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- MRO IN ASIA
- NEXT-GEN ENGINES
- HONEYWELL FACILITIES TOUR
- GARUDA V
- EBACE REPORT
- US REGIONAL AVIATION - LESSONS FOR INDIA
- MARITIME PATROL

PAGE 24

# WORLD FEVER

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# TABLE OF CONTENTS



## COVER IMAGE:

*The month-long FIFA World Cup 2014, which got underway on June 12 with a bang, is witnessing hectic activity in the skies – business jets flying across Brazil.*

Cover image by: SP Design



**FOOTBALL FRENZY:** DUBAI-BASED UNITED AVIATION SERVICES, WHICH BOOKS CHARTER FLIGHTS WITH OVER 500 PRIVATE JET OPERATORS GLOBALLY, HAS PUT THE FIGURE AT 3,000 BUSINESS AIRCRAFT OF ALL HUES FILLING THE BRAZILIAN SKIES BEFORE, DURING AND AFTER THE FIFA WORLD CUP TOURNAMENT.

## TECKNOW

- 10 **SR-72, a Hypersonic Drone**

## CIVIL

- 11 **MRO in Asia**  
All Set to Grow
- 16 **Aero Engines**  
Next-Gen Engines
- 20 **Regional Aviation**  
Connecting Cities, the US Way

## SHOW REPORT

- 28 **EBACE 2014**  
Strongest Show

## OEM

- 32 **Honeywell Visit**  
Honeywell helps Airbus A350 XWB Soar
- 35 **Perfect Back-Up**

## MILITARY

- 37 **Joint-Exercise**  
Strategic Partnership
- 40 **Maritime Patrol**  
Game Changer

## REGULAR DEPARTMENTS

- 4 **A Word from Editor-in-Chief**
- 8 **NewsWithViews**  
–IAF not to wait for indigenous AWACS
- 43 **Hall of Fame**  
Katherine Stinson (1891–1977)
- 44 **NewsDigest**
- 44 **LastWord**  
Adopt Singapore Model of MRO

PAGE 24

## LEAD STORY

### FIFA FEVER

The FIFA World Cup 2014, being held in Brazil, has a cascading effect on business aviation and the Brazilian skies are busy like never before.



NEXT ISSUE

*Green Aviation*



# TABLE OF CONTENTS



## 11 All Set to Grow



## 16 Next-Gen Engines



## 37 Strategic Partnership



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**BRAZIL'S 90-ODD AIRPORTS ARE WORKING OVERTIME TO FLY PLAYERS AND FOOTBALL ENTHUSIASTS TO 12 DIFFERENT VENUES, OF COURSE, WITH A PRICE TAG WHICH ONLY THE RICH AND FAMOUS CAN AFFORD.**

**THE FIFA WORLD CUP** is on in Brazil and the fever is catching up across continents. While it is the most televised event, it is also an event which catapults the aviation industry business as about six lakh international visitors are expected to be watching all 64 matches during the month-long extravaganza. Events such as the Olympics and Formula 1 rely so much on aviation for their people movement, logistics, etc that without aviation one can imagine how different it would be.

In this issue, we have captured the flavour of football in relation to business aviation. Brazil's 90-odd airports are working overtime to fly players and football enthusiasts to 12 different venues, of course, with a price tag which only the rich and famous can afford. The iconic football player from Portugal Cristiano Ronaldo is using the services of four private aircraft to take his family and friends to different venues where Portugal will be playing. That is a strong statement on the benefits of business aviation.

Continuing on business aviation, the two events – ABACE in China and EBACE in Switzerland held recently – have signalled an upward trend in business aviation activity in Europe. In the EBACE show report, there are clear indications of the industry bouncing back as the response has been good, not just by the original equipment manufacturers but also by operators and other service providers.

In this issue, we have two articles on Honeywell Aerospace which has been in the forefront of technological advancements. R. Chandrakanth, *SP's Aviation's* Assistant Group Editor, was the sole representative from India on an international media tour of the Honeywell Aerospace facilities in Phoenix, Arizona, and he gives insights on the research and development work that is going on with regard to auxiliary power units, engines, etc.

In another article, he gives a perspective of the next-generation engines various engine manufacturers are working on, driven by the need to make them efficient, environment-friendly and cost-effective. One of the benefits of next-gen engines is that the down time is going to be reduced, making the maintenance, repair and overhaul (MRO) business to think about new ways of getting business. We have an article on MRO in Asia which talks about the potential in the region, particularly when aircraft acquisitions are happening at an astounding pace. Air-

craft acquisitions, including regional, are fast-paced in India and there are lessons to be learnt from the United States how the latter has effectively networked the country with regional airlines. The article on regional aviation talks about the two scenarios and India's potential.

Moving from civil aviation to military, Air Marshal (Retd) B.K. Pandey has written about Garuda V, a joint exercise recently held in Jodhpur that signifies forward movement in the attainment of a new level in the strategic partnership agreement between India and France, forged in 1988.

Rear Admiral (Retd) Sushil Ramsay has pointed out how capabilities of maritime aircraft make huge difference in intelligence, reconnaissance and surveillance activity. Maritime patrol aircraft (MPA) is a game-changer and commanders at sea look up to MPA as a powerful instrument of command, control, communication and intelligence.

We look forward to your feedback as to enhance our coverage. Happy Landings !

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

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## NEWS:

### IAF NOT TO WAIT FOR INDIGENOUS AWACS

The Indian Air Force (IAF) and the Defence Research and Development Organisation (DRDO) are at odds over development of an Airborne Warning and Control System (AWACS) capability, with DRDO promoting indigenous development of the radar system and the service wanting an overseas acquisition. DRDO has floated a global tender for aircraft for mounting the home-grown



radar so it is not put on hold by the new government, an IAF source said. But since the AWACS radar exists only on the drawing board, completion of the programme by 2020 is unlikely to be achieved, given DRDO's history with high-technology projects. The IAF has an urgent requirement for 10 additional AWACS aircraft and does not want to wait for indigenous development.

## VIEWS:

**IN MARCH THIS YEAR**, the Ministry of Defence floated a global tender for the supply of suitable aircraft with necessary structural modifications for the installation of an AWACS radar developed indigenously by the DRDO. Bids are required to be submitted by the middle of July this year.

The AWACS made its first appearance in the world in the early 1970s in the Yom Kippur war when in the face of a complete rout, with the help of this new platform, the Israeli armed forces decisively turned the tide of the battle against the Egyptian forces. Post-war analysis indicated that the employment of AWACS aircraft by the Israeli forces had contributed decisively to the ultimate outcome of that war.

The IAF's quest for AWACS aircraft began with a \$1.5 billion tripartite agreement in January 2004 with Israel and Russia for three Phalcon radar mounted IL-76 AWACS aircraft. These aircraft have already been inducted into the IAF and are operational. Action is also in hand to procure two more of such systems. However, unconfirmed reports in the media indicate that the deal has run into some rough weather due to sharp cost escalation. The IAF is hopeful that the issue will be resolved soon enough.

The AWACS fleet has enhanced the capability of the IAF to track movement of aircraft operating at even ultra low levels deep inside enemy territory as well as direct own combat aircraft employed in the air defence role. Operating in a net-centric environment, the fleet of AWACS aircraft of the IAF provides enhanced situational awareness for all elements and the capability to project aerospace power effectively. In the assessment of the IAF, in the long term, the service needs a total of 15 AWACS platforms including the five already under induction, to provide round the clock surveillance of the complete land borders with the two not-so-friendly neighbours.

On parallel track, the DRDO has developed an indigenous Airborne Early Warning and Control (AEW&C) system radar that has already been mounted on a much smaller platform, the Embraer 145 executive jet. Three such aircraft have been acquired from Brazil at a cost of \$210 million and having been fitted with the AEW&C radar, are currently undergoing trials after successful completion of which, these platforms would be inducted into the IAF. Being tier-II platforms as compared with

the IL-76, these Embraer 145 based systems operate at a lower operational level and serve to augment aerial surveillance capability of the air defence establishment of the IAF. Based on the experience of the initial inductions, the IAF may opt to order additional such systems in the future.


In order to derive advantage from the expertise gained by DRDO in the development of Embraer 145 based AEW&C system, in February 2014, the government approved a project for the indigenous development of AWACS radar. The timeline for the completion of the project was specified as seven years from the date of formal sanction of the programme. In the pursuit of this programme, DRDO has opted for a conventional circular radar dome that will house the indigenously developed Active Electronically Scanned Array Radar. However, the space requirements for the radar and its systems are expected to be so large that it will require a transport aircraft of a size considerably bigger than the Embraer 145. The platform for the AWACS programme would have to be an aircraft such as the Boeing 767 or the Airbus A330 on which the system can be mounted with ease. Such a platform will also provide adequate cabin space for the number of work stations the system will require. An aircraft like the IL-76 would also be suitable but DRDO is in favour of a platform currently in use in civil aviation industry so as to leverage commercial maintenance ecosystems already available in the country. Currently Boeing has an AWACS version of the 767. Airbus could modify the A330 as has been done by the company for the in-flight refuelling role.

India's thrust towards indigenisation is undoubtedly laudable. However, in this particular case, as the IAF requires only ten platforms, the huge investment the project entails, may not be justifiable. Besides, the track record of the Indian aerospace industry and the R&D organisation in respect of delivery schedules and cost control, does not inspire confidence. The IAF needs this force multiplier urgently and cannot risk delay in delivery as it will have debilitating impact on operational capability. It is therefore understandable that the IAF prefers outright purchase as against indigenous effort. **SP**

**—By Air Marshal (Retd) B.K. Pandey**



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Left: Alessandro Galera, Customer Service Manager  
Center: Sergio Ribeiro, Field Technical Representative  
Right: Gutemberg Silva, Sorocaba DAS Service Center

# SR-72, A HYPERSONIC DRONE



The SR-72 hypersonic drone is the follow-on to the air forces' strategic reconnaissance aircraft, the Mach 3 SR-71 BlackBird

**THE SKUNK WORKS SR-72** design, a hypersonic unmanned aircraft developed for intelligence, surveillance, reconnaissance and strike missions at speeds up to Mach 6. The aircraft armed with hypersonic missiles could penetrate denied airspace and strike any location across a continent in less than an hour. Lockheed Martin is ready to embark on the development of the SR-72 that could enter service with the US Air Force in 2030.

The proposed drone is positioned as the follow-on to the air forces' strategic reconnaissance aircraft, the Mach 3 SR-71 'BlackBird', developed by the legendary designer Clarence "Kelly" Johnson, the Chief Designer of the Lockheed Skunk Works in the early 1960s. Envisioned as an unmanned aircraft, the SR-72 would fly at speeds up to Mach 6. At this speed, the aircraft would be so fast that an adversary would have no time to react or hide.

The SR-72 that has been dubbed "Son of Blackbird," and integrated engine and airframe that is optimised at the system

level for high performance and affordability. Lockheed Martin is ready to embark on the development of the new hypersonic drone. The SR-72's design incorporates lessons learned from the HTV-2, which flew to a top speed of Mach 20, or 20,800 kmph, with a surface temperature of 3,500°F.

SR-72 is not the first hypersonic Skunk Works aircraft. In partnership with the DARPA, engineers developed the rocket-launched Falcon Hypersonic Technology Vehicle 2 (HTV-2). The HTV-2 research and development project was designed to collect data on three technical challenges of hypersonic flight: aerodynamics; aero-thermal effects; guidance, navigation and control. SP



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FINE-TUNING AIRCRAFT  
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# ALL SET TO GROW

With aircraft acquisitions increasing by leaps and bounds in Asia, the opportunities for MRO activity are opening up

BY R. CHANDRAKANTH

**ACROSS THE GLOBE, PARTICULARLY** in Asia, aircraft acquisitions are proceeding on at an astounding pace. China and India are two huge markets which are driving considerable demand for commercial aircraft as the two Asian giants enhance pan-country air connectivity. According to the Centre for Asia-Pacific Aviation (CAPA), Asia-Pacific airlines are expected to spend close to \$2 trillion on new jets over the next two decades. Asia Pacific airlines will need 12,820 new airplanes, valued at \$1.9 trillion during the period. The growth in intra-Asia travel, spurred by

the burgeoning low-cost carriers, has created an increasing demand for single-aisle airplanes and regional aircraft.

China continues to lead the region in new deliveries. By 2030, Chinese airlines will need nearly 6,000 new airplanes, valued at \$780 billion, accounting for more than 40 per cent of forecast deliveries to the Asia-Pacific region. South East Asia's airlines, particularly from Malaysia, Indonesia and Singapore, are also growing rapidly as the region continues to develop economically.





SIA ENGINEERING MRO  
FACILITY AT HANGER 6  
IN SINGAPORE

## MROS IN KEY ASIAN COUNTRIES

### INDIA

Air India Maintenance Ltd  
Air Works India (Engineering) Pvt Ltd  
Arrow Aviation Services Pvt Ltd  
Aviationbaba Aero Services  
Blue Dart Aviation Ltd  
Cochin International Aviation Services  
Deccan Aviation  
HAMCO - Hyderabad Aircraft Maintenance  
Hindustan Aeronautics  
Indamer Company Pvt Ltd  
Kazi Aviation & Travel Services  
Livewel Aviation  
Lufthansa Technik Services India  
MAS-GMR Aero Technic  
Max AeroSpace & Aviation Ltd  
NACIL-Air India  
Taneja Aerospace & Aviation  
Topcast Aviation Supplies Co Ltd  
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MTU Maintenance Zhuhai Co Ltd  
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Shanghai Pratt & Whitney Aircraft Engine  
Maintenance Company  
Shanghai SR Aircraft Technics Company  
Shanghai Technologies Aerospace Company  
Sichuan Snecma Aero-Engine  
Maintenance Co.  
Taikoo (Xiamen) Aircraft Engineering Co.  
Volvo Aero Services-Beijing

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Airod Sdn Bhd  
CTRM Sdn Bhd  
FL Technics-Malaysia  
GE Engine Services-Malaysia  
GE On Wing Support-Kuala Lumpur  
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Honeywell Aerospace Services  
MAS Engineering & Maintenance  
Sepang Aircraft Engineering Sdn Bhd  
SR Technics Malaysia  
Yasmin Wings Sdn Bhd

### SINGAPORE

Aerospace Component Engineering Services  
Airfoil Technologies International-Singapore  
Asian Surface Technologies Pte Ltd  
Aviation & Electronics Support Pte Ltd  
Avio Aviation  
Component Aerospace Singapore Pte Ltd

Composite Technology International  
Combustor Airmotive Services Pte Ltd  
Derco Aerospace Pte Ltd  
Eagle Services Asia Pte Ltd  
Eurocopter South East Asia  
Fuel Accessory Service Technologies Pte Ltd  
GE Aviation Service Operation  
GE Aviation Services ATI  
UTC Aerospace Systems Aerostructures  
Singapore  
UTC Aerospace Systems Aircraft Wheels &  
Brakes  
Hamilton Sundstrand Pacific Aerospace  
Honeywell Aerospace  
International Engine Component Overhaul  
Jet Aviation-Singapore  
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Meggitt Aerospace Asia Pacific  
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### CHINA

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Flightparts (Xiamen) Component Services  
GE Engine Services-Xiamen  
GE On Wing Support-Xiamen  
Guangzhou Aircraft Maintenance &  
Engineering Co  
Hamilton Sundstrand-Xiamen Repair Station  
Hangxin Aviation Engineering Group  
Lufthansa Technik Shenzhen

Indian carriers, Airbus forecasts, will require 1,020 new passenger and 23 freighter aircraft valued at \$145 billion between now and 2030.

All this means so much more aircraft maintenance related work, opening up huge opportunity. But the question is whether maintenance, repair and overhaul (MRO) is keeping abreast of the surge in aircraft acquisition?

#### YES AND NO

TeamSAI, an aviation consulting company, has pegged the Asian MRO business to soar from \$13.9 billion in 2013 to \$24.3 billion in 2023. In China alone, it is estimated that MRO business will double from \$3.6 billion to \$7.8 billion.

With further investments in China, there is a possibility of West European and US carriers sending their wide-body aircraft to China for heavy maintenance as it would be less expensive due to low labour costs. TeamSAI estimates that there are over 80 MRO companies in China, 25 of which provide MRO services (aircraft, component and engine) to commercial operators. The consultant says that many aircraft MROs appear to be supporting Western operated international aircraft types such as the Boeing 747, 777 Airbus A330 and A380.

ST Aerospace, a major Singapore-based MRO provider, has

the UAE and Singapore to develop as MRO hubs in Asia.

There are very few MROs in India. The nation's first and only independent EASA-certified commercial MRO is Air Works, a leading provider of aviation services. It has a world-class facility at Hosur near Bengaluru, for base maintenance of narrow-body aircraft. It has DGCA CAR 145, EASA part 14, GCAA CAR 145, AS 9100B for Airbus A320 family; ATR-42/72 series and Boeing 737 Classic/NG series aircraft. It has an enclosed hangar to accommodate two-three regional jets or one narrow-body aircraft.

Lufthansa Technik Services India (LTSI) set up in 2008 in Bengaluru, is a fully owned subsidiary of Lufthansa Technik AG. As the successor to One Stop Airline MRO Support Pvt Ltd, the company operates a pool of components and provides materials management and spares provisioning services for Indian and South East Asian customers of Lufthansa Technik AG. LTSI also manages the home base material stock for customers in India and in some cases holds inventory for them at the Bengaluru site.

LTSI's main focus is regional component service for Airbus aircraft of the types A319, A320, A321, A330/A340 as well as for Boeing aircraft of the types 737NG and 777. In this connec-



LUFTHANSA TECHNIK SERVICES VARIOUS ASIAN MARKETS INCLUDING INDIA AND SOUTH EAST ASIA



MAS-GMR AERO TECHNIC FACILITY IN HYDERABAD

established a joint venture with Guangdong Airport Management Corporation (GAMC) to establish a commercial aircraft heavy maintenance facility. One of the largest MROs of China is Aircraft Maintenance and Engineering Corporation (Ameco Beijing), a joint venture between Air China Limited and Lufthansa German Airlines, was established on August 1, 1989, with Air China Limited holding 60 per cent and Lufthansa 40 per cent stake. Besides airframers, engine makers such as GE, Pratt & Whitney, Rolls-Royce, Hamilton Sundstrand, Snecma and Volvo, are also involved with Chinese MRO companies.

#### INDIA LAGGING BEHIND

While there is considerable MRO activity in the Middle East and South East Asia, in India, which is expected to become one of the top five aviation markets in the world soon, the absence of MRO is telling. The lack of full-fledged MROs in India has helped

the company cooperates closely with Lufthansa Technik's Aircraft on Ground (AOG) Desk in Hamburg. Lufthansa Technik's permanent presence in India through LTSI means that Indian and South East Asian customers can count on a fast, local materials service for a growing number of aircraft types and rely on highly skilled customer service in their region.

Lufthansa Technik Philippines is also a dominant firm in the field and has recently finished the construction of its third and largest hangar, capable of accommodating the A380. The company has already started an A380 cabin modification project and is now seeking certifications to perform C-checks.

The Air India-Boeing MRO which is to come up in Nagpur, has been slightly delayed. The \$100-million project is slated to go operational soon. So also there are plans of MROs by Airbus which during India Aviation in Hyderabad indicated that it was in talks with global MRO firms to start a facility in India.





MALAYSIAN AIRLINES' MRO FACILITY

### SOUTH EAST ASIA GAINING GROUND

In South East Asia there are over 80 MRO entities and Singapore is a key MRO hub. ST Aerospace has 30 wide-body and 31 narrow-body bays worldwide, with nine wide-body and 11 narrow-body bays in Singapore alone. However, of late, many MRO businesses have formed joint ventures with Western companies, including original equipment manufacturers (OEMs) and airlines. With aircraft reliability improving, major checks on the latest aircraft are necessary once in eight to 12 years as against four to six years on the older generation aircraft. The MROs are now contemplating reworking their revenue models.

Director of TeamSAI, David Hygate has said that with new, efficient aircraft coming into the market, profits for MROs are shrinking, unless the MRO is tied-up with one of the OEMs, as most new engine orders are accompanied by long-term service agreements with these companies. Engine manufacturers have developed a model in which aftermarket servicing is key. They have factored in life-cycle repairs and replacement parts into product revenues. As fuel efficiency is the driving factor in the development of new technologies, airframes and components, OEMs are now following the example of engine OEMs and seeing the chance to recoup investment via a stake in an MRO service.

"For component makers the attraction lies in controlling parts supply, as parts comprise the bulk of their MRO costs – certainly for engines but also for many types of components. The appeal to the aircraft makers is less easy to see, given that materials are only about 20 per cent of MRO expense, but they may see opportunity in being able to offer a comprehensive 'cradle to grave' service for their products," added Hygate.

Meanwhile, independent MRO companies are thinking out-of-the-box to gain market-share. For instance ST Aerospace which has been in the business for nearly four decades, has got into commercial business, moving away from defence contracts. Commercial MRO accounts for 70 per cent of an average \$1.4 billion annual revenue. ST Aerospace intends to increase capabilities in China.

The Chairman and CEO of TeamSAI, Chris Doan, has stated, "Excessive demand will probably not be the cause of MRO domination and control but there is the distinct possibility that the OEMs, particularly the engine makers, might

achieve overwhelming mastery of the market. Over 80 per cent of LEAP and GTF orders are sold with long-term maintenance contracts and over 90 per cent of Rolls-Royce Trent engines come with TotalCare, so these segments may fall under the control of the manufacturers. But because of the total capacity available worldwide, there is little chance of the regional providers dictating to the airlines."

The MROs in South East Asia will have to work carefully alongside OEMs to capitalise on global growth forecasts, which see the MRO market share shifting distinctly towards the East. Hygate said, "Today, the MRO market for jet airliners is worth around \$54 billion. In ten years' time, TeamSAI predicts this will reach almost \$73 billion, with engines the largest and fastest-growing segment. Training will become more important as the appetite for new staff grows and technology will probably be deployed in the form of distance learning and computer simulations. Organisations that recognise the value of training and are prepared to invest in this resource should cope best."

There is rapid expansion of MRO facilities to the North, major facilities such as ST Aerospace in Singapore, China's Ameco Beijing, TAECO and GAMECO as well as HAECO in Hong Kong, companies which have all been undergoing unprecedented expansion over the past few years, adding massive new hangars and expertise across the MRO spectrum. And Asia isn't the only threat. MRO suppliers in the booming Middle East are jumping on the bandwagon. Firms such as Mubadala Aerospace in Abu Dhabi are dominating the market with aggressive expansion.

Today, the majority share of MRO remains in North America (35 per cent) and Western Europe (26 per cent), with the Asia-Pacific holding close to 20 per cent. The Asia-Pacific MRO market is now worth \$11.5 billion but by 2017 is expected to reach \$16.2 billion and by 2022 some \$20.9 billion, around 30 per cent of world MRO turnover.

**THE LACK OF FULL-FLEDGED MROS IN INDIA HAS HELPED THE UAE AND SINGAPORE TO DEVELOP AS MRO HUBS IN ASIA.**

Despite the continual expansion of MRO facilities in Asia, there are worries about availability of trained engineers. Besides there are infrastructure and policy bottlenecks in several countries and it is hoped that they would be resolved. In India with the BJP-led government coming to power, there is huge expectation that the aviation sector per se will be imparted the much needed momentum. **SP**





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THE TRENT XWB WILL POWER THE AIRBUS A350 FAMILY

# NEXT-GEN ENGINES

Aero engine manufacturers are driven by the need for advancements which will improve engine efficiency, burn less fuel, is environment-friendly and above all reduces the cost of operation

BY R. CHANDRAKANTH

**ON A RECENT VISIT** to Honeywell Aerospace facility in Phoenix, Arizona, the group of visiting International media (this journalist was the sole representative from India) was witness to some path-breaking engine development that Honeywell scientists and engineers are working on. These technologies are in the development phase, but are sure to revolutionise engine production in the near future.

Honeywell is working on ceramic additive manufacturing to fabricate casting cores for turbine blades and vanes in lieu of

costly and complicated tooling. The company has successfully fabricated engine quality single crystal castings for the TFE731-60 1st blade which provide greatly improved efficiency and productivity. Among other research and development activity, Honeywell has developed an improved thermal barrier coating for turbine engine components with significantly lower thermal conductivity, best in class phase stability and fracture toughness and unsurpassed life. This technology significantly improves engine power and reduces fuel consumption.





GE'S GENX-1B ENGINE IS USED ON THE BOEING 787 DREAMLINER

Not just Honeywell, all the aero engine manufacturers are driven by the need for such advancements which will improve engine efficiency, burn less fuel, is environment-friendly and above all, reduces the cost of operation. While they are driven by the need to be competitive, they are also on path in complying with the ambitious goals for air traffic set by various bodies including the Advisory Council for Aviation Research and Innovation in Europe (ACARE). The major part of the improvements in NO<sub>x</sub> and noise emissions will have to come from the engine. The target values for reductions in aircraft engine fuel burn and in CO<sub>2</sub> emissions are – 20 per cent by 2020; 30 per cent by 2035 and over 40 per cent by 2050. It is happening as can be seen how over the years engines have become highly efficient. In the early 1990s, the average fuel consumption of aircraft was around six litres per 100 passenger kilometres, which now is as 2.9 litres on an Airbus A380.

#### ROLLS-ROYCE NEXT-GEN DESIGNS

Rolls-Royce recently shared details of its next-generation of engine designs which could be ready within ten years, featuring technology innovation designed to transform performance. The company has built a technology leadership position with its Trent family of engines, the latest of which, the Trent XWB, is the world's most efficient engine flying today. Trent engines will continue in service for decades to come with 2,500 in service and more than 2,500 on order.

Rolls-Royce is continually innovating and as part of that ongoing process, is looking to build on the success of the Trent family of engines with two new generation engine designs. The first design, Advance, will offer at least 20 per cent better fuel burn and CO<sub>2</sub> emissions than the first generation of Trent engines and could be ready by the end of this decade. The second, UltraFan, a geared design with a variable pitch fan sys-

tem, is based on technology that could be ready for service from 2025 and will offer at least 25 per cent improvement in fuel burn and emissions against the same baseline.

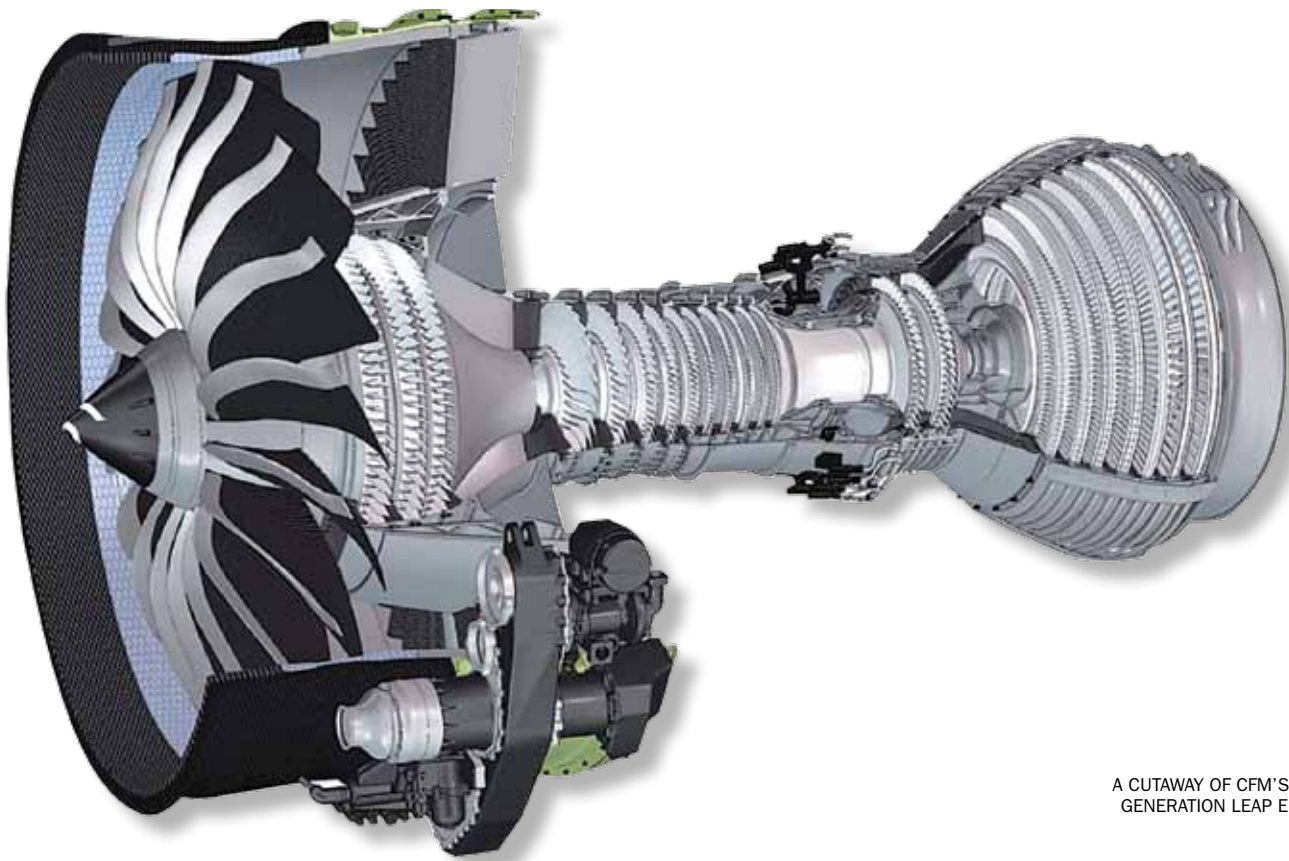
Colin Smith, Rolls-Royce Director, Engineering and Technology, said, "These new designs are the result of implementing our ongoing technology programmes. They are designed to deliver what our airframe and airline customers tell us they need, even better fuel efficiency, reliability and environmental performance."

Eric Schulz, Rolls-Royce President, Civil Large Engines, said, "As innovators, we can never stand still, even when we have the leadership position. Our horizons extend into the coming decades and we have amassed a range of new technologies to meet the needs of our customers. I am confident that our engine design strategy will ensure we power the future of global aviation."

Both engine designs are the result of the ongoing research and development investment, of approximately £1 billion a year, which Rolls-Royce makes across its aerospace and non-aerospace business. The designs will feature architecture and technology improvements, all currently at an advanced stage of development that include new engine core architecture to deliver maximum fuel burn efficiency and low emissions, a CTi Fan System, carbon/titanium fan blades and a composite casing that will reduce weight by up to 1,500 lb per aircraft, the equivalent of carrying seven more passengers at no cost; advanced ceramic matrix composites—heat resistant components that operate more effectively in high turbine temperatures and a geared design, called UltraFan, which will deliver efficient power for high-thrust, high-bypass ratio engines of the future.

While Rolls-Royce currently focuses on development of the Trent XWB for the Airbus A350 and the next version of Trent 1000TEN for the Boeing 786, the engine maker has unveiled its strategic roadmap for a new generation of turbofans for entry





A CUTAWAY OF CFM'S NEXT-GENERATION LEAP ENGINE

into service from 2020. The ambitious plan centres on a two-phase evolution of the three-shaft architecture that is designed to position Rolls for new applications in the wide-body market. Because the technology is scalable, Rolls believes the strategy could also provide a launch platform for new medium-thrust engines, possibly allowing it to re-enter the narrow-body market ceded to Pratt & Whitney with its withdrawal from International Aero Engines in 2013. The road map also sees Rolls introducing composites on a wider scale in new areas such as fan blades and casings and in its second phase, embraces geared turbofan technology for the first time. In the longer term, the plan also keeps the door ajar for potential open-rotor engine derivatives.

In addition, Rolls-Royce has developed and tested technologies to support the Open Rotor engine concept and is positioned to mature them should there be clear market demand for such a product.

#### GENX TURBOFAN

The GENx is GE's next-generation turbofan and will be the workhorse engine of the 21st century for medium-capacity, long-range aircraft. Designed around customers' needs, the GENx represents a giant leap forward in propulsion technology. The engine will use the latest generation materials and design processes to reduce weight, improve performance and lower maintenance. The GENx is part of GE's 'ecoimagination' product portfolio—GE's business strategy to develop new, cost-effective technologies that enhance customers' environmental and operating performance. The GENx will deliver 15 per cent better specific fuel consumption which translates to 15 per cent less CO<sub>2</sub> than the engines it replaces, helping operators save whenever they fly. Its innova-

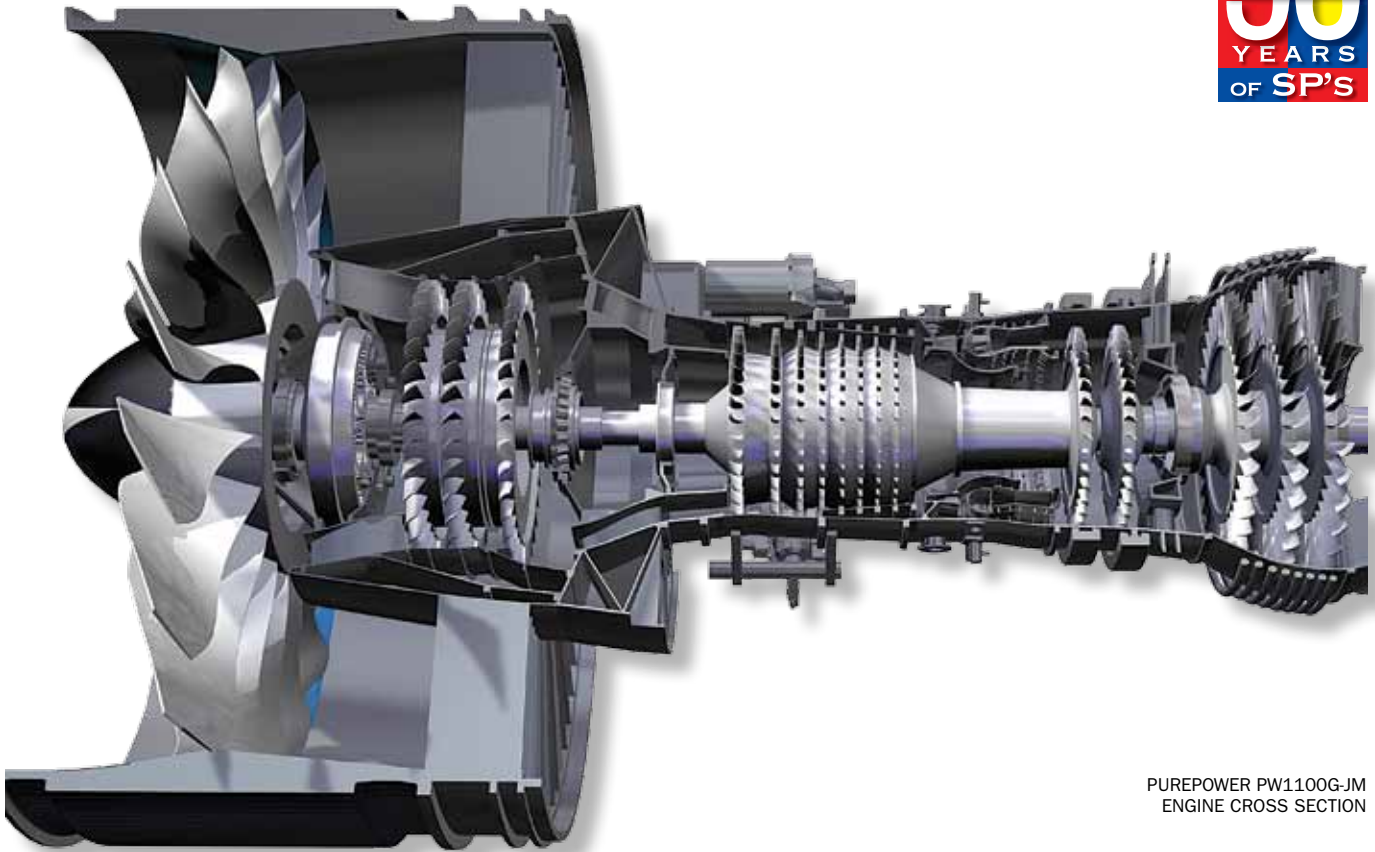
tive twin-annular pre-swirl (TAPS) combustor will dramatically reduce NO<sub>x</sub> gases as much as 56 per cent below today's regulatory limits. Additionally, the GENx's emissions for other regulated gases will be as much as 94.5 per cent below current regulatory limits, ensuring clean compliance for years to come.

Based on the ratio of decibels to pounds of thrust, the GENx will be the quietest, most passenger-friendly commercial engine ever produced due to the large, more efficient fan blades that operate at a lower tip speed, resulting in about 30 per cent lower noise levels. It will be the world's first commercial jet engine with both a front fan case and fan blades made of carbon fibre composites, which are both durable and low maintenance. This technology reliability has been validated over more than 15 years and 22 million flight hours on the GE-90.

All of these improvements are thanks to the incorporation of advanced and proven technologies from other engine families and ongoing R&D programmes, such as lightweight, durable composite materials and specialised coatings, an innovative, clean-burning combustor and a fan module that's virtually maintenance free. It is a low-risk, high-value solution to the challenges customers face every day. It is the GENx.

#### PRATT & WHITNEY HIGHER THRUST PUREPOWER ENGINE

Pratt & Whitney in May launched the newest addition to the PurePower engine family, the PW1135G-JM engine, a 35,000 lb thrust class engine for the Airbus A321neo aircraft. The engine's higher thrust rating makes it the most powerful engine on the A321neo allowing A321neo operators fitted with Geared Turbofan engine technology, to fly routes of greater distance while carrying more passengers or larger payloads when operating



PUREPOWER PW1100G-JM  
ENGINE CROSS SECTION

out of high-altitude airports. "At Pratt & Whitney, we're always working to stay one step ahead with our technology while providing our customers value. The PurePower PW1135G-JM engine is yet another example of this approach," said David Brantner, President, Pratt & Whitney Commercial Engines. "With the PW1135G-JM engine, we offer incremental value by opening up new routes without compromising fuel burn, emissions and environmental performance."

The higher thrust offered by the PW1135G-JM engine allows an A321neo operator to benefit from increased range when operating out of high altitude airports, such as Mexico City and Bogota. Compared with an A320ceo without Sharklets, the A320neo powered by PW1100G-JM engine technology will provide customers with up to a 15 per cent reduction in fuel-burn with a corresponding reduction in CO<sub>2</sub> emissions. The PW1100G-JM engine also provides up to 75 per cent reduction in the A320neo noise footprint, which is also environmentally-friendly and allows longer hours of operation at airports that operate under curfew.

To date the PurePower engine family has completed more than 9,000 hours of testing, including more than 1,200 hours of flight test hours. Pratt & Whitney has more than 5,500 PurePower engine orders and commitments, including options.

#### LEAP FORWARD


LEAP is a new-generation engine designed and developed by CFM International, the 50:50 joint venture company of Snecma (Safran) and General Electric, through a very technologically ambitious development programme. The new LEAP engine will incor-

porate a number of innovative technologies developed through the LEAP research & technology programme. It is mainly designed to power the next-generation of single-aisle commercial jets.

LEAP features a host of advanced technologies to help reduce its fuel consumption by 15 per cent, NO<sub>x</sub> emissions by 50 per cent and noise to 15 decibels. There will be fewer fan blades (18 against 24 to 36 in CFM56 engines) and the engines will be lighter, since they are made of composite materials using a proprietary woven 3D Resin Transfer Molding (RTM) process. Use of new composites on fan blades and other components would reduce the weight of the aircraft by about 450 kg.

In December 2009, the Commercial Aircraft Corporation of China (COMAC) selected LEAP as the only Western propulsion system for its new, single-aisle commercial jet, the C-919. Designated LEAP-1C, this engine is the first member of the LEAP family slated for certification in 2015. CFM International will also supply the nacelle and thrust reverser, developed in partnership with Nexcelle, a 50:50 joint venture of Middle River Aircraft Systems (GE) and Aircelle (Safran).

A year later, in December 2010, Airbus also chose Safran's new engine, this time the LEAP-1A version, as one of the powerplants to be offered on its new A320neo. This new aircraft could enter service in mid-2016. Boeing subsequently selected the new engine, the LEAP-1B version, as the exclusive power-plant on its new 737 MAX.

Indeed, there is frenetic research going on in engine development by all the manufacturers. This is imperative to stay in business as well as to be responsible companies. 

THE GENX REPRESENTS A  
GIANT LEAP FORWARD IN  
PROPULSION TECHNOLOGY.



EMBRAER 175 IN THE LIVERY OF US AIRWAYS EXPRESS

# CONNECTING CITIES, THE US WAY

Regional airlines are nascent, if not non-existent in India. The government has approved 15 applicants to start regional airlines and they have not yet got the courage to do so, though the government has announced a new policy to encourage regional aviation.

BY R. CHANDRAKANTH



**THE REGIONAL AIRLINE INDUSTRY** in the US is an essential mode of transportation as it connects various States. If we can make an analogy, the regional airline industry in the US networks the way inter-state buses do in India. The essence is quicker transportation without many frills, accordingly the frequencies are good and convenient. The regional airlines in the US carry 22 per cent of passengers. The domination is by the large hub-and-spoke carriers such as United Airlines, Delta Air Lines (DAL) and American Airlines (AAL) who fly most of the

planes regional airlines operate. The connectivity they provide is far-reaching and there is frenetic activity in the skies.

However, they are not without problems. The old regional airline, capacity-purchase model is well and truly broken and airlines have to look at more revenue-bearing models. Regional airlines have been rapidly evolving, expanding capacity purchase portfolios or acquiring branded operations such as Republic's acquisition of Midwest and Frontier to form Frontier Airlines. But the problem is of plenty as there are many aircraft





DELTA CONNECTION'S BOMBARDIER CRJ 700 IN FLIGHT

in a reportedly vastly shrinking regional airline system. The dependence of regional airlines on some of their major partners may not have really worked in their favour.

The problem for regionals really began in the post-9/11 period when major-carrier bankruptcies allowed the restruc-

turing of that sector. Regionals took on an increasing capacity lift for their partners with 8-10 per cent margin contracts. Major carriers were still suffering a negative or just-barely positive margins and in 2007 began a watershed change in the industry.

During the 2005-2010 period – and only at the behest of actions taken by their major carrier partners – the regionals began consolidating, although not half as much as needed. For instance, Delta Airlines Limited wanted to rid itself of Atlantic Southeast Airlines and convinced partner SkyWest Airlines, Inc to buy it in 2005. SkyWest has restructured and has found it impossible given Delta's rapidly changing schedules and policies that cancel and delay regional flights first. Still, that did not keep SkyWest Airlines Inc from acquiring ExpressJet in 2010 since it was a good opportunity to grow in a non-growth industry.

The regional airlines have little leverage with their major airline partners, and without leverage we believe it will be difficult for the industry to return to profitability. The regional airlines generally control a lot of aircraft, too many 50-seat aircraft, but there are still too many airlines competing for too few opportunities. Consolidation is the answer but, unlike their major-carrier counterparts, it has not resulted in a reduction of capacity, and won't until carriers earn their Single Operating Certificates (SOC).

#### PILOT SHORTAGE

One major problem for the regional airline industry is pilot shortage. The cost of flight training can top \$100,000, and the entry-level pay at regional airlines, which handle roughly

## QUICK FACTS

### US SCENARIO

- Regional Airlines carry over 22 per cent of airline passengers
- Major airlines have regional subsidiaries
- Consolidation is a regular phenomenon
- US airline industry needs to hire 1,900 to 4,500 pilots in next 10 years
- High cost of pilot training
- Strong Regional Airline Association

### INDIAN SCENARIO

- Regional airline industry is nascent
- Air Costa, only regional airline as of date
- 15 regional airline applications approved
- Government announces regional aviation policy
- \$12 billion investment expected in airports sector
- Airports Authority of India investing in smaller airports
- India needs to prepare for pilot shortages now
- Concessions for regional airlines will attract investment



AMERICAN EAGLE'S ATR 72-212

half of US flights, for years hovered between \$17,000 and \$22,000 a year. The resulting nationwide pilot shortage is putting a squeeze on regionals, and ultimately some may not survive. A recent report from the US Government Accountability Office (GAO) found 11 of 12 regional airlines fell short of their hiring targets.

The shortage has deepened when federal regulations raised the number of hours in the air, to 1,500 from 250, that first officers—entry-level pilots—must have under their belts. That makes training even more expensive, as aviation graduates typically fall short of the new requirement. Some fledgling pilots take on debt, many work as flight instructors, and others abandon plans to fly for a passenger airline.

The new federal rule raising the minimum flight hours was an effort to increase safety by requiring that airlines use more experienced pilots. The mandate was passed by Congress in 2010 in response to the 2009 crash of a Continental Express regional flight near Buffalo in which all 49 people on board and one on the ground were killed. Regional airlines are having trouble hiring enough pilots, and a government report says one reason may be they simply don't pay enough. The US airline industry will need to hire 1,900 to 4,500 new pilots annually over the next 10 years because of pilots retiring at age 65 and increased demand for air travel, the report said.

#### LESSONS FOR INDIA

The regional airline industry in India is

nascent, if not non-existent. What is it that India can learn from the US. As mentioned earlier, India can model the route network on the lines the US has done, connecting smaller cities to other smaller cities; smaller cities to major hubs etc. The large hub and spoke model has been effective in the US. It certainly calls for entrepreneurs to take the call of starting regional airlines in India where there is enormous potential to expand air connectivity. The government has come out with a pro-regional policy and it needs to be seen how many are going to bite the bullet.

The only regional airline in India at the moment is Vijayawada-based Air Costa, while several applications have been approved by the government for private operators to start regional airlines.

According to Ramesh Lingamaneni, Chairman of Air Costa, running a successful regional airline is no different from any other business. The fundamentals are the same. The focus, he mentions, is to drive costs down without compromising on service quality. He adds that two key lessons that airline industry has to learn from the failure of other airlines (within India) is lack of focus and discipline on the sectors the airline is operating.

Air Costa is seeking from the government waiver of value added tax on aviation turbine fuel; development of Tier II and III airports and concession of airport charges.

As regards lessons from the US regional airline industry, the two are different as India is yet to make a beginning. However, one needs to guard against pilot

**THE LARGE HUB-AND-SPOKE  
MODEL HAS BEEN EFFECTIVE  
IN THE US AS EVIDENCED  
BY PROLIFERATION OF  
REGIONAL AIRLINES**



DELTA CONNECTION'S EMBRAER 170

shortage and take necessary action before operations commence itself. With regards to consolidation as is happening in the US, the question does not arise at the moment, but the ones who are making a bid should first get their act together.

The government has announced a new regional policy and it remains to be seen whether these 15 odd applicants will start operations in the near future. The civil aviation ministry is clearer now about the role of regional aviation and intends to promote regional and remote-area connectivity.

#### LOW -COST AIRPORTS

The Airports Authority of India (AAI) is developing 50 low-cost airports in remote and interior areas. The government envisages an investment of \$12.1 billion in the airports sector during the 12th Plan period, of which \$9.3 billion is expected to come from the private sector for construction of new airports, expansion and modernisation of existing airports and development of low-cost airports.

#### NEW POLICY

As per the new policy, it is now mandatory for all scheduled airlines to operate at least six per cent of their total domestic operating capacity to airports in remote or strategic areas. Areas/airports where operations mandated are – North East region with the exception of Guwahati and Bagdogra; all airports in J&K except Jammu; Andaman and Nicobar Islands and Lakshadweep. It is also mandatory

for airlines to operate at least one per cent of their total operating capacity on sectors/routes operated within the above areas. The total operating capacity means the number of seats operated by an airline in all its sectors, multiplied by sector distance in kilometres. The Ministry states that these areas/airports would be reviewed from time to time to ensure that the operators adhered to the norms.

#### CONCESSIONS FOR REGIONALS

The Ministry has announced the following concessions to any passenger or cargo aircraft which operate to the above airports for an initial period of three years. The concessions are: Exemption from landing and parking charges; RNFC charges; PSF; Fuel throughput charges and any other charges levied by AAI.

The policy has been long overdue but one must appreciate the fact that the Ministry had several discussions with various stakeholders. Consultancy firm KPMG had suggested that the government allow 'no-frills' airport model to lower the fixed cost of airport development and to improve the financial viability of Tier II and III airports.

While the government is trying to create an eco-system, it is for the private sector to capitalise on the same and help build regional connectivity. It is a model which has enormous benefits, considering that a large part of India needs to be connected by air and regionals are the only answer. **SP**

**THE GOVERNMENT HAS  
ANNOUNCED A NEW  
REGIONAL AIRLINE POLICY  
TO EXPAND PAN-INDIA  
CONNECTIVITY**



# FIFA FEVER

2014

The FIFA World Cup 2014 being held in Brazil has a cascading effect on business aviation and the Brazilian skies are busy like never before

BY R. CHANDRAKANTH



**CRISTIANO RONALDO, THE ICONIC** football player from Portugal, is known for his extravaganza. He can afford to do it. He is a goal-machine and fans just love to watch him speed on the field and off the field. After he won the Ballon d'or (Golden Ball) award he is said to have bought every member of the Real Madrid (the club he plays for) medical team a car of their choice. And what is he doing for FIFA World Cup 2014 now underway in Brazil? He has brought his family and friends to the land of football, coffee, samba and Embraer, in four private jets. The 'beautiful game' means a lot to him and his family and he wants them to be there when he and his team make a bid for the World Cup title. On board were Ronaldo's mother, his sisters, his brothers-in-law, his son, his girlfriend and other friends. They landed at the Campinas military airport on June 7, just before the start of the 2014 finals. What better way to criss-cross the 12 stadiums in Brazil to catch all the action than in a luxurious private jet. That is the effervescent Ronaldo.

Eto'o is another player from Cameroon and former Barcelona Football Club striker who has his own private jet, but had to come in the chartered plane with the team.

The game of football is bigger than any individual. It is the fans who make the game what it is. Some fans descend on the venues in their own luxurious private jets, chartered jets and all kinds of transportation to get a ringside view of their teams making a bid for the coveted trophy.

#### JETS FILL BRAZILIAN SKIES

The month-long FIFA World Cup 2014 which got underway on June 12 with a bang is witnessing hectic activity in the skies – business jets flying across Brazil. Leonardo Fiuza, Director of the Brazilian company TAM Executive Aviation, estimated that between 700 and 1,000 executive jets would be flying during the period, ferrying rich fans, politicians, royal families and the like. While Dubai-based United Aviation Services (UAS), which books charter flights with over 500 private jet operators globally, has put the figure at 3,000 business aircraft of all hues filling the Brazilian skies before, during and after the tournament. Privately chartered airliners make up less than five per cent of that estimate. Eduardo Marson, President of the Brazilian Association for General Aviation, said the UAS estimate may be on the

high end of possible scenarios, but he agreed air traffic outside of commercial airlines would outpace any prior event in Brazil.

Officials estimate that the World Cup will draw about 6,00,000 international visitors, spending nearly \$3 billion. Of that, there will be good numbers using business aircraft. From the Amazon basin in the North to the banks of the River Guaiaba in the South, 12 stadiums across Brazil are each well-served by private jet airports. Many of these are smaller airports than those used by airlines, allowing shorter ground transfers to the games.

#### EARLY KICKSTART BY PRIVATE OPERATORS

Among the early birds to secure landing and parking was Paramount Business Jets. The Virginia-based firm said it got the slots it wanted for nearly 20 of the World Cup charters it has



CRISTIANO RONALDO



WELLINGTON MOREIRA  
FRANCO, CIVIL AVIATION  
MINISTER, BRAZIL



EDUARDO MARSON  
PRESIDENT OF THE  
BRAZILIAN ASSOCIATION  
FOR GENERAL AVIATION  
(ABAG)



DASSAULT FALCON SERVICE CENTRE OFFERING ONSITE SUPPORT FOR FIFA WORLD CUP NEAR SÃO PAULO, BRAZIL

booked so far. But many private-jet customers aren't booking beyond the first round unless they know that their teams have advanced, making planning tough.

Lider Executive Aviation, a leading Latin American company, which has 15 aircraft, has said that aircraft utilisation will be extremely high as it is present in 19 airports, including in the 12 host cities. Lider has an agreement with American NetJets, one of the largest private jet rental companies in the world, to capitalise on the demand. Junia Hermont, Director of Lider, has been quoted as saying that the company was looking at a huge pie of the opportunity that the World Cup was providing. "We want to win 80 per cent of the demand for services generated by those planes coming from outside," said Hermont. TAM also expects a significant increase in demand for airport services and aircraft maintenance.

#### GEARED FOR THE EVENT

Brazil has really geared up for the event despite the protests on the money spent. In fact, during the 2013 LABACE, doubts were expressed whether the country would have enough airstrips ready to handle the sudden gusts of traffic, but Brazil has proven everyone wrong. "In big cities we're seeing major problems. In Sao Paulo and Rio de Janeiro there's almost a blockade of executive aviation services," the Civil Aviation Minister Wellington Moreira Franco had told the media much before the event started. "Soon that story should be different," promised Franco, highlighting a handful of private initiatives to build new airports around Rio and São Paulo, Brazil's two biggest cities. "Brazilians are last-minute sprinters. It is part of our culture," said Marson.

Brazil whose fleet of private aircraft is second only to that of the United States, has opened military airstrips and hangars in order to accommodate the jets.

#### EMBRAER IN ACTION

Embraer Executive Jets has developed an integrated and comprehensive customer support plan. Throughout the event, Embraer's support and services are being expanded to be present in host cities. "Our goal is to ensure presence and assistance for our Brazilian and international customers to enjoy the World Cup with peace of mind regarding aircraft availability," said Edson Carlos Mallaco, Vice President, Customer Support and Services, Embraer Executive Jets.

Embraer has strategically placed field service representatives and are counting on the support of the authorised service centres, backed by a Contact Centre, which already operates round the clock at its headquarters in Sao Jose dos Campos.

At Bertram Luiz Leuploz Airport in Sorocaba, Embraer Executive Jets Service Centre, operated by Universal Aviation, is providing aircraft handling, hangar and FBO services for all business aircraft makes and models. In over two lakh square feet, Embraer offers MRO facility for its executive jets.

A fleet of over 160 Embraer executive jets operates in Brazil, backed by a strategically based national support network. In addition to both owned service centres in Sao Jose dos Campos and Sorocaba, four authorised service centres in Belo Horizonte, Brasilia, Curitiba and Goiania offer swift and efficient support for customers across the country.

PHOTOGRAPH: DASSAULT AVIATION







GULFSTREAM BRAZIL  
SERVICE CENTRE  
OFFERING ENHANCED  
CUSTOMER SUPPORT  
FOR FIFA WORLD CUP

### BOMBARDIER SUPPORT

Bombardier is providing service out of its regional support office in São Paulo, where local support is coordinating in conjunction with Bombardier's customer response centres. The company has put in place five field service representatives based at Rio de Janeiro, São Paulo and Belo Horizonte. Bombardier has also deployed its customer response team (FAA and EASA capable) to provide onsite maintenance in Brazil.

### SKY-HIGH PRICES

Brazilian private aviation firms have an edge when it comes to parking as many own their own slots at airports around the country. Líder's Vaz said his company has about 40 jets to lease and prices are \$5,400 per flight hour for an eight-passenger plane. His firm's stable of aircraft include planes by Embraer, Learjet and Dassault. Private jet luxury doesn't come cheap. Paramount quoted a round trip from Beijing to São Paulo on a Boeing business jet for \$6,02,000. That aircraft boasts a shower, a bedroom, a conference room and the package includes two flight attendants and standard catering. Lobster and an onboard masseuse are extra.


### STRIKING NEW PARTNERSHIPS

Jet Aviation has partnered with Brazilian-based C-Fly Aviation to offer handling services and parking to business aviation aircraft at Galeão International Airport, the main airport serving 2014 FIFA World Cup traffic in Rio de Janeiro, Brazil – host city to the final match. Located North of the city of Rio de Janeiro and within 1.5 hours of six World Cup venues, Galeão is the only international airport in Brazil that has dedicated ramp space for business aircraft

during the games. The airport has approximately 2,00,000 square feet of available ramp space and can accommodate all business jets up to and as large as the Boeing 737-800 and the Airbus A320.

Norbert Ehrich, Vice President and Managing Director, South East US, Central and South America, is leading a team of multilingual international aviation specialists to support C-Fly Aviation's operations on-site at Galeão through the end of the games. The team of handling specialists has 65 years of combined experience to ensure a positive customer experience.

"We look forward to working with C-Fly to support traffic during the World Cup event," said Ehrich. "We have significant experience in handling traffic for high level events such as the Olympics in London and Beijing. Our highest priority has always been to ensure our customers receive the best personalised service that they've come to expect with Jet Aviation."

Oh yes, there are restrictions on flying time and air space as security during the World Cup is extremely tight. The Brazilian Government has put in a place a rigorous plan of operation for routes, landings, take-offs and parking slots at 90-odd airports. The Centro de Gerenciamento da Navegacao Aerea has issued the World Cup Practical Reference Guide that outlines information such as definitions of "exclusion zones" that will secure the airspace against terrorism or accidents during matches, airports that will require slots, and recommended airports to use for flight planning purposes. Primary airports for the 2014 World Cup will have some closures on match days during the tournaments, including one hour before a match and for three to four hours afterwards. These restrictions will be in place for all aircraft, regardless of who is on board. The game is such. 

PHOTOGRAPH: GULFSTREAM

A PANORAMIC VIEW OF  
THE STATIC DISPLAY  
OF BIZ JETS



# STRONGEST SHOW

The business aviation sector is bouncing back in Europe and the 14th edition of EBACE in Geneva signals this trend

BY R. CHANDRAKANTH

PHOTOGRAPHS: EBACE SHOW MANAGEMENT

**THE 14TH ANNUAL EUROPEAN** Business Aviation Convention Exhibition (EBACE), held recently at Geneva's Palexpo conference centre and Geneva International Airport, "will be remembered as one of our strongest shows to date," said European Business Aviation Association (EBAA) CEO Fabio Gamba. EBACE is jointly hosted by the National Business Aviation Association (NBAA) and European Business Aviation Association (EBAA). In fact, all of the show metrics were up year-over-year: attendance rose seven per cent, to more than 13,200. At 320, the number of exhibitors was up eight per cent, exhibit space sold climbed four per cent and the static display area which hosted 55 aircraft, was sold out. "We are very pleased that all indicators were up

this year," noted NBAA President and CEO Ed Bolen, "and that EBACE continues to demonstrate its value as a premier venue for companies in the industry to give aviation decision-makers a first-hand look at their products and services."

Said Gamba, "We are delighted with the level of business done and with the excitement that characterised the event, not to mention all of the positive feedback we have received from exhibitors and attendees alike. Given the beautiful weather, the new single, contiguous exhibit floor layout and the enthusiasm among show participants, we had a great EBACE." The organisers announced that next year's EBACE will return to Palexpo and Geneva International Airport from May 19 to 21.





**INAUGURATION OF EBACE:** FROM RIGHT TO LEFT, NBAA PRESIDENT AND CEO ED BOLEN; ANDRÉ KUDELSKI, CHAIRMAN AND CEO, KUDELSKI GROUP; FRANK BRENNER, EUROCONTROL; ANDRÉ KUDELSKI, VICE CHAIRMAN OF GENEVA INTERNATIONAL AIRPORT; ROLAND WERNER, STATE SECRETARY OF TRANSPORT, SAXON STATE MINISTRY FOR ECONOMIC AFFAIRS, LABOUR AND TRANSPORT AND EBAA CEO FABIO GAMBA.

## KEY LAUNCHES

Enthused by market sentiments, original equipment manufacturers (OEMs) chose EBACE to launch their new products/projects. Swiss company Pilatus which had unveiled the PC-24 at last year's show, this year opened the show with booking 75 aircraft as the company plans for an official roll-out of the aircraft on August 1. And by the end of the show it had notched up another nine sales, taking the production slots through 2019.

## DASSAULT UNVEILS FALCON 8X

Dassault Aviation unveiled its top-of-the-range Falcon 8X, a lengthened and longer-range derivative of its Falcon 7X, as well as showing off a cabin of the eagerly awaited super-midsize Falcon 5X. The Falcon 8X will offer a range of 6,450 nm and will feature the longest cabin of any Falcon. Moreover, it will offer the same low operating economics and the remarkable operating flexibility for which all Falcons are known, Dassault announced.

"The Falcon 8X will be our new flagship and a great complement to our product line," announced Dassault Aviation Chairman and CEO, Eric Trappier. "It builds on Dassault expertise in aerodynamics, in precision design and manufacturing and in advanced digital flight controls. It embodies the best of Falcons that have come before with the most capability of any Falcon ever." "With two new aircraft, the 5X and 8X under development, Dassault will now be able to offer a family of six jets designed to meet the widest possible range of operator needs at the upper end of the business jet spectrum," added Trappier.

With eight passengers and three crew, the Falcon 8X will be capable of flying 6,450 nm non-stop at Mach 0.8. It will be powered by an improved version of the Pratt and Whitney Canada PW307 engine that equips the Falcon 7X. Combined with improvements to wing design, the new power plant will make the 8X up to 35 per cent more fuel efficient than any other aircraft in the ultra long-range segment, providing corresponding savings in operating costs.

The Falcon 8X will be equipped with a totally redesigned cockpit modelled after the Falcon 5X. It will feature a new generation of the EASy flight deck equipped with a head-up display that combines synthetic and enhanced vision and offer a dual HUD capability. First flight is expected early 2015 with certification in the middle of 2016 and initial deliveries before the end of 2016.

"The Falcon 8X will be the longest cabin of any Falcon. But, more importantly, it will feature the highest level of customisation of any large cabin business jet on the market," said Trappier. Like the Falcon 7X, the Falcon 8X will be capable of approaches up to six degrees, allowing it to serve challenging airports such as London City Airport; Aspen, Colorado; La Mole (Saint-Tropez), France and Saanen (Gstaad), Switzerland that are normally not accessible to most large cabin aircraft.

## BOMBARDIER'S GLOBAL 7000 MOCK-UP

Stealing the show too was Bombardier's mock-up of the ultra longrange Global 7000 fuselage. Bombardier claimed it to be the largest business jet mock-up ever made, with a length of 111 feet. Global 7000 is scheduled for entry into service in 2016.

The impressive full-size mock-up showcases the aircraft's unparalleled spaciousness, luxury and comfort. With its four distinct living spaces, including a private stateroom, the Global 7000 business jet will allow passengers to work, eat, sleep and relax in a comfortable environment. This aircraft also features the largest total window area, allowing for more natural light inside the cabin and state-of-the-art Bombardier Visionflight deck.





(TOP LEFT) BOMBARDIER UNVEILED A COCKPIT AND CABIN MOCK-UP FOR ITS LATEST GLOBAL 7000 BUSINESS JET; (TOP RIGHT) CESSNA'S STATIC DISPLAY; (RIGHT) EMBRAER JETS LEGACY 500 ON DISPLAY

"We are extremely proud to present the mock-up of the Global 7000 aircraft here at EBACE, an event that gathers the world's key players in business aviation. The new Global 7000 business jet's breakthrough design illustrates how Bombardier is well ahead of the curve when it comes to offering the ultimate level of comfort," said Eric Martel, President, Bombardier Business Aircraft. "This aircraft is the first business jet to offer a true four-zone cabin to satisfy the increasing travel needs of customers and will offer the most comfortable long-flight experience to passengers and crew," he added.

Launched in 2010 and set to enter into service in 2016 and 2017 respectively, the Global 7000 and Global 8000 business jets exemplify Bombardier's visionary thinking. They will have the ability to reach more destinations non-stop than ever before, delivering unprecedented levels of performance, flexibility and comfort.

#### BEECHCRAFT, HAWKER AND CESSNA UNDER ONE UMBRELLA

The strong brands of the Textron Aviation segment of Textron Inc—Beechcraft, Cessna and Hawker, got together for the first time publicly at EBACE with a display of nine aircraft. The companies' strength in the region is reflected in analysis of JetNet data that shows that in the past decade, Beechcraft, Cessna and Hawker have delivered more than 1,400 new business aircraft in Europe, Middle East and Africa.

"EBACE is the perfect venue for us to debut our strength as a unified company. Beechcraft, Cessna and Hawker products have done very well individually in the EMEA marketplaces and we have high expectations for our united efforts," said Kriya Shortt, Senior Vice President, Sales and Marketing. "Combined, our products make up the region's largest business aviation fleet and we offer the largest service centre network across the world."

The Citation M2 light jet and Citation Sovereign+ midsize jet, made their EBACE debuts after entering service in the late 2013. Both aircraft achieved Federal Aviation Administration (FAA) certification and began customer deliveries in December. Cessna has sold both models to customers in Europe and is currently working with the European Aviation Safety Agency (EASA) on certification. Textron also exhibited Cessna's Grand Caravan EX, Citation CJ4 and Citation XLS+ and Beechcraft's



Baron G58, King Air C90GTx, King Air 250 and Special Mission King Air 350ER.

#### GULFSTREAM SHOWCASES G650ER

Gulfstream lifted the lid on the G650ER, an extended-range version of the company's flagship G650 that will be available from early next year. With a range of 7,500 nm, the G650ER becomes the longest-legged business aircraft in the world.

The Gulfstream G650ER can fly 500 nautical miles further than the original Gulfstream G650, a total range of 6,400 nm at Mach 0.9 and 7,500 nm at Mach 0.85, which has shifted 65 units to date since Steve Wynn took delivery of the first G650 in December 2012. Reports indicate that the Gulfstream G650ER will cost \$66.5 million for a new aircraft or an additional \$2 million for existing order holders and customers already operating the G650 to upgrade.

#### EMBRAER'S PRODUCT ENHANCEMENTS

With due certification of its midsize Legacy 500 and mid-light Legacy 450, the Brazilian manufacturer Embraer presented enhancements to its product line. The Legacy 500, which appeared with a full interior for the first time at this year's show, is slated for deliveries this year while Legacy 450 is slated to enter service in 2015. "We are thrilled to return to EBACE with the Legacy 500, now complete with its new interior, which



(TOP LEFT) FALCON 8X BEING UNVEILED AT EBACE 2014; (TOP RIGHT) A VIEW OF AIRBUS GROUP'S DISPLAY; (LEFT) STATIC DISPLAY OF AN ARRAY OF AIRCRAFT FROM BEECHCRAFT

redefines the midsize category,” said Marco Tulio Pellegrini, President & CEO, Embraer Executive Jets.

Embraer highlighted upgrades to the entry-level and light-jet Phenom family, the smaller of which now comes standard with multi-function spoilers that act as speed brakes to increase the descent rate and as spoilers to decrease landing roll. The Phenom 100 is also now available with a choice of up to 11 new interior themes. Another upgrade replaces the fixed club seating in the cabin with three moving chairs while an optional refreshment centre is now offered in lieu of the standard wardrobe.

Deliveries have also begun of the Phenom 300 equipped with the touch-screen version of Garmin's Prodigy flight deck. In the large and super-midsize categories, Embraer presented new cabin upgrades for the Legacy 600/650 primarily centred on a redesigned galley with more storage space, restyled seating and new flooring featuring a layer of natural stone. The interior also includes Honeywell's Ovation Select digital cabin management system with surround sound, high-definition monitors and seat-mounted media docks to plug in iPods and iPhones. The Ovation is also available with an iPad that can be configured for specific aircraft to wirelessly control the cabin management system.

#### AIRBUS ELEGANCE

Airbus' ACJ-319 has the most capable cabin of any corporate jet and this was exhibited at EBACE, allowing visitors to see for

themselves how more people can fly in greater comfort, with more freedom of movement. The Airbus ACJ-319 on display operated by K5 Aviation, has seating for 19 passengers in a cabin with

several lounges, including one that converts to a bedroom with ensuite bathroom.

“We're in the business of giving wings to our customers' lifestyles, which the more capable cabins of the Airbus ACJ-320 Family are better at doing than any other business jet” declared Airbus Chief Operating Officer, Customers, John Leahy. “This frees customers to do more in the air, whether it's taking care of business, spending time with family and friends or representing their country,” he added.

Airbus has long offered fully customisable cabins in its corporate jets, and is now also offering a new version, the ACJ319 Elegance, which offers a modular approach that delivers simplicity, speed and savings, while preserving the element of choice. Airbus has sold over 170 corporate jets to date and these aircraft are flying on every continent, highlighting their versatility.

Airbus Helicopters exhibited the Hermès luxury version of its EC-135, and is soliciting new possibilities for customisation.

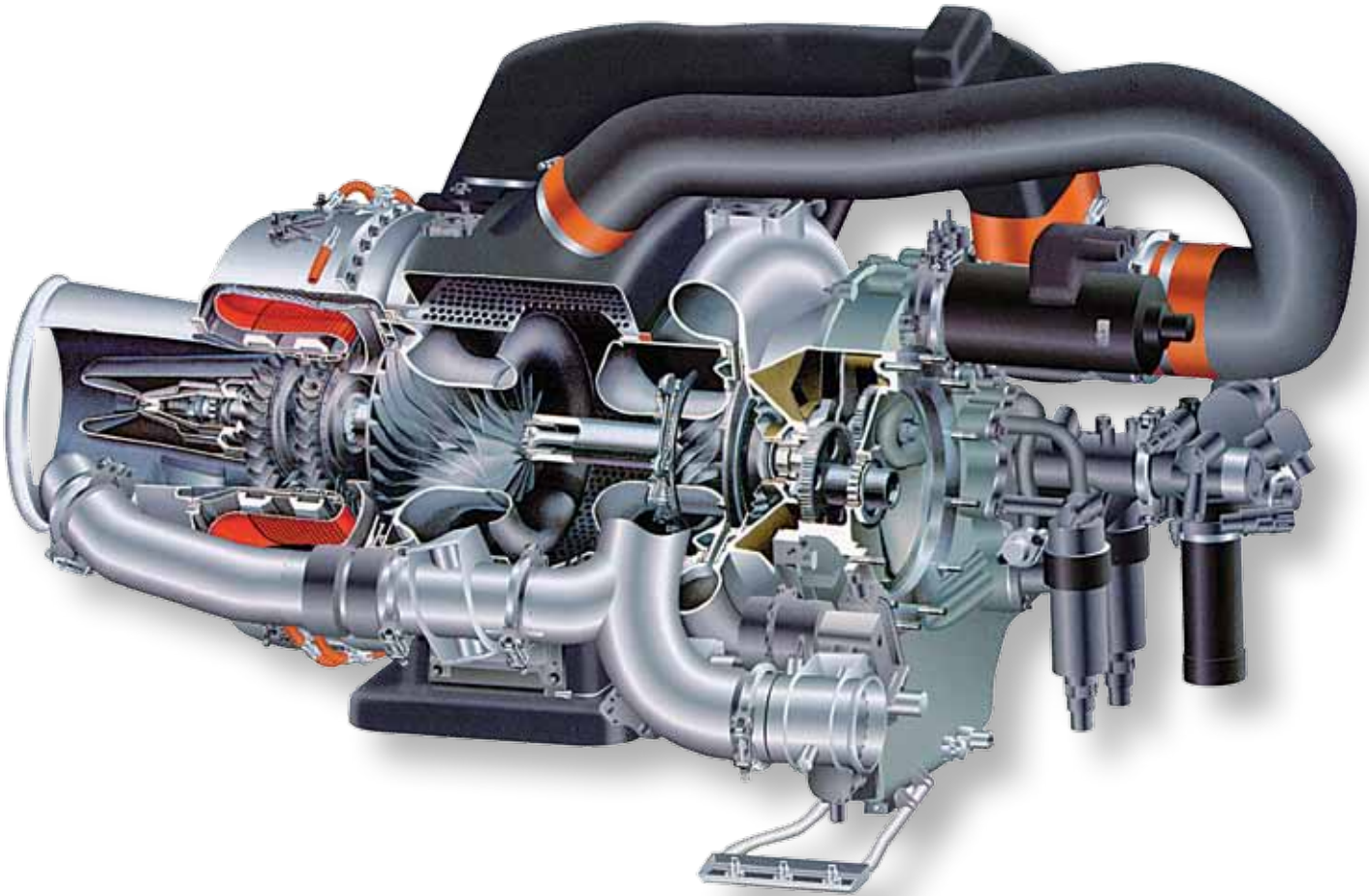
#### BOEING'S PANORAMIC WINDOW

Boeing Business Jet (BBJ), in cooperation with Fokker Services, launched the panoramic window concept for the BBJ MAX series. The panoramic window is a custom modification to the fuselage of the aircraft similar to a cargo door conversion, which, once completed, gives a continuous window pane with a total diameter of 54.5 inches. This modification is available for all BBJ MAX aircraft.

#### FINAL WORD

Besides airframers, several companies found EBACE eventful. Rockwell Collins unveiled two key cabin systems programmes at EBACE, including expansion of the capabilities of the Tailwind 550 Direct Broadcast Satellite TV system and introduction of a Venue HD (high-definition) retrofit for Bombardier Globals. The two successive business aviation events—ABACE in China and EBACE in Switzerland—have had positive impact on market sentiments in the recent past. **SP**





# HONEYWELL HELPS AIRBUS A350 XWB SOAR

Airbus-Honeywell partnership has established a legacy of superior and reliable products with innovative technologies that drive efficiency, improve safety and deliver a world-class flying experience for passengers

BY R. CHANDRAKANTH  
REPORTS FROM PHOENIX, ARIZONA

PHOTOGRAPHS: HONEYWELL





**JIM FUSARO**  
VICE PRESIDENT,  
HONEYWELL AEROSPACE



**DANIEL WENNINGER**  
SENIOR DIRECTOR, AIRBUS  
A350 XWB US PROGRAMME

**WITH AIR TRAFFIC EXPECTED** to double in the next 15 years, the demand for highly efficient, environment-friendly and low acquisition cost of aircraft has gone up considerably. The aircraft behemoth Airbus has lined up several families of aircraft to cater to this surge in demand and one of them is the A350 XWB (Extra Wide Body) aircraft. The new A350 family provides long-range capability with seating capacities from 270 to 350 passengers and offers optimal efficiency through the A350 XWB's commonality of systems. Till date, it has notched up orders of 81 aircraft from 39 countries and many more are expected to follow, according to Daniel Wenninger, Senior Director, Head of A350 XWB US Programme. The total opportunity in terms of value the company sees is to the tune of \$19 billion.

Flagging the highlights of the programme, Wenninger said that the A350 XWB has a 53 per cent carbon fibre fuselage, thus making the aircraft much lighter and increasing efficiency by 25 per cent over its competitive product. The engines are the latest generation, Trent XWB and the cockpit has large display systems. Over 70 per cent of the flight test on the aircraft has been completed and the aircraft is all set to soar.

As regards the contribution of Honeywell to the programme, Jim Fusaro, Vice President, Marketing & Product Management, Mechanical Sub Systems, Honeywell Aerospace, pointed out that it comprised a comprehensive package of mechanical and avionics products which included the flight management system (FMS), ventilation system, bleed air system, air-conditioning, Airbus aircraft environment surveillance system (AESS), cabin pressure control system and supplemental cooling system and the HGT 1700 auxiliary power unit (APU).

On the programme update, Wenninger mentioned that MSN1 to 5 have flown about 1,700 flight hours and that four aircraft are currently undergoing test flights. MSN5 is on track for type certification in the third quarter. The launch customer is Qatar Airways. As there is considerable interest in the programme by operators, Airbus has plans to deliver three aircraft this year and step up production to 10 per month by 2017.

#### ENHANCING AIRCRAFT EFFICIENCY

A multitude of Honeywell products are contributing to the new Airbus A350 XWB

programme. As a Tier-1 Airbus designee, Honeywell provides a more comprehensive package of mechanical and avionics (electronics) products to the A350 XWB than any other current Airbus platform. Honeywell's integrated mechanical components also help make the aircraft more efficient, reliable and comfortable than ever before. The integration of critical systems help reduce the overall weight of the aircraft and the advanced HGT1700 APU effects a ten per cent reduction in specific APU fuel use and an equivalent reduction in carbon dioxide emissions.

Honeywell's avionics for the A350 XWB are built upon proven Airbus systems, providing the most advanced FMS and AESS available for a greater level of overall cockpit integration for pilots. Honeywell also provides passengers and crew with enhanced air management systems for a more refreshed, long-haul flying experience.

#### AIRSIB: A MARKET DIFFERENTIATOR

The A350 XWB Air System Integration Bench (AirSIB) is an integrated test bed for the A350 XWB that enables Honeywell to observe and confirm interaction between control systems and physical characteristics of mechanical hardware. By using AirSIB for the A350 XWB, Honeywell was able to test the APU and all of its air generation and conditioning systems on the platform, making sure all major mechanical and electrical systems work flawlessly together. Last year, for the first time all the major mechanical work packages for an air management system were integrated into a single lab and run together. AirSIB greatly improves system maturity compared to past programmes, where these mechanical systems would only have come together on the first aircraft.

#### HONEYWELL PRODUCTS ON THE A350 XWB

**Mechanical systems.** The HGT1700 auxiliary power unit and Starter-Generator are integrated systems that supply pneumatic and electric power for the aircraft while on the ground or in flight. The HGT1700 APU is derived from Honeywell's 331 series APU, is optimised for the A350 XWB and incorporates industry-leading technological advancements to reduce weight, maximise performance

**HONEYWELL'S INTEGRATED  
MECHANICAL COMPONENTS  
ALSO HELP MAKE THE  
AIRCRAFT MORE EFFICIENT,  
RELIABLE AND COMFORTABLE  
THAN EVER BEFORE.**

and provide safe, efficient and low-cost operations. The air-conditioning system, bleed air system, cabin pressure control system, supplemental cooling system and ventilation system are all part of the integrated mechanical system. Through a holistic approach, Honeywell is able to provide a more comfortable experience for passengers by minimising changes in the cabin environment and reducing the workload for the crew.

**Air-conditioning system.** Honeywell's industry-leading air conditioning system technologies deliver conditioned engine bleed air for passenger comfort, cabin pressurisation, equipment cooling and ventilation for various aircraft zones using high-reliability components and integrated solutions to maximise passenger comfort and safety while minimising operator costs.

**Starter-generator system.** The innovative AC APU starter-generator system provides APU electric start and electrical power generation without the need for a dedicated starter motor and saves substantial weight through the elimination of a dedicated battery and associated feeder cable.

**Air management system.** Designed especially for the A350 XWB, Honeywell's air management system builds on its over 50 years of providing integrated aircraft systems that improve passenger comfort and safety.

**Avionics systems.** The flight management system introduces the latest advances, functions and features, while achieving the goal to create a common cockpit for Airbus wide-body aircraft, enabling pilots to easily transition between aircraft platforms. Honeywell's latest FMS technology reduces workload for flight crew and enables improved flight planning. The AESS has also been inducted into the A350 aircraft among other Airbus aircraft. This system integrates the traffic collision avoidance system, Mode S transponders, weather radar and the enhanced ground proximity warning system modules into one system, reducing as many as eight avionics boxes down to two. Like the FMS, the latest innovations and features are introduced such as ADS-B IN and airborne traffic situational awareness. The AESS provides critical information to the pilot to enhance safety and efficiency, while increasing cockpit efficiency. The RDR-4000 radar has also been selected for the Airbus A380 and for the US C-17 and Japanese C-X military transport aircraft. It uses pulse compression to provide simultaneous long-range and high-resolution performance and provides 3D volumetric scanning, using ground clutter extraction of the weather and terrain ahead of the aircraft. Honeywell was selected in March 2008 to supply the FMS and AESS. John Bolton, President, Air Transport and Regional, Honeywell Aerospace, has said, "This new and innovative aircraft applies the broad range of avionics and mechanical products and services we offer in a highly integrated manner. Our joint effort offers Airbus customers, pilots and passengers a more efficient, safe and comfortable experience than ever before. The maiden flight is a great milestone we are celebrating with



HONEYWELL  
HTF7000 ENGINE

Airbus today and we look forward to extending our relationship for a very long time."

#### KEY BENEFITS

- Solutions designed to reduce operating costs and improve reliability.
- Long-term Airbus design partner.
- Comprehensive range of innovative A350 XWB products and integrated systems.
- Critical solutions for aircraft efficiency.
- Advanced mechanical system expertise.
- Global repair service, logistics and customer support network.

Airbus executives visited Honeywell Aerospace in Phoenix on May 21 to thank employees for their contribution to Airbus programmes over the last 35 years, including the A320, A380 and the new A350 XWB.

Wenninger expressed the company's gratitude for Honeywell's past and future service. "Thank you for a long-lasting partnership and for what each of you has done to support our products. We are especially grateful for the work you have done on the A350 XWB in getting it ready for entrance into service. For example, the HGT-1700 APU is doing outstanding in the test flights and we really appreciate the good work you have done."

"This town hall meeting provides us the opportunity to express gratitude not only about how well we have done together in the past but how well we are going to do in the future thanks to our partnership," added Wenninger. SP

**THE RDR-4000 RADAR HAS ALSO BEEN SELECTED FOR THE AIRBUS A380 AND FOR THE US C-17 AND THE JAPANESE C-X MILITARY TRANSPORT AIRCRAFT.**



Honeywell APU solutions employ leading-edge technologies and integrated system architectures to deliver higher performance and enhanced reliability with a reduced cost of ownership

# PERFECT BACK-UP

BY R. CHANDRAKANTH  
REPORTS FROM PHOENIX, ARIZONA

ON JANUARY 15, 2009, US Airways flight 1549, an Airbus A320-200 that took off from LaGuardia Airport in New York City for Seattle-Tacoma International Airport in Washington, flew through a flock of Canada Geese during its initial climb about three minutes into the flight. As a result of bird ingestion, the aircraft lost power on both the engines and with no possibility of making it to a runway, the pilot managed to ditch the aircraft in the Hudson River off midtown Manhattan with no loss of life. All 155 occupants were safely evacuated from the aircraft that was sinking slowly. The incident is known as the 'Miracle on the Hudson'.

Narrating this to the visiting international media at Phoenix, Arizona, the Vice President, Propulsion Systems, Honeywell Aerospace, Ron Rich said the Honeywell auxiliary power unit (APU) on the US Airways flight 1549 had come in handy in the 'miracle'. The APU operated in a moment's notice.

As the captain of US Airways Flight 1549 prepared to ditch his disabled jet in the Hudson River, he had some help from some last-resort equipment that apparently kept the plane's electrical and hydraulic systems working even as both engines

had nearly shut down. The generators that are driven by the aircraft's engines, routinely provide electrical power, were now not available, but the plane's APU made by Honeywell International Inc, was operating during the descent and gave the pilot full use of the jet's flight control system, according to a spokesman for the National Transportation Safety Board.

## RANGE OF APPLICATIONS

For more than 50 years, APUs manufactured by Honeywell have delivered highly reliable electrical and pneumatic power for a wide range of business, regional and commercial aircraft applications. From main engine starting and cabin cooling to electrical power generation, Honeywell APU solutions employ leading-edge technologies and integrated system architectures to deliver higher performance and enhanced reliability with a reduced cost of ownership.

Rich mentioned that from the first flight in 1950 of the Honeywell APU, the company has since produced over 90,000 of which over 36,000 are in operation. The APUs have about 150 appli-



cations and the company has produced 20 models in seven families. From 100 HP to 1700 SHP (on the Airbus A350 XWB), Honeywell has the range. The 1700 SHP APU is Honeywell's largest APU which is being certified and almost ready for entry into service. It is developing APUs for Bombardier C Series, Comac 919 and Irkut MC-21 aircraft. It has a strong presence in the single/narrow aisle market.

#### APU FOR NEW AIRCRAFT

Jim Walker, Plant Director, who took the media around the APU assembly unit, mentioned that the team was working on APUs for Bombardier's Challenger 300; Gulfstream G280 and later this year it would commence work on Embraer's Legacy 650. A flight begins and ends with the APU. From the moment a passenger walks into an air-conditioned plane on the tarmac, to the time when the plane parks at the gate, the APU provides electrical air power to the aircraft for starting the main engines, enabling the air-conditioning system, energising lighting and flight equipment and more. The APU allows passengers to sit in comfort inside the aircraft while awaiting take-off.

#### MARKET DOMINANCE

In the business aviation sector, there are about 9300 APUs and Honeywell accounts for almost 9,000 of these, indicating its dominance. In the defence and space segment, Honeywell has 9,000 APUs of the total of 18,000 in use. The stranglehold it has over the APU market is because of the huge benefits it offers – cabin comfort when the aircraft is on ground by providing cooling, cabin temperature, aircraft electrical loads and main engine starting. In flight, the APU stands ready to assist in case there is loss of power. It is environment-friendly and helps burn ten per cent less fuel. It produces three per cent less gaseous emissions.

Honeywell's innovative event and usage-based aftermarket programmes can be customised to the customer's aircraft needs and business requirements to improve APU reliability, while decreasing overall maintenance expenses. Additionally, the APUs, when installed fleet wide, are proven to lower operating costs through unit commonality, reduced mechanic training and decreased inventory requirements.

#### 131-9 SERIES

For main engine starting power, pneumatic power and electrical power generation, the highly reliable 131-9 Series APU delivers robust performance, increased engine life and easy maintainability for lower costs of operation and ownership. Incorporating a two-stage axial turbine design, the patented effusion combustor and highly efficient 8:1 pressure ratio engine compressor, the 131-9 is designed to exceed narrow-body operator requirements. The 131-9B improves engine life by acting as a single starter/generator, using electrical power to start the APU and then transitioning to a generator once the APU is running. With quieter operation from noise reduction features integrated into the inlet, compressor and hot section design, the 131-9 provides a cost-effective APU solution for single-aisle Airbus and Boeing aircraft.

#### RE-220 SERIES

For aircraft with lower electrical and engine



**RON RICH,**  
VICE PRESIDENT, PROPULSION  
SYSTEMS, HONEYWELL AEROSPACE

starting power requirements, the RE-220 Series APU is a highly efficient, reliable and cost-effective source of pressurised bleed air for environmental control systems and emergency electrical power. Demonstrating Honeywell's advances in aircraft system integration, the RE-220 is the first general aviation APU to communicate with the aircraft's maintenance data acquisition unit (MDAU) to allow pilots and aircraft mechanics to monitor and troubleshoot APU performance from the flight deck.

#### SMALL 36 SERIES

Providing advanced performance with lower total cost of ownership for business jet operators, the 36 Series APU uses a high efficiency compressor to provide greater

on-wing reliability, improved main engine starting and enhanced high altitude electrical power capacity. Utilising a ported shroud compressor design, the 36-150 enables both higher pneumatic performance and shaft loads while reducing ground noise acoustics up to ten per cent. A variety of 36 Series APU models are available in a wide range of bleed air/shaft horsepower and size combinations to optimise the aircraft installation.

#### 331 SERIES

The 331 Series APU provides high levels of reliability with economical maintenance, resulting in lower total costs of ownership for dual-aisle commercial aircraft. As the first electronically controlled APU in the industry, the 331 Series in-flight APU operation allows two-engine commercial aircraft to fly extended ranges, as the APU can provide emergency electrical power in the unlikely event of a main engine Integrated Drive Generator (IDG) failure. Design features include a three-stage axial turbine with a reverse-flow annular combustor to increase efficiency, an eductor cooling system that improves reliability, and a compressor design optimised to be highly resistant to foreign-object damage (FOD).

The key benefits of Honeywell APU's include reduced maintenance requirements for a decrease in direct operating costs, exceptional main engine start performance reduces wear and tear for main engine and components, superior fuel burn rates for lower total costs of ownership, more robust APU output for enhanced power generation, ongoing investments in reliability improvements based on direct input from OEMs, airlines as well as aircraft operators and dedicated support team with worldwide maintenance services and asset availability.

#### THE FUTURE

Honeywell is looking to the future to advance the 131-9 APU and continue to provide the best-in-class operational efficiency to customers. This next-generation APU will use new technologies to provide operators with up to ten per cent reduction in fuel burn, 25 per cent reduction in NOx emissions and more than 30 per cent increase in available electrical power. In the future, Honeywell's APUs will power more than just internal systems. For the electric green taxiing system (EGTS), the APU will be tasked with powering the electric motors in the main landing gear, allowing an aircraft to push back autonomously and then taxi between the gate and the runway without even starting its main engines. SP

**THE STRANGLEHOLD  
HONEYWELL HAS OVER  
THE APU MARKET IS  
BECAUSE OF THE HUGE  
BENEFITS IT OFFERS.**



(ABOVE) AIR CHIEF MARSHAL ARUP RAHA, CHIEF OF THE AIR STAFF, IAF, CONGRATULATED BY THE FRENCH AIR FORCE TEAM AFTER HE FLEW THE RAFALE

(RIGHT) THE IAF SUKHOI TOO PLAYED AN IMPORTANT ROLE IN EXERCISE GARUDA V



# STRATEGIC PARTNERSHIP

Garuda V is an air exercise that signifies forward movement in the attainment of a new level in the strategic partnership agreement between India and France forged in 1998

BY AIR MARSHAL (RETD) B.K. PANDEY

**THE 400-YEAR-OLD RELATIONSHIP BETWEEN** India and France and the over six decades of partnership between the Indian and French military aviation, witnessed the flagging of another significant milestone with the successful completion of the Indo-French air exercise “Garuda” held at Indian Air Force (IAF) Station in Jodhpur from June 2 to 13 this year.

Conducted after a recess of every two to three years, this particular series of exercises between the Air Forces of France and India codenamed as “Exercise Garuda”, has been held alternately in India and France at different locations. The most recent exercise held early June 2014, was the fifth edition in the series.

#### OBJECTIVES OF EXERCISE GARUDA

The aims and objectives of the Garuda series of Indo-French exercises is to provide mutual benefit from the interaction, to develop a better understanding of each other's operational capabilities and to imbibe professional skills available with both the participating air forces as well as to enhance interoperability and cooperation between them. Such a joint exercise enables both the air forces to validate their capabilities and help them in appreciating the intricacies of planning and conduct of combat missions through simulation of an operational environment. On a higher plane, the aim of such an exercise is to enhance defence cooperation between India and France

#### PARTICIPATING FORCES

For Exercise Garuda V, the French Air Force had deployed at IAF Station in Jodhpur, four of the frontline omni-role combat aircraft—the Rafale from their No 3/30 Fighter Squadron based at Lorraine and one C-135 FR flight refuelling aircraft from the 2/91 Air Refuelling Group located at Bretagne. A total

**INDUCTION OF THE FLEET OF 126 RAFALE COMBAT AIRCRAFT WILL PROVIDE THE MUCH NEEDED RELIEF TO THE IAF AND REVERSE THE RAPID EROSION IN ITS OPERATIONAL CAPABILITY**

of 94 French Air Force personnel were also deployed including nine Rafale aircrew and 27 technical hands from the Rafale fleet. Rafale aircraft of the French Air Force have had an excellent track record of their role and performance combat operations in Afghanistan, Libya and Mali in the recent years.

Participation by the IAF involved assets of the two major operational commands namely the South Western Air Command based at Gandhi Nagar and the Central Air Command located at Bamrauli, Allahabad. The participating assets consisted of aircraft from its frontline fighter fleet that included four each of Sukhoi-30MKI, MiG-27 UPG and MiG-21Bison. In addition, one of each type of the latest force multipliers that have been inducted into the IAF such as the Ilyushin Il-78 flight refuelling aircraft and the Ilyushin Il-76 Airborne Early Warning and Control System (AWACS) aircraft also participated.

#### CONDUCT OF THE EXERCISE

General Denis Mercier, Chief of the French Air Force accompanied by Francois Richier Ambassador of France in Delhi and Group Captain Benedict Smith the French Defence Attaché from France in the French Embassy at Delhi, arrived at Jodhpur on June 2, 2014, to participate in the fifth edition of the Indo-French air exercise Garuda V. Also arrived on the scene to grace the occasion was Air Chief Marshal Arup Raha, Chief of the Air Staff (CAS), IAF. To kick off the exercise, General Denis Mercier, the French Air Force Chief, flew in an IAF Su-30MKI on a simulated combat mission and in turn, Air Chief Marshal Arup Raha spearheaded a similar mission flying a French Rafale. The two air force Chiefs interacted with the pilots and technicians of both the air forces. This indeed was an inspiring demonstration of the spirit of teamwork by

## HISTORY OF EXERCISE GARUDA

#### February 2003.

Exercise Garuda I, the first exercise in the series was held at IAF Station in Gwalior. This was the first exercise between the IAF and a foreign air force involving combat aircraft. The exercise was witnessed by the French Chief of Staff.

#### June 2005.

Exercise Garuda II held at the French Air Force Base, Istres. This was the first exercise involving the IAF that was held in Europe.

#### February 2007.

Exercise Garuda III was held at the IAF airbase at Kalaikunda in Eastern India.

#### June 2010.

Exercise Garuda IV conducted at Istres Air Force Base, was the first exercise in which cross refuelling on each other's tanker aircraft was practised. This exercise also included the Republic of Singapore Air Force making it a trilateral effort.

#### June 2014.

Exercise Garuda V conducted at the IAF Station in Jodhpur Air Force Base from June 2-13. Four of the frontline omni-role combat aircraft and Rafale take part in this exercise.

2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014







(FROM TOP LEFT, CLOCKWISE) AIR CHIEF MARSHAL ARUP RAHA, CHIEF OF THE AIR STAFF, WITH GENERAL DENIS MERCIER, THE FRENCH AIR FORCE CHIEF; INDIAN AND FRENCH AIR FORCE PILOTS AT A MISSION BRIEFING; FRENCH AIR FORCE'S RAFALE SOARING IN THE SKY DURING THE EXERCISE; FRENCH AIR FORCE PILOT BEING RECEIVED BY AN IAF OFFICIAL AT JODHPUR FOR EXERCISE GARUDA V.

the leadership of both the air forces and was undoubtedly the main attraction of the day.

During this fortnight-long exercise, both the air forces undertook missions based on their operational philosophy to cope with a wide range of challenging scenarios appropriately simulated. The missions included the complete range of air defence and strike, duly supported by in-flight refuelling of aircraft during sorties undertaken by them. During the exercise, the participants flew multiple missions, including close combat engagement of large forces and practised protection of high value aerial assets at the strategic airbase located near the Indo-Pak border.

It is noteworthy that this was the first time that the Rafale combat aircraft that has been selected as the preferred platform for the medium multi-role combat aircraft (MMRCA) contract for the IAF, participated in an air exercise in India. To that extent, the timing of the exercise was significant. Of course the Indian public has had the occasion earlier to witness display by the Rafale at the Aero India international air show held at IAF

Station in Yelahanka on the outskirts of Bengaluru. With a new and dynamic administration at the helm of affairs of the nation, the IAF is optimistic about the speedy finalisation of the tender for MMRCA that has been inordinately delayed and award of contract. Induction of the fleet of 126 Rafale combat aircraft will not only provide the much needed relief to the IAF and reverse the rapid erosion in its operational capability, but will also propel the two nations to new levels of cooperation in the regimes of defence, technology and industrial activity.

While Garuda V is an air exercise that was conducted in a professional and friendly spirit contributing significantly to the camaraderie between the units involved, it will strengthen the bond between the air forces of France and India. But equally importantly, successful completion of the exercise signifies forward movement in the attainment of a new level in the strategic partnership agreement between the two nations forged in 1998. The strategic partnership is founded on cooperation in the regime of defence, nuclear energy, counter-terrorism and space technology. **SP**



POWER HORSE: C295 MPA ARMED WITH MARTE MISSILE

# GAME CHANGER

Commanders at sea look up to the maritime patrol aircraft as a powerful instrument of command, control, communication and intelligence

BY REAR ADMIRAL (RETD) SUSHIL RAMSAY

**THE STRATEGIC POTENTIAL AND** tactical utility of an airborne platform to provide real time tactical picture at sea had been realised long ago by the maritime strategists. The two World Wars witnessed many revolutionary concepts employed in the maritime domain to extract full potential of reconnaissance and surveillance at sea over a sustained period. During World War II through ingenious innovations, commercial airliners and long-range bombers were modified as maritime patrol aircraft. Great Britain was the first to introduce long-range aircraft to patrol the Mid-Atlantic Gap that existed and posed severe vulnerability to the convoy movement through the region. The American bomber Consolidated B-24, Liberator was employed for patrolling the areas between Iceland and Greenland as well as to attack the German submarines.

Post-World War II, there was renewed effort to identify platforms that were less expensive and offered greater flexibility in modifying the aircraft for patrol and reconnaissance missions. The commercial airliners designed for civil aviation role fitted the bill extremely well as these had longer operating ranges and endurance as compared to most wartime bombers. The 1950s vintage jet-powered bombers did not have the endurance needed for long duration, over-water flights. More importantly, these did not have the low loitering speed necessary for anti-submarine operations.

## DEVELOPMENT OF MARITIME RECONNAISSANCE AND PATROL AIRCRAFT

Over the years, importance of roles and missions which can be assigned to maritime patrol aircraft began to diversify. Whilst it retained its original classical role of deployment for anti-submarine warfare missions, many other missions were identified and added to make the platform more versatile to operate as the probing 'Eye in the Sky'. Commanders at sea began to look up to the maritime patrol aircraft as a powerful instrument of command, control, communication and intelligence (C3I). Operations planners ashore began to rely on the platform as real time data link provider for effective deployment of the fleet in an evolving tactical situation.

While the range and endurance of the aircraft remained the static tenet, its mission profiles varied depending upon threat perceptions and security concerns of a nation. This led to classification of the maritime reconnaissance and patrol aircraft into two broad categories of long-range and medium-range platforms. The development of maritime reconnaissance and patrol aircraft in these two broad categories has further witnessed multiplicity of missions added to its primary roles. Nations with long coastlines and widely dispersed offshore assets have begun to rely on this aviation asset as a cost-effective


**SMALL IS BIG:** BEECHCRAFT KING AIR 350ER

tive security solution. Consequent upon research and development efforts spanning over several decades, the maritime patrol and reconnaissance aircraft have undergone comprehensive and holistic changes in its roles and mission profiles. Some of the leading aircraft operating today are profiled in the succeeding paragraphs.

An asset to any naval force on account of its multi-role capabilities, the P-8A Poseidon long-range multi-mission maritime aircraft was developed by Boeing for the US Navy. The aircraft is capable of performing maritime patrol, anti-submarine and anti-surface warfare, as well as intelligence, surveillance and reconnaissance (ISR) missions. It is based on Boeing's Next-Generation 737-800. The Indian Navy also operates a P-8A re-designated as P-8I. The P-8A made its first flight in April 2009. It is equipped with Northrop Grumman infrared countermeasures and electronic support measures, Raytheon AN/APY-10 radar and MK 54 light weight torpedo, GE Aviation flight management system and air-to-surface and anti-ship missiles. The aircraft flies at a speed of 789 kmph. Its power plant consists of two CFM56-7B engines, each developing 27,000 lb of thrust. Additional fuel tanks give the aircraft a range of 2,222 km with mission endurance of four hours on station.

The P-3 Orion is a long-range maritime patrol aircraft (MPA) with multi-mission capabilities. Its 16-hour fly-time and high ferry range of 8,944 km makes it the top MPA in the world. The aircraft was developed by Lockheed Martin principally for the US Navy. The aircraft can undertake a variety of missions such as maritime or over-land patrol, anti-submarine warfare, anti-piracy, anti-terrorism, drug interdiction and prevention of illegal immigration. The aircraft can be equipped with infrared and electro-optical (EO) sensors, as well as special imaging radar to detect objects at long ranges. Its large internal weapons bay and ten external hard-points can house a range of weapons. Four Allison T56-A-14 engines provide the P-3 Orion a long-range cruise speed of 350 kt at 25,000 ft.

**THE C-295 MPA IS A  
VERSATILE MARITIME  
PATROL AIRCRAFT  
DEVELOPED BY EADS CASA,  
NOW AIRBUS MILITARY.**

The CN-235 MPA is a multi-role maritime patrol aircraft deployed in maritime surveillance and homeland security missions. It also serves as basis for the HC-144A Ocean Sentry surveillance aircraft used by the US Coast Guard. The CN-235MPA incorporates a fully integrated tactical system (FITS) which can be integrated with variety of mission sensors for conducting complex surveillance missions. The aircraft features six hard-points to carry anti-ship missiles or torpedoes.

Alenia Aermacchi developed the maritime patrol aircraft ATR-42 MP Surveyor based on the ATR-42 short-haul regional airliner. The aircraft has a range of 3,741 km and can conduct non-stop patrols for up to 11 hours. It integrates advanced tactical observation system (ATOS) mission management system. The state-of-the-art mission system, along with onboard sensors, enables the aircraft to undertake a variety of missions such as identification and tracking of vessels, maritime and coastal surveillance, search and rescue (SAR) and pollution detection missions.

The Saab 2000 MPA is a multi-mission maritime surveillance aircraft capable of conducting ISR, maritime surveillance and reconnaissance (MSAR), maritime border security and anti-surface warfare missions. High dash speed and long endurance capabilities make the Saab 2000 MPA an ideal maritime patrol aircraft. The Saab 2000 MPA comes with an advanced sensor and C4I package consisting of 360° rotating maritime surveillance radar, multi-mode electro-optical sensor, automatic identification system (AIS), identify friend or foe (IFF), electronic support measures (ESM), self-protection system (SPS), SATCOM and data link.

The C-295 MPA is a versatile maritime patrol aircraft developed by EADS CASA, now Airbus Military. The aircraft can be deployed in maritime patrol, EEZ surveillance, SAR and anti-submarine and anti-surface warfare missions. Onboard fully integrated tactical system integrates the C-295 MPA aircraft navigation and communications systems, radar, EO/IR turret, acoustic system, magnetic anomaly detector (MAD), AIS, IFF interrogator, ESM/electronic intelligence,





FRENCH CONNECTION: FALCON 900 MPA'S COMPUTER IMAGE

weapon system and a sea pollution detection system. The under-wing stations of C-295 MPA can carry anti-ship missiles and torpedoes for striking surface and sub-surface targets. The aircraft can patrol a range of 1,800 nm (3,333 km) and depending on the configuration, can remain airborne for more than eight hours.

The ATR-72 Maritime Patrol (MP) aircraft, based on the ATR-72-600 platform, was developed by Alenia Aermacchi. The aircraft is primarily deployed in surveillance and reconnaissance, maritime patrol and SAR missions. The ATR-72 MP can operate in extreme temperatures, altitudes and varied environmental conditions. It is equipped with Selex Galileo ATOS Mission System, which is interfaced with onboard sensors and equipment to perform electronic surveillance, optical reconnaissance, Vessel identification and pollution detection. The aircraft is powered by two Pratt & Whitney Canada PW127M turboprops. Each engine driving a six-bladed, variable-pitch propeller provides a maximum cruise speed of 248 kt and an endurance of ten hours.

EMB-145 MP is a new-generation multirole aircraft produced by Embraer to meet the challenging requirements of maritime patrol and anti-submarine warfare. Derived from ERJ-145 platform, the aircraft can be configured for maritime patrol and anti-surface and anti-submarine warfare missions. Its underwing hard-points can carry conventional and smart weapons. The aircraft is powered by two AE3007 turbofan engines, each generating a maximum thrust of 7,420 lb. The maximum speed is about Mach 0.78 and range is about 3,020 km.

The Falcon 900 MPA is a derivative of the Falcon 900 DX business jet. The Falcon 900 MPA can be employed for a wide variety of missions including anti-submarine and anti-surface warfare, ISR, EEZ surveillance, surveillance of sea lanes of communication (SLOC), SAR, coastal security and environmental protection missions. The advanced mission suite integrates 360° rotating maritime surveillance radar, retractable forward looking infrared system (FLIR), ESM suite, acoustic system with sonobuoys launcher, self-protection system and a complete communications suite. The power-plant of the Falcon 900 MPA includes three Honeywell TFE-731-60 engines equipped with

digital electronic engine computer (DEEC). The aircraft has a cruise speed of Mach 0.85 and range of 1,200 km.

#### KEY SPECIAL MISSION SOLUTIONS

Beechcraft's King Air 350 is a special mission version surveillance aircraft fitted with cameras. Its maritime patrol version is capable of carrying up to 1,300 kg mission equipment and is fitted with air and sea search radar and a forward-looking infrared. Raytheon has developed a new extended-range special mission variant, the King Air 350ER. The 350ER has additional nacelle fuel tanks, heavy-weight landing gear and a maximum take-off weight increased to 7,480 kg. This gives the aircraft an extended range of 4,260 km (2,300 nm) and eight-hour endurance.

The King Air 350ER is a versatile platform designed for special missions such as intelligence gathering, surveillance, reconnaissance (ISR) and transport. The special mission aircraft are fitted with the L3 Wescam MX-15 electro-optic/infrared system, a General Atomics Lynx synthetic aperture radar, inverse synthetic aperture radar (SAR/ISAR), AN/AAR-47 missile warning system and AN/ALE-47 countermeasures dispensing system. Selex has delivered and integrated its Airborne Tactical Observation and Surveillance system onto Hawker Beechcraft special mission Extended Range, King Air 350 maritime patrol aircraft. Equipped with a retractable electro-optical system and ventral radome, the aircraft was integrated with an ATOS system that consists of electro-optics, a laser illuminator and the T200 Gabbiano radar to provide 360° coverage. Beechcraft SKA 350ER aircraft also features high-density seating to support military transport missions and two medical sleds for air ambulance missions.

Reportedly, Beechcraft is planning to integrate anti-submarine warfare (ASW) capability to the long list of capabilities offered by its King Air 350ER in the special missions market. Integration of ASW-lite concept will equip King Air 350ER a capability of combating the increasing numbers of mini-submarines used by drug smugglers and the military. The addition of ASW capabilities would add to already strong levels of interest for the King Air in the maritime role. Expectedly, a move into the bottom end of the ASW sector could provide Beechcraft with further opportunities to build a Special Missions aircraft. SP

**AMONGST AVIATION PIONEERS, THE** Stinsons are surely one of the most remarkable families ever. All four children, two girls and two boys, made a mark in flying. And of them Katherine Stinson was the most famous. In the seven years after she became only the fourth woman in the United States to fly solo, she was also the first to solo at night, the first pilot of either gender to skywrite with flares, the first woman to perform a loop and the first woman to be authorised for US airmail delivery. She also broke some long distance records, taught flying and helped publicise aviation across the globe.

Katherine was born in Fort Payne, Alabama, on February 14, 1891. While she was still a child, the Wright brothers made their momentous first powered flight. Katherine flew in a balloon in 1911 and this sparked an abiding interest in aviation. However, her aim was to get the best music training and become a piano teacher. It required a trip to Europe, something her parents couldn't afford. Then Katherine heard that stunt pilots could earn the princely sum of \$1,000 a day and decided to adopt this route to finance her voyage to Europe. The problem was that she didn't know how to fly.

After approaching many flight instructors and being turned down, mainly because she was female, she caught up with aviation pioneer Max Lillie of Chicago. Lillie took one look at the diminutive and pretty Katherine and refused. But she persisted and he grudgingly agreed to take her up for a joy ride. Soon after getting airborne he realised that the calm and self-possessed young woman was a natural flyer. She needed just four hours of instruction to fly solo in Lillie's Wright Model B, an early pusher biplane produced by the Wright brothers. She gained her pilot's licence on July 24, 1912. And that the family piano had to be sold to pay for flying lessons seemed a sign that she should forget her music career and concentrate full-time on aviation.

Max Lillie now began to teach Katherine Stinson enthusiastically. Although women were not considered "scientific" enough even to drive a car, Katherine soon learned stunt flying and began touring the country as a barnstormer, amazing the crowds with her skill on

the Wright B. Most people thought she was just about 16 years old, so they named her "The Flying Schoolgirl". On July 18, 1915, she became the first woman in the world to fly a loop, a feat she repeated over 500 times without mishap. In another spectacular achievement, this time at night, she attached magnesium flares to the wingtips of her aircraft and traced a few letters in the sky. She also looped, flew inverted,



**KATHERINE STINSON  
(1891–1977)**

Katherine soon learned stunt flying and began touring the country as a barnstormer, amazing the crowds with her skill on the Wright B. Most people thought she was just about 16 years old, so they named her "The Flying Schoolgirl".

and zipped just above the ground with the lighted flares clearly visible to the enthralled crowd.

Katherine's excellent safety record was mainly a result of her stress on aircraft maintenance. She was a skilled mechanic and made it a habit to meticulously check each part of her plane before every flight. Sadly enough, her instructor was killed in an air crash due

to a technical problem. She always felt the accident could have been averted by thorough pre-flight checks.

Following Katherine's successes in aviation, her family was also drawn to flying. First her younger sister Marjorie became the ninth American woman to obtain a pilot's licence and the youngest at age 18. Then younger brothers

Eddie and Jack also learned flying from them. When World War I broke out in 1914, Katherine twice volunteered to join military aviation but was summarily rejected. In 1915, the family founded the Stinson School of Flying in San Antonio, Texas. The school thrived for a few years. Its most important pupils were Canadian cadets who learned flying in preparation for wartime missions. The two sisters were the instructors, the brothers saw to the maintenance of the planes and their mother Emma, was the business manager. The same year Marjorie Stinson became the only woman to be accepted in the US Aviation Reserve Corps. She was dubbed "The Flying Schoolmarm" by her pupils. However, when America entered the War, all civilian aviation was stopped and the flying school had to be closed.

On December 11, 1917, Katherine flew non-stop from San Diego to San Francisco, a distance of 970 kilometres, setting a new American distance record. She also became the first woman to fly in Japan and China. The next year she again broke the distance record, flying 1,253 kilometres from Chicago to New York to deliver mail as America's first authorised female airmail pilot. As the War dragged on, Katherine became a Red Cross ambulance driver in Europe, where she contracted influenza. It became tuberculosis and she had to give up her beloved aviation.

Katherine Stinson died on July 8, 1977. To those who believe that women are easily frightened she said: "Fear, as I understand, is simply due to lack of confidence or lack of knowledge, which is the same thing. You are afraid of what you don't understand, of things you cannot account for." SP

— Joseph Noronha

## QUICKROUNDUP

### AERO VODOCHODY AEROSPACE

The largest aerospace manufacturer in the Czech Republic proved its great shape. During 2013 AERO Vodochody Aerospace managed to accelerate its growth and the company sales reached almost \$190 million. During last year, total profit of the company exceeded \$16.90 million.

### AIRBUS

Airbus has won an order from a Middle East customer for an Airbus ACJ320, adding to the strong presence of its corporate jets in the region. The aircraft, which is being managed by Aviation Link of Jeddah, Saudi Arabia, will be outfitted with a VIP interior with seating for 30 passengers.

### AIRBUS HELICOPTERS

Airbus Helicopters and Turkey's THK Gökçen Aviation have signed a letter of intent for three EC-225 rotorcraft to be deployed for offshore operations.

### BELL HELICOPTER

Bell Helicopter Textron Inc., has been awarded a \$33,77,72,560 modification to definitise a previously awarded advance acquisition contract for the manufacture and delivery of 12 Lot 11 UH-1Y new-build aircraft and 12 Lot 11 AH-1Z new build aircraft for the US Marine Corps to a fixed-price-incentive for the aircraft and firm-fixed-price for the auxiliary fuel kits.

### BOEING

Boeing celebrated a milestone achievement on May 20, when the 737 MAX programme surpassed the 2000th order for the super-efficient single-aisle airplane. With the addition of 30 orders from unidentified customers this week, the 737 MAX now has a total of 2,010 orders from 39 customers worldwide, valued at \$209 billion at list prices. The 737 MAX also has commitments for more than 250 additional airplanes.

Boeing and Nok Airlines Public Company Limited (Nok Air) finalised an order today for eight Next-Generation 737-800s and seven 737 MAX 8s. Nok Air also announced that it intends to convert one of the 737-800s into a 737 MAX at a later date. The order is valued at \$1.45 billion at list prices and will establish Nok Air as the first airline in Thailand to operate the 737 MAX.

Boeing has delivered the fourth P-8I maritime patrol aircraft to India on schedule, fulfilling the first half of a contract for eight aircraft. The aircraft departed from Boeing Field in Seattle and arrived May 21 at Naval Air Station Rajali, where it joined three P-8Is currently undergoing operational evaluation.

### ELBIT SYSTEMS

Elbit Systems of America LLC has been awarded a contract amounting to \$11.6 million, to provide US Marine Corps to provide helmet display tracker system (HDTs) kits to the Bell AH-1W attack helicopter fleet. The

## MILITARY ASIA-PACIFIC

### RAO INDERJIT SINGH TAKES OVER AS INDIA'S MOS DEFENCE



Rao Inderjit Singh took over as Minister of State for Defence on May 29. On taking charge, the Minister took stock of various developments in the Ministry by interacting with the Chief of Army Staff General Bikram Singh, Chief of Naval Staff Admiral Robin K. Dhowan and Chief of Integrated Defence Staff to the Chairman Chiefs of Staff Committee (CISC) Lt General Anil Chait. This was followed by the Defence Secretary R.K. Mathur calling on the Minister where he discussed with him the working of the Ministry and other important issues.

### ADVANCED WEAPON TRIALS OF TEJAS FIGHTER COMPLETED

Three Tejas aircraft have successfully completed advanced weapon trials in Jamnagar as part of the final operational clearance (FOC) campaign which began in December last year. The three Tejas aircraft undertook over 30 sorties to complete the trials which included the integration of a new drop tank and successful completion of the carriage, fuel transfer and jettison trials. FOC will also include all-weather trials to be held later in Bengaluru, followed by hot weather trials in Gwalior. One of the aircraft is also being prepared for night flying with upgraded systems and software. So far Tejas has completed 2,587 sorties logging in over 1,750 hours of incident-free flying. The Hindustan Aeronautics Ltd Chairman R.K. Tyagi has stated that they are on schedule to roll out the first Series Production Tejas.

### INAUGURATION OF FACILITATION-CUM-PUBLICITY CELL PAVILION AT HYDERABAD

Air Marshal R.G. Burli inaugurated the Facilitation-cum-Publicity Cell (FCP) Pavilion on May 22 at Hyderabad Airport. Amongst the initiatives by the IAF for induction publicity, a major step was to enhance its presence at major airports. The IAF pavilion at Terminal-3 IGI airport

in Delhi, set up during October 2012, proved to be a success. As the number of commuters through airports which include aspirants and influencers are increasing day by day, setting up of IAF pavilions at major airports with high footfalls would play a major role in building 'Brand IAF.' While contributing to enhancing awareness about the IAF, FCP would also have a subsidiary function of acting as a nodal point for handling of deceased defence personnel as well as to assist defence personnel and their families in air travel.

### IAF SYMPHONY ORCHESTRA AND DRILL TEAM PERFORM AT INDIA GATE



To generate public awareness and showcase the glorious image of the Indian Air Force (IAF), a performance of the Air Warriors Synchronised Drill Team and Symphony Orchestra was held at India Gate on May 24. Air Marshal HB Rajaram, Air Officer-in-Charge Administration was the chief guest of the event. Drill being an integral part of military ethos, the Air Warrior Drill team (AWDT) was conceived to project the dynamic and vibrant image of the IAF. It is the first of its kind among all military and paramilitary forces in India as it performs unique advanced drill movements with rifles fixed with live bayonets. Eighteen tunes including Rejoice in Raisina, Vande Matram and few Bollywood numbers of instrumental and vocal were played by the 30-member IAF Brass and Jazz Band.

### JORDANIAN F-16 JETS TO ENHANCE CAPABILITY OF PAKISTAN AIR FORCE

Pakistan's Chief of Army Staff (COAS) General Raheel Sharif has said that the induction of new F-16 fighter jets into the Pakistan Air Force (PAF) would enhance its capability. Addressing the gathering at the induction of fourth squadron of F-16 fighter jets into PAF at Mushaf airbase on May 21, Army Chief said that the air force has a crucial role in making country's defence invincible. The PAF has purchased 13 aircraft at minimal price from Royal Jordanian Air Force. The induction of 13 fighter jets, which have undergone midlife upgrade and can serve for another 20 years. The PAF now has a fleet of 79 F-16s.



## LUFTHANSA BECOMES FANHANSA FOR WORLD CUP

A total of eight aircraft in the Lufthansa fleet will swap their well-known lettering for the new 'Fanhansa' logo. It will be the first time that Lufthansa has changed, for a certain time period, its name on the fuselage of some its aircraft since commencing operations almost 60 years ago.

The first Fanhansa Airbus took off from Munich to Hamburg and London in mid-May this year. Over the coming days, we will be creating new travel experiences with a number of different promotions – there is no doubt that we will be flying the happiest fans to Brazil with Fanhansa, offering the best World Cup atmosphere and



pure football fever, said Alexander Schlaubit, Head of Marketing at Lufthansa Passenger Airlines. "It will make Lufthansa the official carrier of all football fans." During the many surprise promotions that will be happening onboard Lufthansa's scheduled flights and at check-in counters and gates in German airports, participants will be able to qualify immediately for a ticket to Brazil onboard a Fanhansa plane. ●

## QUICKROUNDUP

HDTS significantly improves flight safety by providing crew members greater situational awareness with enhanced night vision, weapons sighting, and weapons control capabilities. The contract will be performed over a two-year period.

### EUROFIGHTER

Eurofighter Jagdflugzeug GmbH chose the 2014 ILA Berlin Air Show to unveil details of a major capability enhancement package which includes the second element of the Phase 1 enhancements package known as 'P1Eb' which allows Typhoon to realise both its air-to-air and air-to-ground capability to full effect. It also integrates the uniquely potent meteor beyond visual range air-to-air missile.

### IAE

IAE International Aero Engines AG has shipped all six prototype V2500-E5 power plants for Embraer Defense and Security's new KC-390 multi-role tanker/transport aircraft. All six engines will be used in flight tests beginning in 2014. Civil certification for the new engine model is planned for third quarter 2014.

### RAF

A Rivet Joint surveillance aircraft has been flown in UK airspace by an RAF aircrew. The aircraft is one of three that MoD is buying from the US which, as part of the Airseeker programme, will provide the UK with a world-class real-time signals intelligence and surveillance capability for the first time. Apart from gathering data and vital intelligence using advanced sensor technology, it is also able to carry out onboard analysis and distribute the information via its high-tech communications suite.

### ROYAL CANADIAN AIR FORCE

The Royal Canadian Air Force (RCAF) identifies it as the Block III CP-140M Aurora long-range patrol aircraft and it's an airplane that is crammed with gadgetry fit for James Bond. Fourteen Auroras are undergoing a significant modernisation; six have now passed rigorous RCAF testing and achieved "Initial Operational Capability".

### RUSSIA

Russia could manufacture replacement helicopter engines at a St Petersburg plant if Ukraine's aircraft engine maker Motor Sich leaves a joint project, the head of the Rosoboronexport delegation at the HeliRussia 2014 expo said on May 21. Under the programme, Russia will manufacture all the components and assemble the engines. Ukraine's Motor Sich is the main supplier of helicopter engines to Russia and is among the largest engine manufacturers for airplanes and helicopters worldwide.

## RQ-4 GLOBAL HAWK ARRIVES AT MISAWA



The first-ever RQ-4 Global Hawk to touch down in Japan has arrived at Misawa Air Base to support US intelligence, surveillance, and reconnaissance missions and contingency operations throughout the Pacific theatre and is scheduled to operate from Misawa between May and October.

## MOD TO RECOVER BANK GUARANTEES IN AGUSTAWESTLAND CASE

The appellate court in Milan, Italy, in its judgement on May 23, 2014, substantially upheld the claims of the Government of India against AgustaWestland International Ltd (AWIL), A W Spa and Deutsche Bank, Italy on the encashment of bank guarantees and performance bond in the VVIP helicopter case. The court also ordered AWIL and A W Spa to reimburse legal costs of Government of India. MoD is studying the order and will take immediate steps to recover the amounts fully.

## AMERICAS

### UNMANNED AIRCRAFT SERIES SETS RECORD

Northrop Grumman Corporation's high altitude long endurance (HALE) unmanned aircraft system (UAS) series, which includes the US Air Force RQ-4 Global Hawk, set a new record for mission hours flown in one week, logging 665 hours flying operational and exercise missions during the week ending February 23. During 2013, Global Hawk flew an average of 433.8 hours a week. The weekly record of 665 hours set in February 2014 is 53 per cent above last year's average.

### JASSM ACHIEVES FINAL OPERATIONAL CAPABILITY (FOC)

Australian Minister for Defence Senator David Johnston, has announced that FOC had been achieved for Project AIR 5418, the AGM-158A Joint Air-to-Surface Stand-Off Missile (JASSM). Chief of Air Force, Air Marshal Geoff Brown AO said the JASSM was designed to attack high-value, heavily defended targets such as hardened bunkers or pinpoint targets such as radar and communications sites. This long-range, highly accurate missile can be released far from enemy targets, keeping Royal Australian Air Force aircrew safe without compromising mission objectives. JASSM is a 'military-off-the-shelf' long-range guided missile developed by the US Air Force with a 1,000-pound penetrator/blast fragmentation conventional warhead, capable of precisely striking targets from over 300 km away.

## QUICKROUNDUP

### SAAB

The Czech Republic and Sweden have signed the new JAS39 Gripen contract to extend the lease of 14 Gripen aircraft for another 12 years until 2027. The first leasing agreement with the Czech Republic on 14 Gripen C/D aircraft was signed in 2004. This contract would have expired next year and this is why the two countries have negotiated a new one. The Czech Republic was the first NATO member to fly the Gripen.

### SEA LAUNCH

Sea Launch SA has successfully launched the EUTELSAT 3B satellite today from its ocean-based Launch Platform Odyssey. This marks the completion of Sea Launch's first mission in 2014, its third for Eutelsat and its 36th mission overall. Based on the Eurostar E3000 platform of Airbus Defence and Space, the EUTELSAT 3B satellite has been designed to operate three commercial payloads in the C, Ku and Ka bands.

### SIKORSKY

Sikorsky Aircraft Corp., Stratford, has been awarded a \$14,33,81,783 modification to contract W58RGZ-12-C-0008 to procure 13 Army UH-60M Black Hawk helicopters for the US Army. Work is estimated to be completed by September 30, 2015.

### SOUTH KOREAN AIR FORCE

An evaluation team from the South Korean Air Force will test Lockheed Martin's F-35 Lightning II before signing a deal to purchase 40 of the stealth aircraft for its "next-generation" fighter jet. However, as in 2012, the 10-man team will not be able to fly the stealth jet because they have not gained approval from the US Government and instead, the test will be carried out by a simulator while a Korean pilot will follow an actual F-35 test-flight in a chase plane.

The world's two major aircraft makers are seeking to win a contract to supply the South Korean Air Force with four in-flight refueling tankers. The project to improve airborne operations of its fighters at a maximum cost of 2 trillion won (\$1.8 billion) was finalised last November. Boeing's KC-46 and Airbus Defence & Space's A-330 MRTT are the potential candidates for the acquisition.

### TURKEY

Turkey's under-secretariat for Defense Industries and American aerospace manufacturer Pratt & Whitney have signed a letter of intent for the establishment of an F135 engines centre for F-35 fighter jets in Turkey. The deal covers the final assembly, check and maintenance, repair, overhaul and upgrade capabilities for the engines in Turkey and has been approved by the US Government.

### ULA

A United Launch Alliance (ULA) Delta IV rocket has successfully launched on May 16, the sixth Global Positioning System (GPS) IIF-6 satellite for the US Air Force from Space Launch Complex-37. This is ULA's fifth launch in 2014, and the 82nd successful launch.

## PRECISE AND POWERFUL



The F-35B Lightning II is one of the most complex fighter aircraft ever designed, capable of stealthy, supersonic flight or merely parking in midair and slowly lowering itself to the ground vertically, via the Rolls-Royce LiftSystem. Through this unique Rolls-Royce technology, driven by the F-135 turbofan from Pratt and Whitney, the F-35B can perch aloft on 40,000 lbs of thrust, in a precise and powerful balancing act. This capability provides short take-off and vertical landing (STOVL), and allows aircraft to operate from short-deck ships or austere, forward-operating bases devoid of lengthy, permanent runways. Rolls-Royce is the only company in the world to produce the advanced technology that enables the F-35B aircraft to perform with STOVL capability.

## EUROPE

### DEVELOPMENT OF JOINT STRIKE MISSILE BY NORWAY

The Norwegian Government it proposes to invest nearly \$622 million in the third and final phase of development of the joint strike missile (JSM). The JSM has been in development since 2004 and is one of the most advanced military development programmes ever conducted in Norway. Its objective is to equip future Norwegian F-35 combat aircraft with a weapon that allows for successful engagement of highly defended sea and land targets at very long range. JSM is a long-range precision-guided anti-surface missile being developed in partnership between Kongsberg Defence and Aerospace (KDA) and the Norwegian Armed Forces.

### AIRBUS, DASSAULT AVIATION AND ALENIA AERMACCHI TO DEVELOP NEXT-GEN DRONE

Airbus Defence and Space, Dassault Aviation and Alenia Aermacchi, a Finmeccanica company, have delivered a proposal for further defining a European unmanned air system (UAS) to the Ministry of Defence of France, Germany and Italy. The offer proposes a Definition Phase which has been prepared by joint development teams of Airbus Defence and Space, Dassault Aviation and Alenia Aermacchi and which is backed by an industrial agreement on

## SHOW CALENDAR

23-25 June

**MRO MEETINGS SOUTH EAST ASIA**  
MECC, Kuala Lumpur, Malaysia  
[www.mromeetings.com](http://www.mromeetings.com)

24-25 June

**UAV PAYLOADS 2014**  
Grand Connaught Rooms, London, UK  
[www.uavpayloads.com](http://www.uavpayloads.com)

14-20 July

**FARNBOROUGH INTERNATIONAL AIRSHOW**  
Farnborough Airport, Farnborough, UK  
[www.farnborough.com](http://www.farnborough.com)

28 July-3 August

**EAA AIRVENTURE OSHKOSH**  
Wittman Regional Airport, Oshkosh, USA  
[www.airventure.org](http://www.airventure.org)

30-31 July

**UNMANNED COMBAT AIR VEHICLES**  
Kensington Close Hotel, London, UK  
[www.ucavconference.com](http://www.ucavconference.com)

work share and a cooperative agreement to start the MALE (medium altitude long endurance) 2020 programme.

## CIVIL AVIATION

## ASIA-PACIFIC

### INDIGO WINS AWARD FOR OPERATIONAL EXCELLENCE

IndiGo, India's largest and fastest growing airline, has been conferred the "Best Operational Excellence Worldwide 2012-13" award by Airbus in recognition of its service record with a fleet of 78 single-aisle aircraft. The award was presented during the Airbus Symposium in May 2014 at Kuala Lumpur. IndiGo has been recognised as Aditya Ghosh, President, IndiGo said, "To be recognised in the world is indeed an exhilarating and overwhelming experience. We are under eight years old and to be compared with the world's largest airlines, is an honour in itself and then to come out ahead is amazing!"

## INDUSTRY

## ASIA-PACIFIC

### RUSSIA'S AVIATION INDUSTRY GETS \$28 BILLION BOOST

The Russian Government plans to funnel \$28 billion into Russia's aviation industry to make Russia the world's top three air-

## APPOINTMENTS

**RUSSIAN HELICOPTERS**

Russian Helicopters, a subsidiary of Oboronprom, part of State Corporation Rostec, announces that Pyotr Motrenko has been appointed Managing Director of its Rostvertol subsidiary.

**ATR**

The ATR Assembly of Members has appointed Patrick de Castelbajac as Chief Executive Officer of ATR succeeding Filippo Bagnato.

**LOCKHEED MARTIN**

Lockheed Martin's Missiles and Fire Control business has made three appointments as under:

- Rita C. Flaherty as Vice President, Strategy and Business Development for the Fire Control/Special Operations Forces Contractor Logistics Support Services line of business.
- Daniel S. Norton as Vice President-Strategy and Business Development for Tactical Missiles/Combat Manoeuvre Systems.
- Michael L. Oates as Vice President-Strategy and Business Development for the Air and Missile Defense line of business.

**THALES**

Thales has made three appointments at its International Development Department as under:

- Jean-Yves Tolot as Vice President, Saudi Arabia.
- David-Claude Pichavet as Vice President, Export Sales.
- Christophe Farnaud as Vice President, Africa.

**SINGAPORE TECHNOLOGIES ENGINEERING LTD**

Singapore Technologies Engineering Ltd announced the appointments of

two new Board of Directors with immediate effect as under:

- Ng Chee Khern as a non-independent and non-executive Director of the Company.
- Ms Olivia Lum Ooi Lin as an independent and non-executive Director of the Company

**NORTHROP GRUMMAN**

Northrop Grumman Corporation has made the following appointments:

- Diane M. Balderson, Vice President, Contracts and Pricing.
- Ben Palmer as Director, European Strategy and Business Development.
- Jon Anderson as Director, Business Development for C4ISR - Land, Maritime and Civil.
- Simon Cooper as Director Business Development, C4ISR - Air.

**GULFSTREAM**

Gulfstream Aerospace Corporation has made the following appointments:

- Arno Forehand as General Manager of its component repair facility in Lincoln, California.
- John Liotta as Director of Product Support Sales for the East Coast of the US.
- Stan Dixon Vice President, Sustaining and Government Programs.

**BOEING**

Boeing has named Eric John as President of Boeing Korea.

**BAE SYSTEMS**

BAE Systems Applied Intelligence, the fastest growing division of BAE Systems, has named Jim Anderson as President for the Americas region.

**CFM INTERNATIONAL**

CFM International has named Allen Paxson as Executive Vice President.

cent of the world's military aircraft engines, up from the current 6.7 per cent.

**AMERICAS****EMBRAER OPENS FINAL ASSEMBLY HANGAR FOR THE KC-390**

Embraer held the opening ceremony of the final assembly line of the KC-390 military transport on May 20. The event was organised at Embraer's plant in Gavião Peixoto, São Paulo, and was attended by Brazil's President Dilma Rousseff and other dignitaries. On the occasion, Embraer and the Brazilian Air Force signed the series production contract of the KC-390, thus marking the beginning of a new phase of the project, which started in 2009. The contract provides for the purchase of 28 aircraft over a period of ten years, with the first delivery scheduled for the end of 2016. The total value is estimated to be about \$3.26 billion.

**EUROPE****PRATT & WHITNEY'S PUREPOWER ENGINES FOR AIRBUS**

Pratt & Whitney, a division of United Technologies Corp, has delivered its first ship set of PurePower PW-1100G-JM engines on schedule to Airbus for its A320neo aircraft family.

"Airbus put its trust in Pratt & Whitney to design, develop and certify the PW-1100G-JM engine for the A320neo," said David Brantner, President, Pratt & Whitney Commercial Engines. "I am pleased to say that Pratt & Whitney has completed more than 75 per cent of certification testing and we are on track to meet or exceed all commitments. Our PurePower engine family has now completed over 9,000 hours of rigorous testing, which is proving the engine's capability and reliability. We are on track and ready to power the first A320neo aircraft in late summer." •

craft manufacturers by 2025. The government will invest \$20.5 billion of state funds into the aviation industry through 2025, while a further \$7.9 billion are to come as private investment, according to a document published on the ministry's website. As per the plan, over 3,000 airplanes and 5,500 helicopters should roll off production lines between 2013 and 2025. The

goal is to increase Russia's global market share of civil aircraft production to 3.2 per cent in 2025 from 0.6 per cent in 2011. In the civil helicopter industry, the programme seeks to elevate Russia's share over the period to 12 per cent from just over 6 per cent; in aircraft engines — to 1.4 per cent from 0.4 per cent. By 2025, Russia should be making almost 13 per



# ADOPT SINGAPORE MODEL OF MRO

**ESTIMATES BY CREDIBLE AGENCIES** hold that in the civil aviation industry in India today, the aircraft maintenance, repair and overhaul (MRO) business is currently worth under \$1 billion which is less than two per cent of the \$50 billion global MRO market and has the potential to grow to over \$2.5 billion by 2020.

However, lack of a favourable policy framework is proving to be a major impediment in the efforts of this extremely critical segment of the aviation sector to exploit the potential that the vibrant civil aviation industry has to offer. Currently, the MRO industry in India is groaning under the burden of complex, heavy and multi-tiered tax structure, exorbitant customs duty on import of spares or components and high royalty charged by airport operators. Apart from these, other issues impinging on the growth of the industry are absence of an industry regulator, shortage of space at major airports, lack of quality institutions to provide trained manpower and high attrition rate of skilled labour due to the growth of MRO activities in the region. Also, despite the optimistic growth projections of the industry, the Directorate General of Civil Aviation (DGCA) has not yet streamlined the process of certification of technical training. The existing system of certification by the DGCA does not measure up to the standards laid down by the European Aviation Safety Agency (EASA), thus effectively excluding international carriers from the list of potential customers of the Indian MRO industry. EASA certification is necessary as the fleet of airliners manufactured in Europe and the US dominate the Indian airline industry. One of the major stumbling blocks is that some of the government policies do not offer much clarity and this becomes a frustrating bureaucratic hindrance for those within the country and even abroad desirous of setting up MRO facilities in India. The maze of statutory requirements and bureaucratic timelines prevent MROs from keeping pace with the growth in the aviation industry in India.

The combined effect of all these factors is that it neutralises the advantage of low-cost labour in India and renders initiatives in this segment of the industry by entrepreneurs somewhat uncompetitive. Tax burdens on the customer is so high that the Indian carriers find it financially far more attractive to avail of MRO facilities overseas as they save up to 30 per cent on maintenance costs. Unfortunately, the Indian MRO industry has not been able

to exploit the inherent advantage of India's geographic location between Europe and the Asia-Pacific region. Some experts in the industry are of the view that the private companies that have invested huge resources in setting up MRO facilities in India may not remain economically viable for long and may have to wind up. As per Bharat Malkani, Chairman and Managing Director of Max Aerospace and Aviation Pvt Ltd, "The single largest problem faced by Indian MRO companies is the non-availability of level-playing field. While import of services is totally free of duties and taxes, Indian MRO companies are straddled with levies to the extent of 40 per cent." As per Malkani, a number of MRO firms operating out of Bengaluru have already ceased functioning and those still in the field are literally struggling to survive. Also, European companies that were intent on establishing MRO facilities in India have put their plans on hold.

As per Amber Dubey of the aviation consultancy firm KPMG, on account of the skewed cost structure, India is losing not only foreign exchange and investments, but valuable opportunities in this sector of the aviation industry. Dubey is of the firm view that the first requirement is to remove the anomalies in the tax structure. There is definitely the imperative need to eliminate or even minimise bureaucratic impediments and make the regulatory process less convoluted and cumbersome to facilitate speedy processing of cases. Induction of technical personnel from the industry with the right expertise to help streamline the regulatory process, ought to have high priority. Amongst the list of priorities that KPMG has drawn up for the new government at the centre, the plight of the MRO industry in India figures high. KPMG has recommended a ten-year tax holiday on MRO and provide incentive

to the global aerospace majors to establish component manufacturing and MRO units in India. The government needs to adopt the Singapore model of creating an environment that attracts global aerospace industry.

While the nation has high hopes of the new government, the task before it in the civil aviation regime is formidable indeed. However, no achievement of significance would be possible without creation of a business-friendly environment that would include an efficient regulatory framework, rational tax structure and a bureaucracy with a clear mandate to deliver. **SP**

—By Air Marshal (Retd)  
B.K. Pandey



Tax burdens on the customer is so high that the Indian carriers find it financially far more attractive to avail of MRO facilities overseas.

# Indispensable

# Reference

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