$50.7 BILLION AT LIST  
PRICES**

double decker flagship is twice as hurtful.

The \$2 billion needed to extend the wings by 15 feet, improve the range, reduce the per passenger cost effectiveness by 13 per cent and make the aircraft viable to its best customer, is blowing in the wind because without other customers the sums do not add up. And there is no one knocking on the door.

The general belief now is that with Emirates hedging its bets and being frontal and transparent in its demands, Airbus will return to Toulouse in an ambivalent frame of mind, ready to make the cruel cut and mothball its A380 production line.

The comfort from Indigo's largesse is still in the MOU stage and not signed and sealed so there can be many changes to what Bill Franke at IndiGo Partners finally picks up for his carriers: Frontier Airlines, Volaris, Wizz Air Holdings and JetSmart, the last now operating out of Chile.

It is a toss up how many of the 273 Airbus A320neo jets and 157 of the A321neo variant will finally be picked up and much will depend on the oil prices, peace in the region, liquidity in the carriers in the Middle East and how the projected need for 10,000 new aircraft across the size spectrum pans out with the flying public. It has to be remembered that Qatar is already hurting by virtue of political isolation, Etihad has had two rough hits through its investments in Air Berlin and Alitalia and there will also be competition from airlines exercising the fifth freedom to fly between two foreign countries on a flight originating or ending in one's own country. Add to that the unofficial but widely practiced sixth freedom of flying from one foreign country to another while stopping in one's own country for non-technical reasons and regional carriers are not going to find it easy. With India, China and the ASEAN belt expected to be the new emerging markets, the attention of the industry will engage in a tectonic shift.

In other deals, Bombardier signed a letter of intent with Egyptair for the purchase 24 CS300 jets from Bombardier and Watanya Airways took the first step towards a possible 25 Airbus A320neo aircraft to Golden Falcon Aviation, its exclusive aircraft supplier.

In a breakdown given by Mubasher, the delays per day make for impressive reading. On the first day of the Dubai Air Show, deals signed amounted to \$19.34 billion, while on the second

(LEFT) AIRBUS HAD A MAJOR PRESENCE AT DUBAI AIRSHOW 2017; (RIGHT) FRED CROMER, PRESIDENT, BOMBARDIER COMMERCIAL AIRCRAFT, AND SAFWAT MUSALLAM, CHAIRMAN AND CEO OF EGYPTAIR



PHOTOGRAPHS: AIRBUS, ASDS MEDIA



(LEFT) VERSATILE C295 WITH A DISPLAY OF WEAPONRY; (RIGHT) ROCKWELL COLLINS PROLINE FUSION ON CALIDUS B250

day, companies signed agreements worth \$3.8 billion. The third day saw deals worth \$7.1 billion being concluded, while the fourth marked the highest value of agreements signed for \$77 billion. The fifth and final day of the Dubai Air Show saw a \$1.23 billion in signed agreements.

Airbus and Boeing came away with orders of 695 planes worth \$92 billion of which Indigo helped the French manufacturer pull in 510 aircraft of which 502 were from the Airbus A320neo family and the rest were for the company's multi-role C295 transports and 'H generation' H160 rotorcraft with a price tag of \$58.3 billion, according to Airbus.

Boeing, however, said it secured total commitments for 302 aircraft including 50 options with a value of about \$50.7 billion at list prices. It also signed agreements with Azerbaijan Airlines, Alafco and Ethiopian Air. Meanwhile Air Arabia signed for the lease of six Airbus A321neo to augment its fleet. And as the 160 aircraft on static display took off for home, there was good reason for Dubai to feel satisfied.

Now time will tell if the figures will be infused with life.

**US OPEN TO F-35 SALE TO UAE**

An exciting dimension during the Air Show was centred on the tangible interest shown by the UAE in opening talks over the F-35 Lightning II and the readiness of the US to sit at the table. This fifth-generation fighter will be a game-changer and could well turn the rest of the pack into obsolete mode. Even though this is just a start, the other jab in the arm for the Emirates came from the call for an upgrade in the Mirage fleet. The 42 planes that have been in service since 2003 will undergo a refit although details of the project have not been disclosed.

There was also considerable interest over Malaysia's intent for a maritime patrol aircraft (MPA) when it announced that this surveillance fleet was its number one priority. This light combat aircraft would have exceptional air-to-ground capabilities and, as of now, the Korean KA-50 looks the winner even though a sweet deal could have other manufacturers offering to replace the recently grounded MiG-29 fleet.

Also of interest at the Air Show was Boeing initiative in pitching the KC-46 tanker to this region and the company is

confident it will gain a foothold in this segment although issues in flight tests have delayed the schedule for the latest version. Boeing is of the opinion that just the refueling in flight needs of the Saudi forces is a viable market in itself.

Meanwhile, the KC-390 from Embraer arrived in Jacksonville for a comprehensive testing programme which includes evaluating avionics systems, assessing its performance in cross-wind operations and measuring its external noise. Once it gets its certification it will be another contender in the global market.

In the interim, work on the A400M transport aircraft is moving along nicely although the need to certify the modified gearbox following discovery of a crack in one of them, will take a little longer and is unlikely to be resolved before early 2018.

**OPPORTUNITIES FOR SALES IN THE FUTURE**

Bombardier Commercial Aircraft confirmed that it signed a letter of intent (LOI) for up to 24 CS300 aircraft with EgyptAir Holding Company of Cairo. This includes 12 CS300 aircraft with purchase rights for an additional 12 aircraft at a cost of \$1.1 billion for the first deal. As it showcased this series in Dubai, another manufacturer Hondajet took to the skies and established a good relationship with potential customers for its fast selling small bizjet. The most delivered jet in its category for 2017, the aircraft was positively received by sheikhs and corporate executives in the Middle East. With the concentration largely on the Boeing-Airbus divide of the spoils, the other players namely Bombardier and Embraer, recorded no sales; but used the occasion to engage in some ground work for the near future.

For Embraer, it was an opportunity to talk to several as yet undisclosed Middle East carriers for small aircraft to ply short haul regional routes. With the Embraer E2 family of aircraft on the cusp of certification, it was no surprise that the Chief Executive Commercial Aircraft John Slatery looked pretty chuffed with the current round of negotiations.

Meanwhile, Gulf Air signed a \$1.9 billion LEAP-1A engine and services agreement with CFM. The UAE Armed Forces went in for five CN295 military transport aircraft with related services from Spain's Airbus Defence and Space company for \$250 million. ■ SP

**THE F-35 LIGHTNING II,  
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PHOTOGRAPHS: AIRBUS, ASOS MEDIA





## “ WE EXPECT TO SELL ABOUT 370 AIRCRAFT IN THE MIDDLE EAST ”

**Jayant Baranwal**, Editor-in-Chief, **SP's Aviation** had a Quick 4 with **John Slattery**, President & CEO, Embraer Commercial Aviation during Dubai Air Show

- “We expect to sell about 370 aircraft in the Middle East”
- “We have 80% market share in China’s 130 seat segment in-service jet fleets”
- “Working rigorously towards the environmental issues and the greener skies, is in our DNA”

**Jayant Baranwal (JB):** What number of ERJs are operating at this point in the Middle East and what number of E195-E2 you forecast to operate in Middle East in the next 10 years?

**John Slattery (Slattery):** There are 25 aircraft in the region. In terms of the opportunities, the discussions we are having and the forecast we have done to sell is 370 aircraft. We have got a family from E175-E2 through to the E195-E2 at the moment. I am not breaking that down. A lot of my discussions with airlines in the last day or so have been around either the E190-E2 or the E195-E2. Both aircraft have got the same engine so it could even be working together with these aircraft. I think all the aircraft are getting an appetite.

**JB:** The very first customer we believe will be Azul for E195-E2. What number of aircraft they are likely to acquire?

**Slattery:** Yes, that’s correct. They have already announced a firm order for 30 aircraft. What their larger plan is, I will direct that question to John Rodgerson, the CEO of Azul. Azul at one point was operating over 80 E-Jets with the acquisition of TRIP Linhas Aéreas of Brazil so they have everything from E175 to E190 and of course E195. They have now pivoted around the E195, and are one of the largest operators of E195 in the world. They will be our launch operator of E195-E2 in the first half of 2019.

**JB:** China Express operates a few Embraer, they also seem

to be going for A320 aircraft. How do you perceive this development?

**Slattery:** I won’t talk about specific airline, I don’t think that’s fair to talk about airline campaigns that are going on. But I would say in China, we have had active commercial relations for over 15 years. We have a significant presence in Beijing and in terms of market share under 130 seats of in-service jet fleets, we have over 80 per cent market share. It’s a market we are very much committed to. We have a number of flag carriers and marquee type customers there already and certainly, as we project forward, both Mark and I showed you the global view over the next 20 years and China features heavily in that.

**JB:** Any of the environment and Green Sky initiatives on the part of Embraer?

**Slattery:** Multiple, certainly when you think about the E2, the reduction in fuel and the reduction in noise emissions, feed deeply into that. In addition to that, Embraer has been working on an ecoDemonstrator using our partnership with the Boeing Company, so Embraer is very much committed to become as environmentally friendly as possible. When you get to see our mock-ups of E2, our colleagues will tell you about the specific environmental action we have taken on the material that you will see on the inside of the mock up. So, it’s in our DNA. We are completely aligned with global demands and E2 can be a perfect complement to Airlines’ requirements in that perspective. SP

# ENDLESS POSSIBILITIES



Boeing is not just offering unmatched products to the Indian armed forces but also significant benefits to India's indigenous aerospace manufacturing sector

BY EUGENE J. (GENE) CUNNINGHAM JR.

**THE IMPORTANCE OF CARRIER** aviation cannot be understated – in particular to a country like India with a large coastline covering more than half its borders. The Indian Air Force (IAF) is focused on protecting the north, and with coastlines covering much of India's east – south – and west, the need for a strong carrier air wing is clear. With multi-role capabilities, advanced technologies with room to grow and low acquisition and sustainment costs, the F/A-18 Super Hornet is the clear choice for India. With designed-in stealth, an AESA radar and many other advanced technologies that are ideal for mission requirements of the naval aviator, the F/A-18 Super Hornet is the most advanced aircraft of its kind in operation today and will provide operational benefits to the existing and future force structure of the Indian armed forces.

Boeing's Super Hornet offers the best of those attributes – it is combat proven, but defined to meet the US Navy's flight plan so that it continues to evolve to outpace future threats. The Super Hornet will be on the Navy's carrier decks well into the 2040s – being three-fourths of the Navy's strike fighter capacity into the 2030's and no less than half the carriers striking force into the 2040's.

Introduced in 2007, the F/A-18 Super Hornet Block II is the world's preeminent carrier capable aircraft and best suited for India's naval fighter requirements. The F/A-18 Super Hornet was designed from day one for carrier operations and is the world's preeminent carrier capable aircraft. Every Super Hornet to the US Navy has been delivered on cost and on schedule.

Every Super Hornet has a buddy refueling capability that can extend time on station, range, and endurance. Additionally, the Super Hornet can provide close and deep air support through the active electronically scanned array (AESA) radar targeting data and reliable data links. The Super Hornets are fully compatible with the Indian Navy's aircraft carriers. Extensive simulation has shown that the Super Hornet is capable of conducting STOBAR operations with a meaningful weapons and fuel load.

## EASE OF MAINTENANCE

The F/A-18 Super Hornet not only has a low acquisition cost, but it costs less per flight hour to operate than any other tactical aircraft in US forces inventory. Part of its affordability is because the Super Hornet is designed to need far less maintenance; this trans-

lates into high mission availability. Plus, the Super Hornet does not require any scheduled depot-level maintenance and the engine does not require any scheduled maintenance between overhauls.

This low cost of operation, low maintenance requirements and twin-engine based survivability allow the Super Hornet to fly to and back from harsh environments.

## PREPARED FOR FUTURE THREATS: F/A-18 ADVANCED SUPER HORNET CAPABILITIES

Every two years Boeing and its industry partners along with the US Navy work on delivering new capabilities to the fighter. Critical mission systems such as the radar, mission computers and sensors continue to evolve to match up to the mission profiles of the future.

To address the capabilities needed in the air wing as early as the 2020s, Boeing has also developed the Block III Super Hornet to complement existing and future air wing capabilities. Block III is the same aircraft as Advanced Super Hornet. The Advanced F/A-18E/F Super Hornet's multi-mission capabilities include battle-space situational awareness, counter stealth targeting, greater range and increased acceleration, improved survivability and reduced signature and room for growth.

These advanced capabilities can be both built into new aircraft and incorporated into existing aircraft, allowing maximum ability to field these capabilities quickly and affordably. Block III Super Hornet is built from the same airframe as Block II, providing low risk development and maintaining the lowest operating costs of any US tactical fighter. While Boeing demonstrated advanced Super Hornet capabilities in flight in 2013, the package of upgrades has evolved to best complement F-35, EA-18G and E-2D as they will be operating together in the air wing well into the 2040s.

Key features of Block III Super Hornet include enhanced network capability, longer range with low-drag, stealthy conformal fuel tanks, long-range detection with Infrared Search & Track, enhanced situational awareness with a new Advanced Cockpit System, improved signature with low observable next generation radar cross section for increased survivability and 9,000+ hour life for reduced life cycle costs by incorporating design changes into production aircraft based on lessons learned from the Service Life Analysis Program.

A significant design evolution is the addition of Conformal Fuel Tanks. Mounted on the shoulder of the Block III, conformal fuel tanks extend the range of the Block III by 100 nautical miles which is significantly larger range when compared to the Block II. Conformal Fuel Tanks also free up the space occupied by a centerline drop-tank. This means that the Air Force and the Navy have an additional hard-point to carry more air-to-air or air-to-ground weapons.

Modern and next-generation aircraft have a large amount of data available through their sensors. The Super Hornet Block III comes equipped with Distributing Targeting Processor Network (DTP-N) and Tactical Targeting Network Technology (TTNT). These are basically a computer and a big data platform that work together to aid in even more efficient movement and management of data within assets.

The Advanced Cockpit System is a next-generation use interface, which simplifies the interpretation and projection of a large quantity of information for the aircrew – both in the front and rear cockpit – making it easy to interface and manage an information network. The Block III's sensors along with the APG-79 AESA Radar coupled to DTP-N and TTNT systems plots information on the Advances Cockpit System making it easy for aircrews to view and manage information.

Even though the Super Hornet Block II is a stealth aircraft, Boeing has made a few signature improvements to reduce the Radar Cross Section (RCS) of the Block III to make it even stealthier.

#### F/A-18 SUPER HORNET MAKE IN INDIA

Boeing has had a presence in India for more than seven decades and is committed to expanding that partnership by producing Super Hornets in India, further developing India's aerospace ecosystem. Boeing's proposed 'Make in India' plans for the Super Hornet are not about moving a production line but rather building an entirely new and state-of-the-art production facility that can be utilized for other programmes like India's advanced medium combat aircraft (AMCA) programme.

Boeing is prepared to bring its global scale and supply chain, its best-in-industry precision manufacturing processes, as well as the company's unrivaled experience designing and optimising aerospace production facilities to bear in both expanding India's aerospace ecosystem and helping realise the 'Make in India' vision. The approach addresses the infrastructure, personnel training, and operational tools and techniques required to produce a next gen fighter aircraft right here in India.

Boeing will work closely with India industry to ensure they have the very latest technologies, applying lessons learned from the current Super Hornet production line. The programme envisages transitioning airframe and subsystem manufacture to Indian industry in a deliberate way, representing extraordinary opportunity for technology insertion and growth within India's aerospace industry.

Boeing will partner with Indian industry to develop the right capabilities as efficiently and cost effectively as possible to integrate these suppliers into the global supply chain. Boeing and its current industry partners are having robust discussions with suppliers in India about building Super Hornets. Currently over 60,000 people from 800 suppliers across 44 states are part of the supply chain supporting the Super Hornet. This includes suppliers who manufacture parts for the Super Hornet in India.

With advanced technologies and multi-role capabilities, the Super Hornet is perfectly suited to meet the needs of the Indian Navy and IAF now and in the future.



#### F/A-18 FOR THE INDIAN AIR FORCE

It is our understanding that the IAF will have a need for additional twin engine aircraft as the IAF retires its Jaguars, MiG and Mirage aircraft. We are having ongoing discussions with the IAF, Indian Navy and Ministry of Defence on the best way for India to meet its fighter needs while building an indigenous industrial base.

#### 'MAKE IN INDIA'

Our F/A-18 Super Hornet 'Make in India' proposition is a fine example of what the future could look like. The F/A-18 Super Hornet will provide unmatched benefits to not only the Indian armed forces but also to India's indigenous aerospace manufacturing sector. The depth of the transfer will really help advance India's aerospace ecosystem.

Boeing is making the investments required to do this and is delivering on its 'Make in India' promise. Boeing has quadrupled its manufacturing and sourcing activities in the country and will surpass a billion dollars this year with 160 suppliers. We have been working with these suppliers and partners in manufacturing, IT and engineering services to provide parts and assemblies covering aerostructures, wire harness, composites, forgings, avionics mission systems, ground support equipment and training. Through Boeing's efforts, the supplier base is delivering on complex work packages for commercial and defense aircraft such as the 777, 787, P-8, F/A-18 Super Hornet, F-15, AH-64 Apache and CH-47 Chinook.

Our Indian suppliers are already manufacturing critical components and assemblies for the AH-64 Apache and CH-47 Chinook. Our joint venture with Tata Advanced Systems is manufacturing AH-64 Apache helicopter fuselages, secondary structures and vertical spar box in the initial phase and then will focus on co-development of systems in the future. Dynamatic Technologies is manufacturing the ramp and pylon aerostructures for the CH-47 Chinook helicopter. Tata Advanced Systems is manufacturing crown and tailcone assemblies for the Indian configuration of the CH-47F Chinook helicopter. These work orders were established before we even won Indian orders.

Our joint venture, TBAL, is already producing fuselages, secondary structures and vertical spar boxes for the AH-64 Apache, including those for the Indian Army contract when we receive one. In June this year, Dynamatic Technologies is making the CH-47 Chinook's ramp and pylon in India.

This milestones are significant steps in our journey to increase defense capability and manufacturing capacity out of India. ■

—The writer is Vice President, Global Sales, Boeing Defense, Space & Security





EMBRAER LEGACY 500

# BIZJET & MIDDLE EAST

Nearly half of the aviation professionals surveyed said the Middle East private jet market is currently attractive for finance companies and projected a healthy growth rate over the next decade

BY BIKRAM VOHRA, DUBAI

**BUSINESS JET USUALLY DO** score sales at various air shows, but at the Dubai Air Show 2017 it was more of a holding pattern. Eclipsed by the sale of a possible 24 C series to Egypt, the focus shifted for the Canadian planemaker Bombardier to regional jets and the 'save us' deal between it and Airbus for giving a push to the narrow body platforms. And if Bombardier was content to trawl the market for a future impact and settle for a static display as well as share insight on the Global 7000, so be it.

As Embraer wrestled valiantly with the Airbus rescue of a cornered Bombardier and saw in it a positive spin for its share of the

market, it also settled for showing off its triumvirate through the Legacy 500, the Legacy 650E and the Lineage 1000E in the display section. Again, the battle was enjoined over the regional market and Embraer who is now in the last stages of certification for the 114-seat E190-E2, felt quite chuffed that as customers compared price quotes, their option would come out on top especially since Airbus cannot come into the picture fiscally for some time.

Meanwhile, the sparks from Boeing and Bombardier concerning subsidies and tariff barriers, created a bonfire of vanities and captured the attention of the media and directly

impacted on the customary sunniness that is projected between these two giant neighbours. This was a new turn for the books and worth speculation; where will they go from here? That the Canadians have decided to go in for a majority deal with Boeing's French rivals, did not help douse the flames of poorly concealed outrage. The C series will ride ostensively on the coattails of the Airbus A320 family and create a 'hub and spoke' option, something they both feel is viable.

Both the platforms will compete for the demand for 450 aircraft in this category expected to be the Middle East market over the next decade. With power plants suffering in harsh climates; the sand and grit causing friction, the E2 E-Jets from Embraer and the Bombardier C Series, feature Pratt & Whitney PW1000G turbofans, whose bigger cases and higher bypass ratios allow for higher degree of preservation and the ability to withstand heat and dust.

Where did that leave the business jet market? Seen through the year as much like the curate's egg (good and bad in parts), the big players saw Dubai 2017 as the seeding ground for the MEEBA 2018 exhibition also to be held in the same Emirate. Coming hard out of the gate will be the Global 6000 and 7000, the Challenger 600 for Bombardier and for Embraer their trinity will give a strong showing. Gulfstream with over 100 of its aircraft in location, its support system and presence make it a strong competitor and it will be seeking a niche market for its flagship, the G650 Business Jet which is a strong contender in the region. It intends to take on the Airbus Corporate Jet (ACJ) and the Boeing Business Jet (BBJ) from the big boys stables, proving that you cannot really refit a commercial airliner to Business Jet specs.

Cessna will be looking at marketing most aggressively its Citation Longitude aimed squarely at the large cabin segment and also seek hurrahs for its Citation Mark 2 light jet. Also reining in for now was Hondajet, Japan's tough little mite currently being manufactured in Greensboro, North Carolina. The first half of 2017's top seller it caught the eye of many a potential customer including several from the home country who have been impressed by its performance and loved its 'nen' factor (means the little things in cherry blossom land) and the happy price tag of \$4 million or less.

Another reason for the go slow is probably because the region

**ON THE WORLD MAP, THE  
GLOBAL BUSINESS AVIATION  
OUTLOOK FORECASTS UP TO  
8,300 NEW BUSINESS JET  
DELIVERIES WORTH \$249  
BILLION FROM 2017 TO 2027**

has the youngest fleet in the world of genuine Business Jets excluding wide-bodied conversions. Of the 430 aircraft in the air, almost half if not more, are less than ten years old. Place that against the current number of aircraft up for sale at 73 what with the demand for upgrading and seeking larger options and one can understand why there is this slowdown. The Middle East Business Jet market is resetting itself at the mid and large level and seeing considerable opportunity in the small segment where corporates and individuals

of high net worth might see it as a viable fiscal alternative to the cost of commercial flying in terms of work and hours expended.

Research recently carried out by Business Jet financier Global Jet Capital, indicated a heartening upswing in the future. Nearly half of the aviation professionals surveyed said the Middle East private jet market is currently attractive for finance companies and projected a healthy growth rate over the next ten years. Brazilian manufacturer and major contender in the region, sees as many as 200 business jets required in the next decade even as some of them are absorbed by used aircraft aimed at the emerging level of executives and entrepreneurs. On the world map, the Global Business Aviation Outlook forecasts up to 8,300 new business jet deliveries worth \$249 billion from 2017 to 2027. This is a drop of two to three percentage points from the 10-year forecast of 2016 and indicates the uncertainty of peace in the area and the reduction in spending money. Possible customers are hedging their bets. Much will depend on the oil prices, the liquidity in the market and the growth of the region's infrastructure. At present half the fleet in the Middle East is either registered in UAE or Saudi Arabia and unless the needs of the high net worth traveler are met with and there are more than half a dozen pairings, there will be a break on the predictions being realised.

The one advantage that spurs the market in the Middle East unlike those in the US and Europe, is the limited affection for fractional ownership model because of a mindset that prevails in the region. Sharing is still seen as infra dig and is discouraged. This underscores the one in three private and corporate ownerships who have, according to a Honeywell survey, factored in a sale for a new purchase over the next two to five years, the time span in which the region will see its next spurt in the business jet market. **SP**

(LEFT) GULFSTREAM G650; (RIGHT) BOMBARDIER GLOBAL 6000 ON DISPLAY





Business Aviation communities constantly had to clamour about the benefits that this segment of the industry provides for its users and to the growth of the national economy

BY GROUP CAPTAIN A.K. SACHDEV (RETD)

**INTERNATIONAL CIVIL AVIATION ORGANISATION (ICAO)**, the specialised agency of the United Nations (UN) that is concerned with civil aviation, does not offer any definition of 'Business Aviation', a term used widely in the context of usually small but frequently large aircraft for furthering the business needs of individuals and entities. Instead, it uses the term 'General Aviation' to indicate all civil aircraft that are not operated by commercial aviation or for aerial operations for specific tasks such as crop spraying etc.

However, International Business Aviation Council (IBAC), an International Non-Governmental Organisation (INGO) with a permanent observer status with ICAO, prescribes the following definition of Business Aviation: "That sector of aviation which concerns the operation or use of aircraft by companies for the carriage of passengers or goods as an aid to the conduct of their business, flown for purposes generally considered not for public hire and piloted by individuals having, at the minimum, a valid commercial pilot licence with an instrument rating." IBAC further subdivides Business Aviation into commercial, corporate, owner-operated and fractional ownership. Business Aviation communi-

ties all over the world have constantly had to clamour about the benefits that this segment of the industry provides for its users and therefore to the growth and economy of the nation they are a part of. The United States (US) is the largest user of Business Aviation where it has registered a growth of 34 per cent over the last five years. A large part of this success is owed to an undertaking called 'No Plane No Gain' launched jointly by the National Business Aviation Association (NBAA) and the General Aviation Manufacturers' Association (GAMA), both US aviation entities. The purpose of the undertaking is to make all endeavours to make the general public and the US establishment, more aware about the importance of Business Aviation to the US and its communities, companies and citizens. Every alternate year, NBAA carries out studies relating to the use of business aircraft to the performance of the companies they serve. The latest study entitled Business Aviation and Top Performing Companies 2017 (S&P 500 Companies: Using Business Aircraft to Create Enterprise Value) and executed by NEXA Advisors can be accessed at <https://www.nbaa.org/business-aviation/nexa-business-aviation-and-top-performing-companies-2017.pdf>. Its main deductions are discussed below.

ILLUSTRATION: ANOOP KAMATH



**SCOPE OF THE REPORT**

The study examined the financial performance of the Standard & Poor's 500 Index (S&P 500) companies in the period 2013 to 2017 and found that, when sorted into "Users" versus "Non-Users," those companies deploying aircraft to support their missions outperformed those that did not in several metrics. The most important measure of impact is a company's enterprise value, by both share amount and share appreciation; in this respect, Users outperformed Non-Users by about 70 per cent over the study period. The study concludes that business aircraft leverage key employee productivity, accelerate transactional closings and boost customer interaction. The study finally concludes that business aviation delivers extraordinary value for America's top performing companies and contributes across the board, in both financial and non-financial measures. The study uses facts and evidence to arrive at the conclusion that "Business Aviation contributes meaningfully to a company's enterprise value and continues to be a powerful tool of the best-managed companies in America".

**METHODOLOGY**

The study looked at utilisation strategies employed for use of aircraft and identified these as transportation of key employees, transportation of customers, transportation of suppliers, transportation of cargo, parts and mail, transportation for humanitarian and charity missions and direct applications such as site mapping, aerial photography and even hiring out of spare flying effort to derive income for their flight departments. The net benefits from these utilisation strategies were listed by the report as employee time savings, improved productivity, strategic transaction acceleration through rapid deployment of transaction teams, protection of intellectual property through reduced exposure to commercial air travel, improved customer retention, supply chain improvement, product and production cycle improvement, employee safety and security, risk management through better oversight and control of critical processes and tasks, direct travel expense savings, increased personnel retention and social responsibility through use of business aircraft for humanitarian

or charitable purposes. The next logical step was to assess the relationship between the benefits identified and their effect on enterprise value impact. The financial drivers capable of increasing enterprise value were identified as revenue or market share growth, profit growth and asset efficiency while the non-financial value drivers identified through qualitative research, were found to be customer satisfaction, employee satisfaction, innovation, risk management and compliance.

**FINANCIAL ANALYSIS**

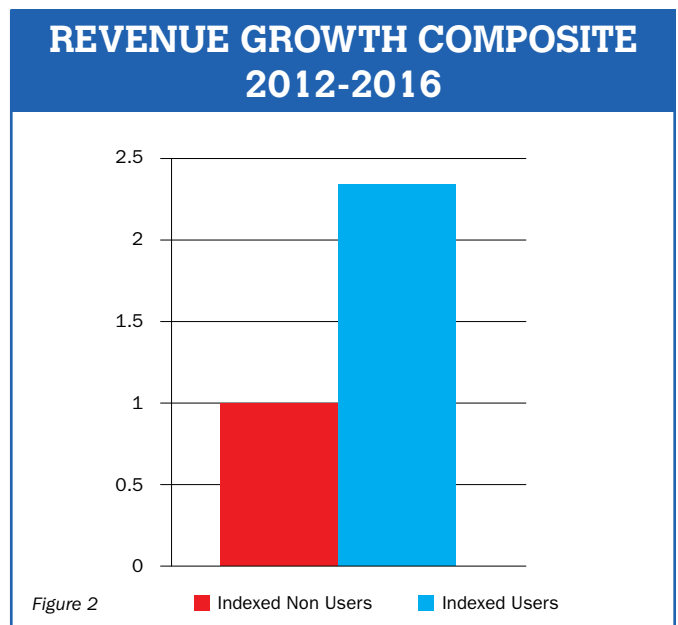
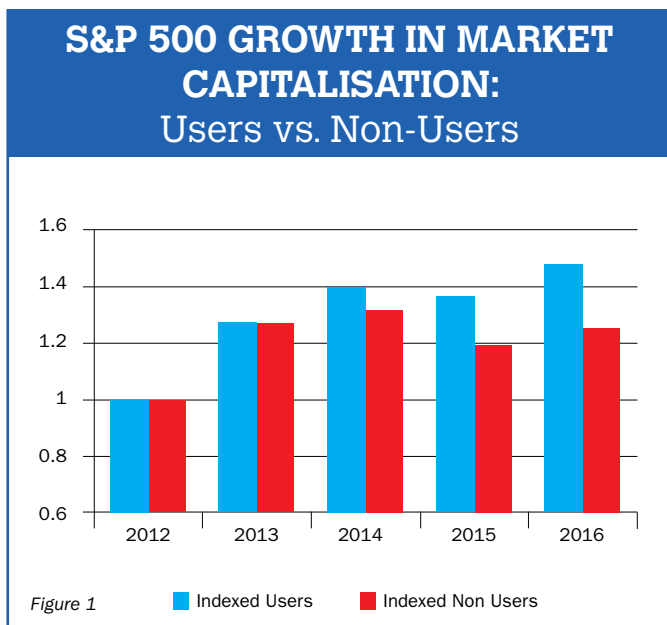
For the study, the 2017 S&P 500 companies were classified as either "users" or "non-users" of business aircraft. A "user" was defined as any company or its officers authorising the regular use of aircraft via whole aircraft ownership, fractional aircraft ownership, charter or any other form of operation as an aid to the conduct of its business and for the benefits of the enterprise. Thus the study included in its scope the use of charter aircraft as business aviation if the use was purely for business purposes. Those companies for whom data was not available for all five years of the report period, were excluded and finally 415 companies were evaluated.

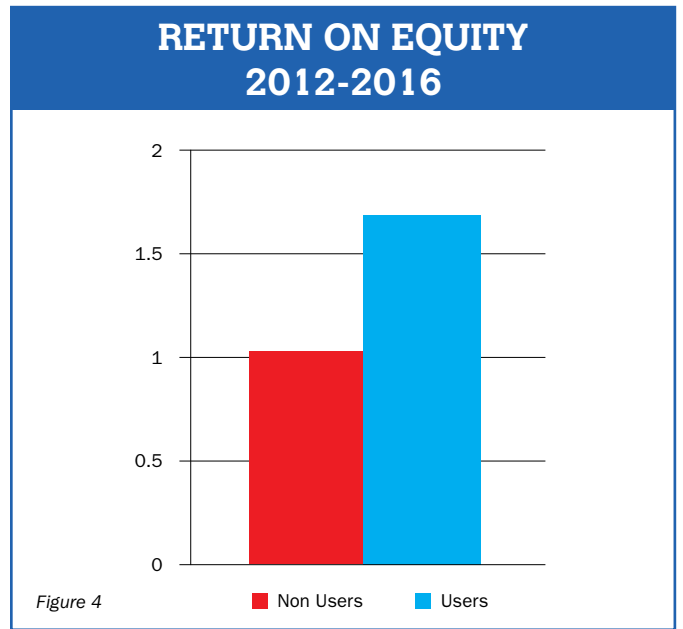
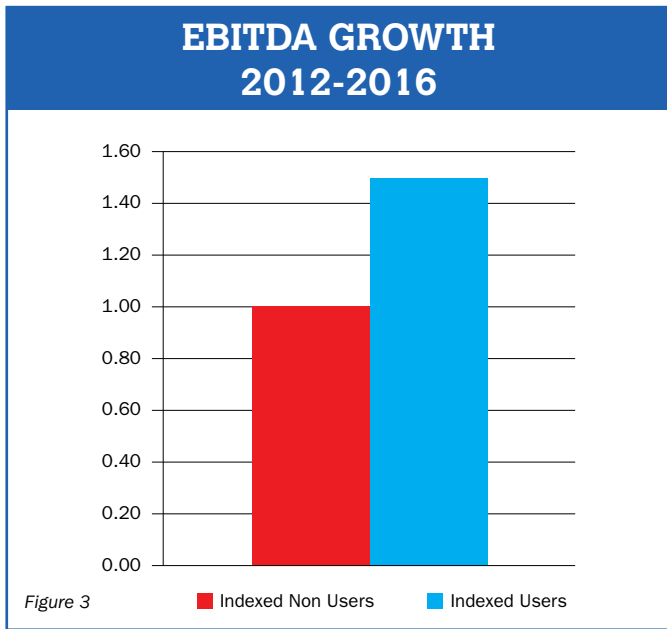
As for market capitalisation that is the all-important metric determining relative shareholder value of a company, business aviation users improved their financial results dramatically during the period of study as can be seen from Figure 1.

The "top line" revenue growth indicates a company's ability to grow and more importantly, grow faster than a competitor. Revenue growth generally comes from organic growth and from strategic acquisitions and business alliances. Figure 2 shows that revenue growth for users surpassed those of non-users by a factor of 2.4 thus indicating that users are at much higher profitability levels than non-users.

Coming to Earnings Before Interest, Taxes, Depreciation and Amortisation (EBITDA) or 'bottom line' which is a measure of a company's financial strength and momentum, again users far outperformed non-users (see Figure 3) by a factor of 1.5.

Another important element in evaluating a company is its





ability to produce returns on investment equity as that is a key metric to continually attract new and larger capital for growth. Return on equity (ROE) or the ratio of net income to common stock equity tells common shareholders how effectively their money is being deployed. Comparing ROE over time reveals trends in the efficiency of applying equity to generate net income. Further comparisons with industry composites reveal how well a company is holding its own against competitors. On this metric, users were ahead of non-users by a factor of 1.6 approximately (see Figure 4), demonstrating that Business Aviation users are more efficient at using equity capital to generate net income.

**NON-FINANCIAL ANALYSIS**

The major non-financial drivers namely customer satisfaction, employee satisfaction, innovation, risk management and compliance are difficult to quantify. Hence, in lieu of a quantitative analysis of these factors, the study relied on its own research as well as other sources to gauge non-financial performance. The study used lists prepared by reliable and reputed analytical and consultative sources to test if there was a correlation between use of business aviation and the prosperity as well as reputation of the company. It found an unquestionable linkage between use of business aviation and these lists which include Forbes Global America’s Most Innovative Companies List 2017, Fortune 100 Best Places to Work 2017, Wall Street 50 Best Customer Service 2016, Interbrand 50 Best Brands 2016, Fortune 2017 World’s 50 Most Admired Companies, Forbes Global 50 Top Performing US Companies 2017, Forbes 100 Most Trustworthy Companies in America 2017, Fortune 2016 Change The World Top 20, S&P 500 Top 50 Performing Stocks and CRO 100 Best Corporate Citizens 2017. In all these lists except

one, more than 90 per cent of the companies were users of business aviation. Needless to say, company value is driven by market forces other than pure financials. Value expectations based on non-financials play an important part in setting current price of the shares of the company.

**CONCLUDING REMARKS**

The study comes out with an unequivocal message about the importance of business aviation and its uniqueness as a tool for providing an advantage to the user companies in contrast to those companies that neither wish to invest in aviation assets nor hire charter aircraft for business purposes. The facts and figures offered by the study are unambiguous and indisputable and make a very strong case for any nation to look at business aviation as a necessity and a national asset. Most international companies such as those in the US discussed above, have realised the contribution of business aviation to business and are using a combination of privately owned aircraft, charter aircraft, fractional ownership models and also commercial flights to act as ‘time multipliers’ in pursuit of company objectives by utilising working time on board aircraft including for private and confidential discussions on own aircraft. So have the governments of developed nations who are striving to nurture Business Aviation through incentives and motivations. In India, however, this realisation has touched only the users and not the establishment which provides the regulatory and infrastructural framework for the progression of Business Aviation. Perhaps it is time now for the Indian government to launch an objective, impersonal and unprejudiced inter-Ministerial study on the lines of the NEXA study discussed above. Such a study could disabuse the government of the idea it appears to harbour that business aviation is luxury and not a necessity. <sup>SP</sup>

PERHAPS IT IS TIME NOW FOR THE INDIAN GOVERNMENT TO LAUNCH AN OBJECTIVE, IMPERSONAL AND UNPREJUDICED INTER-MINISTERIAL STUDY ON THE LINES OF THE NEXA STUDY



*Under the auspices of the*  
**PRESIDENCY OF THE  
REPUBLIC OF TURKEY**

## Dear readers,

Although the aviation industry is susceptible to the vagaries of the global economy it is still able to sustain its dynamism owing to its openness to international trade and competition. This first began with the unipolar new world order that emerged several decades ago, and which enables the discovery of new regions that offer new opportunities for the aviation industry.

In this regard, Turkey is situated in a geopolitically strategic position. As is the case in all other areas of trade, Turkey also serves as a bridge between the aviation industries of the West and the East. While the global aviation industry's growth rate has been 5 per cent in the last 13 years, Turkey's aviation industry achieved 15 per cent growth during the same period. Moreover, Turkey is still far from reaching its saturation point in the aviation industry.

Once the Istanbul's third airport is completed in 2018, this investment will become a hub for global air traffic, as the world's largest airport. The airport, which will offer employment opportunities for 225,000 people, is expected to host 3,500 flights and 200 million passengers annually.

### ***"The Eurasia Airshow brings together Global Aerospace Industries' brands and their executives in Antalya, Turkey."***

Taking advantage of high potential and the developments in the Turkish aviation industry and its region, we are adding a new air show to the premiere league of international exhibitions.

The Eurasia Airshow, which will be Turkey's first biennial international commercial and military aviation exhibition, is preparing to bring together global brands and their executives in a massive event that will take place in Antalya between April 25 and 29, 2018. We expect the Eurasia Airshow to create a business volume of approximately \$40 billion in the commercial and military aviation industry.

We are organizing the Eurasia Airshow under the high auspices of His Excellency President Recep Tayyip Erdoğan. Our aim is to make the Eurasia Airshow ( Turkey's first show-based aviation event ) one of the most important Turkish global brands in the international aviation industry, along with Turkish Airlines and Turkish Aerospace Industries.

will be an aerospace summit which already has 12 senior airline executives confirmed as speakers.

The air show will serve as a business development platform, where the aviation products of our country, as well as its partnerships and business models in this field, will be introduced. Furthermore, all



### ***"Eurasia Airshow brings together aviation giants of the West and East."***

We will hold the Eurasia Airshow in Antalya, which is Turkey's most popular tourism destination, and one that hosts very important events, such as the G-20. At the Antalya International Airport \_ which, with its enormous size and tremendous infrastructure, is one of Turkey's three busiest airports \_ there will be a 50 square metre indoor area, 65 chalets, and a static display area for 100+ aircraft with a total area of 300 square metres. At the Eurasia Airshow, our aim is to host 150 military and civil delegations, 100,000 professional visitors and more than 400 distinguished companies plus many airlines and aircraft maintenance companies. Alongside the airshow there

parties concerned will come together to talk about business, learn about each other's capabilities, and establish business contacts.

The Eurasia Airshow will also be a platform that will be attended by the industry's decision makers, the producers of commercial and military aircraft, sub-components and systems.

We are honoured to invite you to attend the Eurasia Airshow, as our guest, which will be a gathering point for the aviation industries' key players, from West and the East.

**Ferhat Yenibertiz**  
CEO of Eurasia Airshow





OVERHAUL REQUIREMENT OF TRANSPORT AND HELICOPTER FLEET OF THE IAF NECESSITATED SETTING UP OF NO 3 BRD AT CHANDIGARH ON AUGUST 20, 1962

# SYNERGY IN MILITARY & CIVIL MRO

The business models of civil MRO need to look into military aviation linkages and the military MRO needs to open their facilities for utilisation by civil MRO segments

BY AIR MARSHAL SUKHCHAIN SINGH (RETD)

PHOTOGRAPHS: IAF

**MAINTENANCE, REPAIR AND OVERHAUL (MRO)** in military aviation has been an integral part of the force structure. All the Indian Air Force (IAF) erstwhile bases had some deep level workshops to repair aircraft based there. They were mostly accident or battle damage repairs undertaken to put them quickly back for operations to aid the war effort. During World War II (WW-II), Air Force Station, Kanpur had an elaborate set up to support air operations in the Far East. No 322 Maintenance Unit was formed in 1940 in the twenty one TATA hangars at Chakeri, Kanpur. The functions of the unit included arming of bomber and fighter aircraft such as the Liberator, Lancaster, Hurricane and Tempest. The unit was further expanded to include aircraft storage and servicing activities, while the logistics support and aero-engine storage functions operated at Armapur Estate, 25 km from Chakeri.

In August 1945, after Japan surrendered to the Allied Forces and hostilities came to an end, No 322 Maintenance Unit was disbanded and Royal Air Force Station, Kanpur came into formal existence. No 1 Aircraft Repair Depot for servicing and No 10 Aircraft Storage Unit for storage activities at Chakeri were merged to form No 1 Base Repair Depot (BRD) and Group Captain Harjinder Singh took over as the first Commanding Officer of this new unit. Nostalgic moments included induction into the IAF in 1954, of the first jet aircraft, the Vampire and the Depot undertaking its major servicing in that very year. Over the years, No11 BRD repaired and serviced a variety of aircraft, such as the Tempest, Spitfire, Prentice, Auster, Harvard, Mystere, Toofani, Otter, Bell Helicopter, Vampire, Hunter and Avro aircraft. It also overhauled Martin, Griffen, Nene, Verdon, Goblin MK-34-35, Avon 203-207 and AL-7F-1 aero-engines. Reclaiming 50 Liberator bombers from junkyard became the first feather in the Depot's cap. The Depot retrieved a written-off Spitfire aircraft from salvage dump and made it airworthy. It took to the air in 1950 with Pilot Officer Roy Chowdhury on the controls. In fact, Air Vice Marshal Harjinder Singh was the first engineering officer to fly the Spitfire.

Today, No1 BRD is engaged in major servicing of AN-32 transport aircraft. Similarly, overhaul requirement of transport and helicopter fleet of the IAF necessitated setting up of No 3 BRD at Chandigarh on August 20, 1962. The requisite facilities were set up with Russian collaboration and commenced the first of the overhauls of the IL-14 transport aircraft and the MI-4 helicopters. With the induction of new helicopters, the Depot graduated to overhaul of MI-8 and MI-17 helicopters. In fact, the Depot has today become the knowledge centre for all Russian helicopters and has undertaken life-extension of MI-25, repair of MI-26 and upgrade of MI-35. Also, established in 1975 at the peak of modernisation programmes in the IAF, 11 BRD commenced operations by overhauling Sukhoi Su-7s, only to last till 1982, followed in 1987 by the MiG-23, and the MiG-29 in 1996. With collapse of the Soviet Union, MiG-21 spares were not easily forthcoming, forcing the BRDs to work on indigenising rotables and aggregates of avionics and airframes. An Inter-Agency Group for Life Extension was formed to work on indigenous life extension technology. As the inductions into IAF with newer technologies were undertaken, so were the various BRDs established for MRO of the aircraft, rotables, Avionics and aero-engines. Today there are total of eighteen BRDs in the IAF catering to the MRO requirements of various airborne and ground-based weapon systems.

Hindustan Aeronautics Limited (HAL) was established on December 23, 1940 at Bangalore as Hindustan Aircraft. In 1943, the Bangalore factory was handed over to the United States Air Force without any change in management. The factory expanded rapidly and became the centre for major overhaul and repair of American aircraft and was known as the 84th Air Depot. The first aircraft to be overhauled was a Consolidated PBV Catalina followed by every type of aircraft that operated in India and Burma. When returned to Indian control two years later, the factory had become one of the largest overhaul and repair organisations in the East. In the post-war re-organisation, the company built railway carriages as an interim activity.

ALL IAF BASES HAVE SOME DEEP LEVEL WORKSHOPS TO REPAIR AIRCRAFT BASED THERE





ESTABLISHED PLAYERS IN INDIA ARE UPGRADING THEIR HEAVY MAINTENANCE CAPABILITY TO REDUCE TURNAROUND TIME AS WELL AS COST OF MAINTENANCE

Airlines in India spend about 15 per cent of their revenue towards maintenance, the second-highest cost item for airlines after fuel. Generally, airlines carry on-tarmac inspections (A and B checks) in-house and work with third-party MROs for engine, heavy maintenance (C and D checks) and modifications. Almost all airline MRO infrastructure in India is captive and is largely with Air India, with some fully operational independent third-party provider with an EASA-certified facility for heavy maintenance capability for Airbus A320, ATR 42/72 and Boeing 737/NG family of aircraft. GMR has set up in partnership with MAS an operational facility meeting EASA standards at Hyderabad. A significant percentage of the business aviation fleet in India gets heavy maintenance and modifications done at OEM approved facilities in Europe, UK and the US. This trend is gradually shifting as established players in India are upgrading their heavy maintenance capability and providing customers with an option to reduce turnaround time as well as cost of aircraft maintenance. A key inflection point for this segment of the industry will that be when MRO's in India upgrade their facilities to global certification such as EASA in addition to OEM certification. This will enable customers to access globally certified quality of maintenance services locally at their operating base. The other key challenge which is faced by the industry is non-availability of spares in the region which leads to frequent grounding of aircraft. This is driven by a lack of OEM support for the Indian market which is gradually changing with growth in the market and the custom duty regime which discourages MROs from stocking parts on behalf of customers.

PHOTOGRAPH: GMR AERO TECHNIC

Induction of military aircraft are planned in a big way over the next few years. The list for the IAF includes FGFA, additional MMRCA beyond the 36 Rafale already contracted for, single and twin-engine fighters, additional Su-30 MKI, 75 more basic trainers, two more AWACs, replacement for Avro HS-748 as also of the aging An-32 in the near future, advanced light helicopters, light utility helicopters, light combat helicopters, and upgraded versions of Tejas. With such inductions, there is a need to look at the MRO segment to ensure that serviceability of these platforms is no less than 80 per cent. This implies that the original equipment manufacturer (OEM) including HAL has to set up MRO shop jointly with Indian private players. The core MRO capability of the BRDs need to function as an interface with the industry. The Indian civil carriers are expected to double their fleet size in the next five years and there is a rapidly growing need for induction of civil helicopters in the police, para-military establishments and for emergency medical services. Thus, there will be significant growth in MRO activities both in the military and civil sectors. It is expected that the combined MRO spending will be around \$50 billion by 2025. The Indian MRO sector has the ability to absorb the technology transfer at depot level for airframe as well as components and aero-engines.

**ESTABLISHED PLAYERS  
IN INDIA ARE UPGRADING  
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OPTION TO REDUCE  
TURNAROUND TIME AS  
WELL AS COST OF AIRCRAFT  
MAINTENANCE**

**MRO MARKET**

When we talk of MRO, we are referring to the segment related to line maintenance, airframe heavy maintenance and modifications, overhaul of engines, components and accessories. The line maintenance is





THERE ARE TOTAL OF 18 BRDs IN IAF CATERING TO THE MRO REQUIREMENTS OF VARIOUS AIRBORNE AND GROUND-BASED WEAPON SYSTEMS

undertaken by the operator or a third party whereas the other segments are specialised activities which are capital-intensive and high skilled areas. The stringent airworthiness and flight safety requirements are ensured by regulatory mechanisms through CEMILAC and DGCA in India. The OEMs have their regulatory mechanisms rooted in EASA or FAA regulations which have to be adhered to by the operators. In the case of military MRO, additionally life extensions studies and reliability improvement programmes are an integral part. Similarly, since the military platforms do not get replaced at the desired intervals, operational upgrades to keep abreast of technology and above the adversary's capabilities, have to become part of military MRO.

What needs to be appreciated is that both the civil and military MRO is a national air power asset and needs to be in sync to enhance the combat potential of air power. There is a need to co-operate and collaborate in this endeavour to exploit and take advantage of the combined skill sets, infrastructure for optimum utilisation of infrastructure of the country. Technology today is similar for deployment in civil and military platforms and it is now possible to seriously consider collaboration. The business models of civil MRO need to look into military aviation linkages and the military MRO needs to be ready to utilise these and open their facilities for utilisation by civil MRO segments. A mutual trust and understanding needs to be developed and nurtured.

**MILITARY MRO**

The military MRO is primarily based on BRDs and the associated ecosystem of

local vendors. Over the years with BRDs at Nasik, Suler, Kanpur, the nearby HAL supporting ancillary industries and the civil industrial eco-system have been included in the defence MRO fold. HAL has MRO established for the fleets that are licence-produced or they are the OEM. The closed-door policy adopted by HAL till now did not open doors to the MROs in the civil sector and no third-party MRO for these aircraft have emerged. It is only recently that HAL has begun outsourcing some airframe structures of the Su-30 and Tejas aircraft to Indian private entities. Thus, there is a demarcation in the military MRO space with IAF and HAL. A beginning has been made to get traction of 11 BRD with HAL (Nasik) division in the joint Su-30 MKI aircraft overhaul at the BRD. Similarly, the outsourcing of activities by HAL in this MRO, is also being used by the IAF. This is the beginning of collaboration that needs to find more avenues in the long run. MROs for Tejas and ALH variants will be at HAL. With HAL moving to become an integrator of outsourced manufacture, it will only be appropriate to hand over MRO of these platforms to a third party Indian firm.

The military MRO has some unique characteristics. The primary need is the aircraft availability requirements on a daily basis along with surge requirements during operations. The MRO must be able to self-sustain and support the front-line squadrons. Singularly the battle damage repairs on fast track is the need in modern high-tech aircraft. To meet operational challenges posed by the adversaries, the IAF has to retain an edge by undertaking rapid upgrades of the avionics and weapon systems which the concerned MRO facility

**WITH HAL MOVING TO BECOME AN INTEGRATOR OF OUTSOURCED MANUFACTURE, IT WILL ONLY BE APPROPRIATE TO HAND OVER MRO OF THESE PLATFORMS TO A THIRD PARTY INDIAN FIRM**

PHOTOGRAPH: IAF

must be able to provide. HAL has been able to carry out upgrade of Jaguars to DARIN-2 and DARIN-3, Mig-27 avionics upgrade and now is upgrading the Mirage-2000 as a series modification done by OEM abroad. The skill sets need to be available at front line bases to generate the confidence to keep the aircraft on operational readiness. Since military MRO is a captive facility, the development of sub vendors in spares and repairs are few and even they need OEM certification. The possibility of third party of similar systems in civil aviation with adequate regulatory support, needs to be seriously considered.

Military aircraft technology is increasingly modular and there are similarities in the civil aviation transport and helicopters fleet. As discussed above due to OEM regulatory mechanisms, these are compartmentalised and no common MRO process have been encouraged till now. No private player will venture to bridge this gap because the military systems will generally be of low volume. The newer aircraft inductions afford an opportunity to relook at the aggregation of such MRO to third party. Airbus and Boeing flight refuelling aircraft, AWACS, CASA-295 transport aircraft, etc come to mind straight away.

### CIVIL MRO

The civil MRO models are based on OEM or direct venture of operators with the OEM or utilisation of an approved third party regulated by the OEM. The biggest civil MRO is with Air India which is captive to their fleet and it is only recently that they have aggressively marketed their facility for other civil airlines including the IAF and the Indian Navy. The Indian industry ecosystem is too small to support this MRO. However, many smaller players have entered the MRO market, but their scope is limited to low levels of maintenance on various civilian fleets. Many joint ventures (JVs) have been inked or are in the pipeline to increase the MRO base in India but their business models must be cost competitive with offshore facilities to make sense.

An area in which the civil MRO is non-existent is the Russian transport and helicopters which are in the Military MRO domain. No facility exists to support the Russian fleets and hence it is a good opportunity for investment in India. In not so a distant future, there will be a need to replace the aging An-32 fleet and the cost of Russian platforms with the large numbers required will lead to a Russian transport aircraft being also considered. This will open an opportunity for the Russian MRO industry.

There are huge commonalities in the civil and military MRO segments. The difference are in the volumes and the different regulatory requirements. Each one can tap into each other's resources provided the issues of airworthiness and regulatory mechanisms are sorted out. The Aircraft General Spares (AGS), repairs, software services and processes can be dovetailed into the indigenisation process. The MRO supporting industry developed individually, now needs to collaborate and participate globally.

With more common fleets being inducted on both sides and HAL/NAL likely to develop the regional transport aircraft, there is a need to have CEMILAC and DGCA drafting joint airworthiness policy directives. The skill development of military and civil MROs needs to be harmonised for mutual acceptability of core knowledge and practical skills. The volumes of manpower required in the civil MRO and the rigorous military captive

training needs to be relooked as a part of India's aviation skill development. Cross utilisation of third party into military MRO now needs to be pursued vigorously. The plant-in-plant concept prevalent in the automobile industry, needs to be considered in the BRDs and HAL. The manufacture of Su-30 rudder by Dynamic Technologies, a Bengaluru firm at HAL Nasik premises, is a beginning in this direction by HAL. Engagement of the BRDs with civil industry needs to grow which can be an asset in enhancing capacity, skill utilisation and back-up during times of operational necessities. Gradually, it should move towards transparent utilisation of each other's manpower to meet the task requirements. A degree of mutual trust and understanding is essential breaking the traditional barriers of each other's working cultures.

HAL is the only multi-faceted aviation industry in India with all the specialisations in its various domains. It therefore has to become a rallying point for other aviation industries to grow and enhance the aviation base in India. Aggressive outsourcing of its manufacture and MRO industry is the way ahead for its own growth and that of the country's industrial strength. This is a good

opportunity for HAL to consider having its MRO to private players and take them in its fold for the support of the home-grown Tejas, ALH and its variants including the IJT as and when it is operational. This will create a conducive environment for synergy between military and civil MROs.

The IAF, HAL and the DRDO establishments have among them, the entire aviation testing facilities. These are being used in the military domain albeit in isolated packets. The facilities have been established with great care and cost and are a national asset which need to be utilised by all aviation players. They need to be made available to all the civil MRO operators to utilise and enhance the facilities further to global standards. A beginning has been

made by IAF to announce that its facilities at BRDs and ASTE are available to private industry for use. Flight testing of aircraft and new systems is available at ASTE, Bengaluru and can be used by developers and industry within the country for its certification and airworthiness requirements. Business models need to be developed for such activities utilisation which are economical and transparent. ASTE and NFTC, Bengaluru need to be designated as national air power assets for industry in the development of aviation.

Technology has bridged the gap in military and civil aviation specifications primarily due to consumerism needs. Military aviation standards are being harmonised with various civil aviation standards. The high volumes in civil aviation systems in all areas is increasing rapidly. It is up to the military to take advantage of the growing civil aviation business market. Indian MRO market can leapfrog into this domain particularly when India is in the process of new inductions both in civil and military aviation.

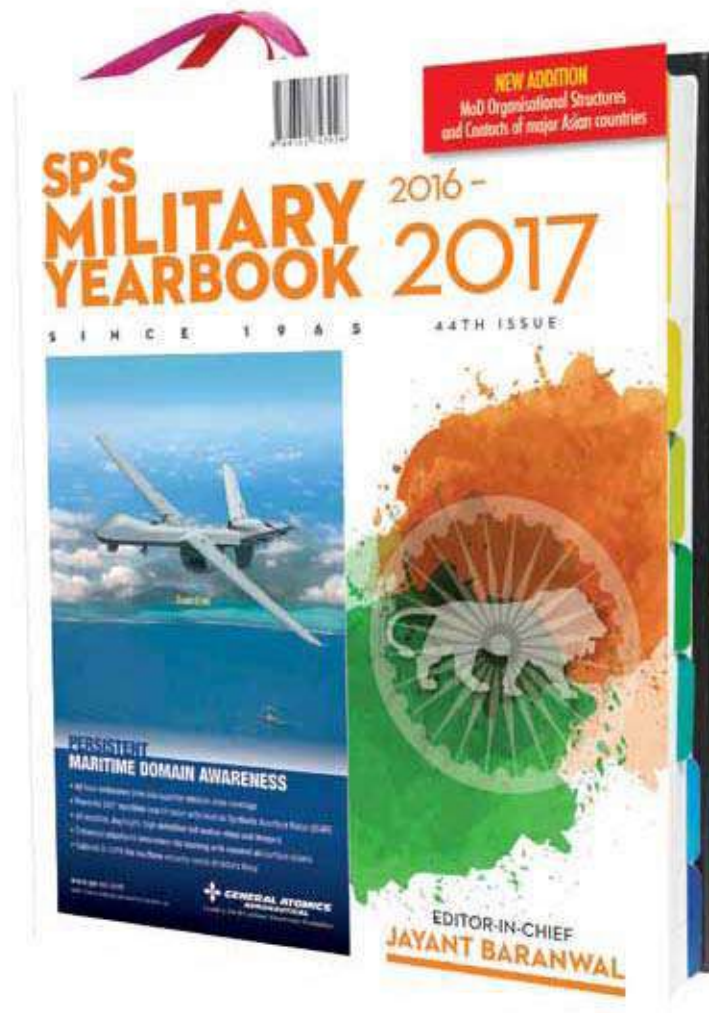
### WAY AHEAD

Out of box thinking is the need of the hour to make the MRO in aviation successful in the 'Make in India' era. A high-power joint committee under the aegis of the Ministry of Defence and Ministry of Civil Aviation is suggested to look into all the areas to generate a national policy for cooperation and collaboration of the MRO in civil and military domains which will enhance the national air power potential of India. <sup>SP</sup>

**MANY JOINT VENTURES  
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# RUSSIA'S 5-TH GENERATION FIGHTER JET NAMED AS SU-57



**ACCORDING TO THE PRESS** office of Russia's state arms seller Rosoboronexport, Russia and India continue their joint project to develop the Fifth Generation Fighter Aircraft (FGFA).

Defense News earlier reported citing a report by the command of the Indian Air Force that the plane being developed on the basis of the Russian Su-57 fifth-generation fighter jet did not meet desired stealth features. Besides, in the opinion of Indian Air Force officials, the fifth-generation fighter aircraft does not have a modular engine concept, which makes maintenance and serviceability of the fleet expensive. That is why, they proposed to the Indian authorities to get out of the Russian-Indian FGFA program, Defense News reported.

"Currently, the Russian-Indian inter-governmental agreement is in effect; there are commitments, under which the parties are implementing the joint project for developing the 5th-generation plane in accordance with the agreed stages and time limits," Rosoboronexport said.

The agreement on the FGFA project was signed in 2007. In early May, a source in India's Defense Ministry told the Indian news agency PTI that a contract on the development of a detailed project of the new fighter jet would be signed in the second half of 2017. [SP](#)

—By Yury Laskin in Moscow

**THE NAME ALEKSEY MARESYEV** is unlikely to ring a bell with most readers in the English speaking world. That is a pity, because this illustrious Soviet fighter pilot of the World War II scripted a heroic saga of human survival in the wild. Unfazed by the loss of both his legs, he went on to resume combat flying. In this respect he resembled the celebrated Douglas Bader of the Royal Air Force (RAF) who, despite losing both his legs in an air crash, got back to fighter flying and claimed 22 kills.

Maresyev himself lived by the maxim of the Douglas Bader Foundation, a charitable organisation looking after the needs of the disabled, which is "A disabled person who fights back is not disabled... but inspired."

Aleksey Petrovich Maresyev was born on May 20, 1916, in a remote village near the city of Kamyshin on the banks of the River Volga in the Russian Empire. He was a rather sickly child, suffering several attacks of malaria and severe pain in the joints. He had to walk four kilometres to school, sometimes almost being carried home by his big brother. Once he was in imminent danger of death, but survived. In his teens, Aleksey saw a film about aviation circulated by the Soviet government in its efforts to encourage young boys to join amateur aviation and parachute clubs. And Aleksey decided he would be a pilot one day.

He tried to join the army when he came of age, but the youth wing of the local Communist Party decided instead to send him to the Far East as part of a special group responsible for the construction of a new city, Komsomolsk-on-Amur. Aleksey was understandably reluctant initially, but was persuaded to go. It was a turning point in his life. The tough conditions and bracing air helped improve his blood circulation and general health. He learned the skills necessary to survive in the taiga or snow forest and this was to stand him in good stead when his aircraft was shot down ten years later.

After Aleksey Maresyev returned home he joined the Soviet Air Force as a technician. He enjoyed tinkering with the planes, but his dream was to be an aviator. He soon enrolled in the Military School of Aviation, an institution for professional pilots and proved to be one of their best trainees. When he graduated in

1940, he was retained as an instructor at the School. The Second World War broke out in September 1939 and initially the Soviet Union was not involved. In June 1941, Germany invaded the Soviet Union in Operation Barbarossa and the German forces rapidly penetrated deep into Russian territory. As the Soviet Air Force could not match the Luftwaffe's brilliant planning and advanced technology, it suffered heavy losses. Aleksey Maresyev's squadron was stationed in Central Ukraine and was equipped with Polikar-

of crawling through the winter forest to reach the village of Plavni and safety. Bleeding from several wounds, cold, hungry and under constant fear of being discovered by the Nazi soldiers, it was only the desire to live that kept him going. His childhood ability to endure intense pain and his teenage experience of the taiga proved invaluable.

However, by the time he was able to get medical treatment, his injuries had become so bad that both his legs had to be amputated below the knee in order to save his life. In due course, he was fitted with prosthetic devices and then began another struggle to learn to use them. He was determined to return to combat fitness, so he learned to walk and even dance, despite the pain, till the military doctors finally acceded to his request to resume flying in June 1943.

It did not take him long to get back in the groove. During one of his first flights he managed to shoot down three German Focke-Wulf FW-190 fighters. In the remaining months of the war, he achieved an overall tally of 86 combat flights and 11 German aircraft confirmed shot down, including seven after the amputation. On August 24, 1943, he was awarded the Golden Star of the Hero of the Soviet Union – the nation's supreme military decoration.

Maresyev spent the rest of his life helping other war veterans. He became a member of the Supreme Soviet and never tired of advocating the rights of the disabled and veterans. He died on May 19, 2001, in Moscow, just minutes before a celebration to mark his 85th birthday the next day.

The story of Alexey Maresyev's incredible bravery and heroic determination in the face of incredible odds inspired generations of military and other wounded people to forget their problems and live life to the fullest. His exploits were immortalised in the book *A Story about a Real Man* by Boris Polevoi, later turned into an opera by the famous Russian composer Sergei Prokofiev. However, Maresyev was modest to a fault and repeatedly insisted that he didn't merit any praise. In one newspaper interview he said, "There's nothing extraordinary in what I did. The fact that I've been turned into a legend irritates me." SP

— Joseph Noronha



**ALEKSEY MARESYEV  
(1916-2001)**

The story of Alexey Maresyev's bravery in the face of incredible odds, inspired generations of people with disability to forget their problems and live life to the fullest

pov I-16 fighters. He got his first taste of combat flying on August 23, 1941, and by March 1942 managed to shoot down four German aircraft.

On April 4, 1942, Alexey Maresyev was engaged in a dogfight with two German fighters when his aircraft was critically hit. He managed to land the flaming plane in a thick forest – part of Soviet territory that had been occupied by the invading Germans. Although the snow softened the impact, both his legs were badly injured. It took him 18 days



## QUICKROUNDUP

### AIRBUS

Airbus, Indigo Partners' four portfolio airlines have signed an MoU for the purchase by the four airlines of 430 additional Airbus A320neo Family aircraft. The aircraft will be allocated among the ultra low-cost airlines Frontier Airlines (United States), JetSMART (Chile), Volaris (Mexico) and Wizz Air (Hungary) upon the completion of final purchase agreements between Airbus and the four airlines. The 430-aircraft commitment comprised of 273 Airbus A320neos and 157 A321neos, are worth \$49.5 billion at list prices.

Airbus has been selected by Singapore Airlines (SIA) to provide cabin retrofit services for 14 Airbus A380 aircraft currently in service with the carrier. The retrofit programme, which will be undertaken at SIA Engineering Company in Singapore, will see the airline's recently launched cabin products installed on the aircraft. The new cabin products will debut on five new Airbus A380s to be delivered this year and next year.

Dublin based CDB Aviation Lease Finance DAC (CDB Aviation) has announced a firm order for 90 Airbus A320neo family aircraft during the Dubai Air Show 2017.

### BOEING

Boeing and Ethiopian Airlines announced an order for four Boeing 777 Freighters, the world's largest and longest-range twin-engine cargo jet, in a deal valued at over \$1.3 billion at list prices.

Boeing and China's CDB Aviation have signed an MOU at Paris Air Show 2017 for an order for 42 Boeing 737 MAX 8, 10 Boring 737 MAX 10 and eight Boeing 787-9 Dreamliner aircraft valued at \$7.4 billion at list prices. The order includes a conversion of six Boeing 737 MAX 8 ordered to the Boeing 737 MAX 10 standard.

Boeing and Avolon, the international aircraft leasing company, have finalised on November 19, 2017, an order for 75 Boeing 737 MAX airplanes. The confirmed order is for 55 Boeing MAX 8 and 20 Boeing MAX 10 with options for 20 additional Boeing MAX 8 airliners. The agreement, announced as an MoU at Paris Air Show 2017, is valued at nearly \$11 billion at list prices including the 75 firm and 20 option aircraft.

At Dubai Air Show 2017, Boeing and flydubai signed, an agreement for 225 Boeing 737 MAX airplanes for \$27 billion. The deal represents the largest-ever single-aisle jet order by number of airplanes and total value, from a Middle East carrier.

Emirates, one of the world's largest airlines, has entered into an agreement with Boeing to purchase 40 Boeing 787-10 Dreamliners at Dubai Air Show 2017. The deal is valued at \$15.1 billion at list prices.

### CFMI

Chile's Sky Airline has signed a MoU for a 12-year Rate Per Flight Hour (RFPH) agreement with CFM International to support the LEAP-1A engines that will power the airline's new fleet of 21 leased Airbus A320neo aircraft. The

## MILITARY

### ASIA-PACIFIC

#### AWARD OF PRESIDENT'S STANDARD AND COLOURS



The President of India and the Supreme Commander of Indian Armed Forces, Ram Nath Kovind awarded the prestigious President's Standard to 223 Squadron and 117 Helicopter Unit of the Indian Air Force (IAF) at a ceremonial parade held at Air Force Station Adampur on November 16, 2017. The ceremonial parade was commanded by Group Captain Tushar Vaidya. The President also released First Day Covers of 223 Squadron and 117 Helicopter Unit at the function.

#### HAL TO OUTSOURCE TEJAS PRODUCTION

The Hindustan Aeronautics Limited (HAL) has decided to outsource about 70 per cent of the production work of light combat aircraft (LCA) Tejas. Presently, in a year, HAL is manufacturing eight LCA Tejas Mk1 and plans to double the production by 2019. The outsourced work includes major sub-assemblies such as front fuselage, centre fuselage, rear fuselage, wings, et al and will be delivered within a year which involves about 85 vendors which includes Dynamic Technologies Ltd, Bengaluru, VEM Technologies, Hyderabad, Alpha Tocol, Bengaluru, L&T Coimbatore, National Aerospace Laboratory and Tata Advanced Materials Ltd.

#### CHINESE J-20 FIGHTERS OPERATIONAL

The recent news of five Chinese J-20 fighter jets training in formation aroused public attention. A Chinese military expert said that the ability to conduct formation flight indicates that the capability of the pilots of the People's Liberation Army Air Force (PLAAF) in operating J-20 fighter jets has reached a high level and the J-20 is ready to carry out combat missions. On July 30 this year, three J-20 fighter jets flew in formation during the military parade celebrating the 90th anniversary of the founding of the Chinese PLA.

#### ANNUAL CONCLAVE OF DEFENCE ATTACHES



Raksha Rajya Mantri (RRM) Dr Bhamre inaugurated the 2nd annual conclave of Foreign Defence Attaches on November 20, jointly organised by Headquarters Integrated Defence Staff (HQ IDS) and defence portal BharatShakti. Defence Attaches of around 70 countries, strategic experts, captains of indigenous defence industry and foreign original equipment manufacturers attended. The RRM said that the Government has been tirelessly working towards making up for critical shortages of the armed forces over the years and the policies are now designed to make procurement and acquisition of defence platforms both fast and transparent.

#### CAS INAUGURATES SWAC COMMANDERS' CONFERENCE

The Annual Commanders' Conference of South Western Air Command (SWAC) was inaugurated by Air Chief Marshal B.S. Dhanoa Chief of the Air Staff (CAS) on November 17, 2017 at Gandhinagar. The Commanders of Stations located in the states of Rajasthan, Gujarat and Maharashtra attended the conference. In his inaugural address, the CAS acknowledged the high degree of professionalism and hard work displayed by the Air Warriors of SWAC in achieving the assigned goals. He highlighted the need for maintaining full operational preparedness with optimal utilisation of available resources. He emphasised the need for Air Warriors to keep abreast with the latest technologies and to focus on the associated challenges while the IAF marches ahead with major upgradation of capabilities and infrastructure.

#### AIR LAUNCHED BRAHMOS FLIGHT TESTED

BrahMos, the world's fastest supersonic air launched cruise missile (ALCM) created history on November 22, 2017, after it was successfully flight-tested for the first time from a Su-30 MKI fighter aircraft of the Indian Air Force (IAF). The test launch was against a sea-based target in the Bay of Bengal. The missile was gravity-dropped from the Su-30 MKI and the two-stage missile's engine fired up and straightway propelled the BrahMos



towards the intended target. This successful firing will significantly bolster the IAF's air combat operations capability from stand-off ranges. Brahmos ALCM weighing 2.5 tonnes is the heaviest weapon to be deployed on India's Su-30 fighter aircraft modified by HAL to carry this weapon.

## UNITED ARAB EMIRATES ORDERS FIVE AIRBUS C295 AIRCRAFT

The United Arab Emirates Air Force & Air Defence has ordered five Airbus C295 medium transport aircraft.

The agreement, announced at the Dubai Airshow, takes the C295 order-book past 200, underlining the type's market leadership in its class.

The aircraft will serve with the UAE Air Force replacing the existing CN235s still in operation. Deliveries will begin in the fourth quarter of 2018. Orders for the C295 in the Middle East and North Africa (MENA) region now total 51.

## AMERICAS

### LOCKHEED MARTIN'S CH-53K SUPER STALLION



Sources close to the programme have said that Lockheed Martin's CH-53K Super Stallion will make its international debut at the Berlin Air Show next April. Built for the US Marine Corps by Lockheed Martin's subsidiary Sikorsky under the Heavy Lift Replacement (HLR) programme, the heavy-lift helicopter is being touted as a possible solution to Germany's CH-53G replacement programme which will see the King Stallion face-off against the smaller Boeing CH-47F Chinook in a \$4.7 billion competition for about 40 units. Israel is also reported to be interested in the King Stallion, adding a potential 20 units to the demand for this platform.

### GLOBAL MILITARY UAV PRODUCTION

Unmanned aerial vehicles (UAVs) will be the most dynamic growth sector of the global aerospace industry this decade, more than tripling in the next decade, report Teal analysts in their latest market analysis. Salient aspects of the forecast are:

- Teal Group's 2017 market study estimates that UAV production will increase from current worldwide UAV production of \$4.2 billion annually in 2017 to \$10.3 billion in 2026, totaling \$80.5 billion in the next ten years.
- Military UAV research spending would add another \$26 billion over the decade.
- US will account for 57 per cent of total military worldwide RDT&E spending on UAV technology over the next decade, and about 31 per cent of the military procurement.
- The larger, higher value systems procured by the US help drive the relative strength of the US market over the decade, but other areas such as Asia-Pacific are growing more rapidly.
- UAV payloads, including Electro-Optic/Infrared Sensors (EO/IR), Synthetic Aperture Radars (SARs), SIGINT and EW Systems, and C4I Systems, are going to more than double in overall value from \$3.6 billion in FY17 to \$7.5 billion in FY26.

## INDUSTRY

### ASIA-PACIFIC

#### RUSSIAN EXPORT TARGETS FOR ITS MIG-35

Russian export targets for its MiG-35 have been set at over \$10 billion, ahead of the fighter's release for export next year. Speaking to Bloomberg at Dubai Air Show 2017, Director General of RSK MiG, Ilya Tarasenko, said as many as 30 countries that fly the older MiG-29 have approached the firm about upgrading their existing fleets or adding extra planes. The MiG-35 is based on the older MiG-29, with greater range and weapons load as well as reduced radar signature making it ideal for Middle East environments. Egypt has already ordered 24 of the fighters, while the UAE hopes to incorporate Russian fighters with its US-made air platforms.

#### CHINA UNVEILS BEIHANG UNMANNED AIRCRAFT SYSTEM (UAS)

China has unveiled its Beihang UAS Technology on November 13, 2017 which is a new TYW-1 strike-capable UAS. With a wingspan of 18 m, the TYW-1 drone features the same outward-canted stabiliser design as seen on the BZK-005 multirole medium-altitude long-endurance UAS (believed to be in use with the People's Liberation Army), and is approximately 9.85 m-long and 2.5 m-high. Featuring an electro-optical system that can reportedly read a licence plate 50 km away from an altitude of 5,000 m, it also

## QUICKROUNDUP

agreement that includes spare engines, is valued at about \$600 million.

Gulf Air and CFM International have signed an agreement for the purchase of 58 LEAP-1A engines to power 17 Airbus A321neo and 12 A320neo aircraft as well as an additional seven spare engines to support fleet operations. The engine order including a long-term service agreement, is valued at approximately \$1.9 billion at list price..

### DSCA

Canada has been cleared by the US' Defence Security Cooperation Agency (DSCA) to proceed with the purchase of 32 AIM-120D air-to-air missiles for \$140 million. The package also includes 18 Captive Air Training Missiles, four AMRAAM Non-Development Item-Airborne Instrumentation Units and other support systems.

### EMBRAER

Embraer and its US partner Sierra Nevada Corporation will produce and deliver a further six A-29 Super Tucano light attack aircraft to the Afghan Air Force. Production of the aircraft will start immediately and once delivered, Kabul will be operating 29 of the aircraft in its fleet.

### GENERAL DYNAMICS

General Dynamics has received on November 6, 2017, a contract for \$8.8 million from the US Missile Defence Agency to commence work on the first phase of the Low Power Laser Demonstrator. The award heralds the first step in equipping a high-altitude, long-endurance UAV with a high-energy laser capable of intercepting and shooting down intercontinental ballistic missiles. Work on the contract is estimated to be completed by July 31, 2018.

### GENERAL ELECTRIC

General Electric will conduct the overhaul and recapitalisation of the T700 series of engine in support of US Army Blackhawk and Apache helicopters. Valued at \$84 million, the contract follows the \$1 billion December 2016 award that called for 2,500 T700 engines to support through 2019, all four branches of the US military, including the US Coast Guard. The overhaul is expected to be completed by November 2, 2020.

General Electric, Ohio, has been awarded a 100 per cent FMS contract to Qatar, Saudi Arabia and Bahrain for \$643,000,000 indefinite-delivery/indefinite-quantity undefinitised contract action to provide F110-GE-129 install engines, spare engines, modernised engine monitoring system computers by November 8, 2024.

### INDIA

It's been reported that the Indian government has expressed interest in procuring retired Canadian CH-124 Sea King helicopters. 16 Sea Kings have so far been taken out of service as Ottawa replaces them with the CH-148 Cyclone and the matter of selling them was discussed during Defence Minister Harjit Sajjan's trip to India last

## QUICKROUNDUP

spring. 24 Sea King's will eventually be up for grabs when the final ones are retired by 2018 with the current resale value under \$200k.

### JAPAN

Five Beechcraft TC-90 training aircraft will be donated free of charge by Japan to the Philippines following recent legislative changes made by Japan's parliament that makes the transfer of military hardware easier to allied nations. Two of the aircraft had already been delivered to Manila under a lease agreement with the next three scheduled to arrive in March 2018.

### LEONARDO

Leonardo has announced that the first of 16 AW-101 all-weather search and rescue helicopters has been delivered to the Norwegian Ministry of Justice & Public Security. The aircraft arrived on November 17, 2017, at Sola Air Base where they will commence Operational Test & Evaluation before entering service with the Royal Norwegian Air Force in 2018. Aircraft deliveries will continue through to 2020.

### LOCKHEED MARTIN

For the ninth consecutive year, Lockheed Martin has been selected by the US Air Force for follow-on production of Paveway II plus Laser-Guided Bomb Kits. Valued at \$131 million, the award also includes all available funding for the service's FMS and replacement kits. Production is expected to commence in the first quarter of Fiscal year 2018.

Lockheed Martin has clinched a \$1.6 billion order with the UAE to upgrade 80 F-16 fighter jets and expects to ink more deals as tensions in the Arabian Gulf region intensify.

### MBDA

MBDA Missile Systems will produce up to 21,000 Diamond Back Wing Assemblies for use on the US Air Force's precision-guided GBU-39 Small Diameter Bomb Increment I (GBU-39 SDB-I). The contract, awarded by the munition's manufacturer Boeing, comes as the US Air Force orders additional SDB-I production under a two-year deal worth \$261 million, which will run through to December 2018.

### NORTHROP GRUMMAN

Northrop Grumman Corporation, has delivered the first operational MQ-4C Triton aircraft to the US Navy facility at Point Mugu, providing the service with unparalleled endurance and 360-degree coverage that allows for a vastly expanded maritime intelligence, surveillance and reconnaissance mission. The second Triton aircraft is expected to be delivered later this year.

### RAYTHEON

Raytheon has received a \$79 million contract for the installation of telemetry equipment on future US Navy

can carry a 370 kg payload, features four under wing pylons, has a ceiling of 7.5 km, endurance of 40 hours and can reach a top speed of 200 kmph. Also displayed was an upgraded BZK-005 complete with a system mounted under the UAV's nose that could be electronic support measures, a radar or a communication relay.

### INDIGO TAKES DELIVERY OF ITS FIRST ATR 72-600

IndiGo, India's largest airline by market share, took delivery of its very first ATR 72-600. The airline and ATR announced earlier this year an agreement for the acquisition of 50 ATR 72-600s. This delivery represents a major step in the airline's ambitious plan to further develop its fleet with the introduction of fuel-efficient and cost-effective ATR 72-600s, thus expanding its regional footprint and bringing air connectivity to smaller Indian airports and communities.

The introduction of the new ATR fleet goes in line with the Indian government's Regional Connectivity Scheme, which aims to boost economic development, employment and tourism by connecting small and remote cities. Under this scheme 100 new airports are expected to be created in the next three years.

## AMERICAS

### LOCKHEED MARTIN'S FURY UAS



Fury is a long-endurance, expeditionary aircraft that leverages its advanced fuel propulsion system, power generation and low signature design to deliver capabilities to Class-3 UAV that were previously only available in larger and more complex systems. It has no landing gear, making it the most advanced truly runway-independent UAV in its class. With the integration of the 1803 engine with the platform, engineering tests performed by the company indicate that Fury will be able to stay in the air for 15 hours, making it one of the highest endurance unmanned systems in its class. Leveraging open architecture design, Fury is both adaptable and reconfigurable to serve a multitude of military missions including

## SHOW CALENDAR

30 January-1 February, 2018  
**INTERNATIONAL MILITARY HELICOPTER 2018**

Park Plaza London Victoria, London, UK  
<https://militaryhelicopter.iqpc.co.uk>

6-11 February, 2018  
**SINGAPORE AIRSHOW 2018**

Changi Exhibition Centre, Singapore  
[www.singaporeairshow.com](http://www.singaporeairshow.com)

8-11 March, 2018  
**WINGS INDIA 2018**

Begumpet Airport, Hyderabad, India  
[www.wings-india.in](http://www.wings-india.in)

intelligence, surveillance, reconnaissance and cyber-electronic warfare.

### TEXTRON AVIATION UNVEILS LARGE-UTILITY TURBOPROP, THE CESSNA SKYCOURIER

Textron Aviation Inc., a Textron Inc. company, today announced its new twin-engine, high-wing, large-utility turboprop – the Cessna SkyCourier 408. FedEx Express, the world's largest express transportation company and longtime Textron Aviation customer, has signed on as the launch customer for up to 100 aircraft, with an initial fleet order of 50 cargo aircraft and options for 50 more. Entry into service for the clean-sheet design Cessna SkyCourier is planned for 2020.

### BOEING, AVOLON FINALIZE DEAL FOR 75 737 MAX AIRPLANES

Boeing and Avolon, the international aircraft leasing company, finalized an order for 75 737 MAX airplanes. The confirmed order is for 55 MAX 8s and 20 MAX 10s, with options for 20 additional MAX 8s.

The agreement, announced as a memorandum of understanding at the 2017 Paris Air Show, is valued at nearly \$11 billion at list prices including the 75 firm and 20 option aircraft.

Launched at the 2017 Paris Air Show, the MAX 10 will have the lowest seat-mile cost of any single-aisle airplane. The new airplanes will bolster Avolon's airplane portfolio to meet growing customer demand in the narrow-body market segment.

## EUROPE

### LEONARDO'S FALCO EVO TACTICAL UNMANNED AERIAL SYSTEM

Leonardo used the Dubai Air Show 2017 to announce the delivery of its Falco EVO tactical unmanned aerial system to un-

APPOINTMENTS

**AIRBUS**

Effective 2018, Aerospace industry veteran C Jeffrey Knittel, formerly both Chief Executive of C2 Aviation Capital and President of CIT Transportation Finance, will join Airbus early next year, taking the reins of the company's business in the Americas.

**DARPA**

The Under Secretary of Defence for Acquisition, Technology and Logistics, has announced the appointment of Dr Steven H Walker as the 21st Director of the Defence Advanced Research Projects Agency (DARPA).

**MBDA**

Effective January 1, 2018, MBDA has appointed Chris Allam as the Managing Director, MBDA, UK as also a member of the MBDA's Group Executive Committee.

**NORTHROP GRUMMAN**

Northrop Grumman Corporation has appointed Dong Ha as Chief Executive for South Korea responsible for coordinating the corporation's relationship with South Korea, supporting current programmes and growing the company's in-country presence.

QUICKROUNDUP

Gulfstream G550 Range Support Aircraft. The solution will be based within the G550 airborne early warning airframe and will offer multi-role capabilities in telemetry data collection, range safety and surveillance and communications relay. The firm states that the platform will be able to support advanced weapons testing and other missions for the next 25 years.

**ROSTEC**

Sergei Chemezov, CEO of Russia's state conglomerate Rostec, has told TASS that the price of Turkey's new S-400 TrumfAD missile system is in excess of \$2 billion. The sale has been controversial, especially in the US, as Turkey is a NATO member yet shunned an AD system that was interoperable with allied systems and networks.

**SAAB**

Saab has announced that its Gripen E smart fighter flew its first supersonic flight on October 18, 2017. During the flight conducted over the Baltic Sea, the aircraft executed maneuvers to demonstrate its aerodynamic design and powerful engine. The data collected will go towards the ongoing flight trials for the fighter programme.

**UAC**

UAC has transferred another batch of Su-34 front-line combat aircraft to the Russian Aerospace Forces in the framework of the 2017 State Defence Order. The Su-34 is designed to destroy over land or over the sea, hitting moving targets even of small size and to destroy air targets by day and night under any meteorological conditions. It has a range of up to 4,000 km, maximum speed up to 1,900 kmph and can carry combat payload of up to eight tonnes.

**US**

The US State Department has made a determination approving a possible FMS to Qatar for support of its F-15QA multi-role fighter aircraft programme for an estimated \$1.1 billion. The Defence Security Cooperation Agency has delivered the required certification notifying Congress of this possible sale on November 1, 2017.

During President Donald Trump's visit to China, Juneyao Airlines reached an agreement with GE to order GEnx-1B engines to power its ten Boeing 787-9 aircraft. Wang Junjin, Chairman of the Juneyao Group and John Rice, Vice Chairman of GE, President & CEO of GE Global Growth, signed the agreement, witnessed by President Trump and Xi Jinping, President of China. The engine order is valued at \$1.4 billion at list prices and delivery will commence from 2018.

The US State Department has made a determination approving a possible FMS to Norway for AIM-120 C-7 Advanced Medium Range Air-to-Air Missiles for an estimated cost of \$170 million. The Defence Security Cooperation Agency delivered the required certification notifying Congress on November 14, 2017 of this possible sale.

named customers in the Middle East. Assembly of the first unit was completed at Leonardo's facility in Italy in August 2017 prior to testing and delivery to customers in September 2017. The drone is used as a surveillance and intelligence-gathering platform that can fly for more than 20 hours while carrying a payload of up to 100 kg. It is Leonardo's longest-endurance model from its Falco RPAS family.

**SMARTGLIDER FAMILY OF GUIDED WEAPONS FROM MBDA**



MBDA has presented, for the first time outside Europe, its SmartGlider, a new family of air launched guided weapons at Dubai Air Show 2017. SmartGlider forms a family of all-up-round glider weapons, with folding wings and a range of over 100 km giving it beyond visual range capability. SmartGlider Light, is 2 m long and weighs 120 kg. 12 to 18 SmartGlider Lights can be carried on an aircraft due to a Hexabomb Smart Launcher capable of managing reactive strikes without affecting the pilot's workload. For general purpose missions, the SmartGlider Light can be engaged against a wide spectrum of

targets, from hardened and defended fixed targets such as hangars, to relocatable targets that can only be destroyed from a standoff distance. The 1,300 kg SmartGlider Heavy is able to carry a multipurpose warhead of more than 1,000 kg to deal with large and hardened infrastructure.

**AIRBUS, ROLLS-ROYCE, AND SIEMENS TEAM UP FOR ELECTRIC FUTURE**

Airbus, Rolls-Royce, and Siemens have formed a partnership which aims at developing a near-term flight demonstrator which will be a significant step forward in hybrid-electric propulsion for commercial aircraft.

The E-Fan X hybrid-electric technology demonstrator is anticipated to fly in 2020 following a comprehensive ground test campaign, provisionally on a BAe 146 flying testbed, with one of the aircraft's four gas turbine engines replaced by a two megawatt electric motor. Provisions will be made to replace a second gas turbine with an electric motor once system maturity has been proven.

**CDB AVIATION CONFIRMS ORDER FOR 90 A320neo FAMILY AIRCRAFT**

Dublin based CDB Aviation Lease Finance DAC (CDB Aviation) announces a firm order for 90 A320neo Family aircraft during the Dubai Airshow 2017. The agreement was reached in two steps: an original purchase agreement signed in 2014 for 45 A320neo Family aircraft, which remained undisclosed to date, and the firming up of the Memorandum of Understanding (MoU) announced at the 2017 Le Bourget Paris Airshow in June 2017 for an additional 30 A320neo and 15 A321neo aircraft. ●



# REVAMP INDIAN AEROSPACE INDUSTRY

IN THE RECENT PAST, the media had carried a report that the Indian Air Force (IAF) has virtually given thumbs down to the proposed advanced versions of the indigenous light combat aircraft (LCA) Tejas. Instead, the IAF has been pitching for the acquisition of a large number of a proven single-engine fighter aircraft that is proposed to be produced in large numbers in India through a joint venture between a foreign original equipment manufacturer and the selected partner from the Indian aerospace industry in the public or private sector. The project is to be executed under the 'Make in India' programme and the Strategic Partnership policy crafted by the government currently in power. The piece of news about the LCA Tejas could easily be misinterpreted to mean that the IAF has virtually rejected the LCA Tejas driving the last nail in the coffin of this indigenous platform. The fact is that the IAF has placed orders for a total of 123 Tejas Mk I and IA, but is not in favour of the Indian aerospace industry undertaking the development of its Mk II version.

The Aeronautical Development Agency (ADA), responsible for the LCA project, had received a serious blow earlier on when on December 02, 2016, Admiral Sunil Lanba, Chief of the Naval Staff (CNS), rejected the long-delayed naval variant of the LCA Tejas Mk I. He stated that "The LCA Navy in its present form, is not up to the mark and does not measure up to the operational capability required by the Indian Navy. This single-engine aircraft which is powered by a General Electric F-404 turbo-fan engine, does not provide the thrust-to-weight ratio necessary for operations from the deck of an aircraft carrier with the required fuel and weapons load. The Director, ADA who is responsible for the LCA Navy programme, was quite understandably, distressed at the stand taken by the service concerned. In the meantime, the Ministry of Defence has gone ahead and issued a Request for Information for 57 multi-role combat aircraft for the indigenous aircraft carrier currently under construction.

Lunched formally in 1983, it took 32 years for the Indian aerospace industry to formally hand over the documents of the first LCA Tejas Mk I to the IAF at a ceremony at Hindustan Aeronautics Limited (HAL) Bengaluru, that was formal

but understandably at somewhat low key. The Initial Operational Clearance accorded was not acceptable to the IAF and as such, the LCA Tejas had to be put through the exercise a second time. The aircraft was finally inducted into squadron service, but without Final Operational Clearance. Ironically, the very same Indian aerospace industry that had commenced design and development in 1956, of its very first fighter aircraft dubbed as the HF-24 Marut, was able to launch the platform on its maiden flight five years later in 1961 and achieved service entry in 1967, just 11 years from launch of the project. In comparison, the LCA Tejas project has taken more than three times that long to fructify. Also, with the retirement from service of the ageing MiG-21 family of fighters, the strength of the combat fleet is dwindling rapidly and currently stands at 32 squadrons as against the authorised level of 42 squadrons. With around 20 aircraft in a squadron, the IAF is currently short of around 200 platforms. With the remaining MiG-21 and MiG-27 due to be retired from service in the next few years, the deficiency would go up to 300 platforms. In another five to ten years, the fleets of Jaguar, MiG-29 and Mirage 2000 aircraft will also be reaching the end of their extended technical life and would have to be phased out enhancing the deficiency to around 500 aircraft. The continuously widening gap needs to be

filled up as quickly as possible with the induction of modern fourth and fifth generation platforms for the IAF to restore and retain its operational edge against the two adversaries. By about 2025, the IAF will be left with 15 squadrons of the Su-30MKI, two squadrons of the Rafale and four squadrons of the LCA Mk I and IA. Given the time taken for the Indian aerospace industry to develop a new aircraft and the low rate of production, the IAF is not in a position to bank on the LCA Mk II whose development may take decades.

Unless the Indian Aerospace Industry transforms itself into vibrant and efficient agency capable of delivering quality product in the time frame required, the IAF or for that matter, the Indian Navy too, cannot repose any level of confidence in the organisation to meet the requirement of combat or other platforms in the future. SP

—By Air Marshal  
B.K. Pandey (Retd)



The widening gap in the combat fleet of the IAF needs to be filled up as quickly as possible with the induction of modern fourth and fifth generation platforms

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**Contact us**

Ravi Shankar

Mobile :- +91 9716239250

Email:- ravishankar.barnwal@ficci.com

Manoj Mehta

M:- +91 9891098772

Email :- manoj.mehta@ficci.com

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