



SP'S

AVIATION

SHARP CONTENT FOR SHARP AUDIENCE

www.spsaviation.net

VOL 16 ISSUE 10 • OCTOBER • 2013



BUSINESS AVIATION:

- **NBAA 2013 PREVIEW**
- **Technological Feats in Business Jets**
- **BAOA Perspective – A Decade of Neglect**

REGIONAL AVIATION:

- **In Need of Policy Framework**

Exclusive Interview:
AIR CHIEF MARSHAL N.A.K. BROWNE

Human Resource:
PEOPLE FIRST MISSION ALWAYS

Special Series:
IAF SANS MMRCA
CONCLUDING PART



INDIAN AIR FORCE

BUILD-UP

STARTS ON PAGE 22

Indian Air Force celebrates its 81st Anniversary





The other Swiss movements.

Swiss timepieces are renowned for their inherent quality, exquisite detail, and careful craftsmanship. Their makers invest immense thought and countless hours to pursue ever higher levels of perfection. At Pilatus, we bring the same attitude to the aircraft we build. We have applied this approach to building extraordinary aircraft for discerning customers for seventy-five years. Like the PC-12 which is one of the most popular turbine-powered business aircraft on the market today. Or our Training Systems: thousands of military pilots all round the world have earned their wings with one of our proven aircraft.

www.pilatus-aircraft.com

TABLE OF CONTENTS

SP'S AVIATION

SHARP CONTENT FOR SHARP AUDIENCE

VOL 16 ISSUE 10 • OCTOBER • 2013



COVER IMAGE:

The ongoing transformation in the IAF is beginning to manifest itself in the latest platforms that are in the induction process or are slated to join the expanding fleet in the near future.

Image by: SP's Design



SURGING AHEAD: THE IAF HAS BEEN UNDERGOING A COMPREHENSIVE MODERNISATION PROGRAMME THAT AIMS AT A COMPLETE TRANSFORMATION OF THIS FIGHTING FORCE AND ELEVATION OF ITS STRATEGIC AND TACTICAL OPERATIONAL CAPABILITIES TO A COMPLETELY NEW LEVEL

CIVIL

NBAA 2013

6 Betting Big on Business Aviation

Business Aviation

10 A Decade of Neglect

13 Technological Feats in Business Jets

Regional Aviation

18 Victim of Government Apathy

BUSINESS AVIATION

OEM

17 Record Breaker

IAF SPECIAL

Messages

22 A.K. Antony, Defence Minister

23 ACM N.A.K. Browne, IAF Chief

Exclusive

24 Interview: ACM N.A.K. Browne

Fighters

28 IAF Sans MMRCA

Interview

34 Dr R.K. Tyagi, HAL

Transport

36 A Long Haul

Technology

38 New Innovations

Force Multipliers

40 Understanding Force Multipliers

Human Resource

46 People First Mission Always

Training

50 Filling the Gap

Indigenisation

53 Tapping India's Potential

Strategy

55 Focus on China

43 **OEMSPEAK:** A Developing Partnership

44 **OEM:** Rafael's High-Tech Air Defence Systems

48 **OEMSPEAK:** Relationship Going Strong

52 **OEM:** First A400M Delivery

57 **OEM INTERVIEW:** Colin Mahoney, Rockwell Collins

58 **OEM:** On Turning 80

REGULAR DEPARTMENTS

4 **A Word from Editor-in-Chief**

59 **Hall of Fame**
Antoine de Saint-Exupéry

60 **NewsDigest**

63 **LastWord**
Need for Direction

PAGE 30

LEAD STORY

MOVING AHEAD

The IAF is undergoing a major transformation, upgrading and inducting new aircraft, including fighters, trainers, transport aircraft, helicopters, aerial tankers, etc.


APPLIED FOR

NEXT ISSUE

Legacy Carriers in Asia-Pacific

TABLE OF CONTENTS

6

Betting Big on Business Aviation



13

Technological Feats in Business Jets



18

Victim of Government Apathy



PUBLISHER AND EDITOR-IN-CHIEF

Jayant Baranwal

SENIOR EDITOR

Air Marshal (Retd) B.K. Pandey

ASSISTANT GROUP EDITOR

R. Chandrakanth

EDITORIAL ADVISER

Air Marshal (Retd) Anil Chopra

SENIOR TECHNICAL GROUP EDITOR

Lt General (Retd) Naresh Chand

ASSISTANT EDITOR

Sucheta Das Mohapatra

CONTRIBUTORS

INDIA

Group Captain (Retd) A.K. Sachdev
Group Captain (Retd) Joseph Noronha

EUROPE

Alan Peaford

USA & CANADA

LeRoy Cook

CHAIRMAN & MANAGING DIRECTOR

Jayant Baranwal

PLANNING & BUSINESS DEVELOPMENT

Executive Vice President: Rohit Goel

ADMIN & COORDINATION

Bharti Sharma

DESIGN

Holistic Directions: Jayant Baranwal
Creative Director: Anoop Kamath
Designers: Vimlesh Kumar Yadav,
Sonu Singh Bisht
Research Assistant: Graphics
Survi Massey

DIRECTOR SALES & MARKETING

Neetu Dhulia

SALES & MARKETING

General Manager Sales: Rajeev Chugh

SP'S WEBSITES

Sr Web Developer: Shailendra P. Ashish
Web Developer: Ugrashen Vishwakarma

© SP Guide Publications, 2013

SUBSCRIPTION/ CIRCULATION

Annual Inland: Rs 1200 • Foreign: US\$ 320
E-mail: subscribe@spguidepublications.com
subscribe@spsaviation.net

LETTER TO EDITOR

editor@spsaviation.net
expert@spsaviation.net

FOR ADVERTISING DETAILS, CONTACT:

neetu@spguidepublications.com
rajeev.chugh@spguidepublications.com

SP GUIDE PUBLICATIONS PVT LTD

A-133 Arjun Nagar,
(Opposite Defence Colony)
New Delhi 110 003, India.

Tel: +91 (11) 24644693,
24644763, 24620130
Fax: +91 (11) 24647093

E-mail: info@spguidepublications.com

REPRESENTATIVE OFFICE

BENGALURU, INDIA
204, Jal Vayu Vihar, Kalyan Nagar
Bengaluru 560043, India.
Tel: +91 (80) 23682204

MOSCOW, RUSSIA

LAGUK Co., Ltd., (Yuri Laskin)
Krasnokholm'skaya, Nab.,
11/15, app. 132, Moscow 115172, Russia.
Tel: +7 (495) 911 2762
Fax: +7 (495) 912 1260

Owned, published and printed by Jayant Baranwal, printed at Kala Jyothi Process Pvt Ltd and published at A-133, Arjun Nagar (Opposite Defence Colony), New Delhi 110 003, India. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, photocopying, recording, electronic, or otherwise without prior written permission of the Publishers.

1964 - 2014



50 YEARS

SP GUIDE PUBLICATIONS

WWW.SPGUIDEPUBLICATIONS.COM

FLYING FEARLESSLY. FOR INDIA.



For over 8 decades the Indian Air Force has flown fearlessly and has served the Nation with pride and passion. We salute their spirit of continuing excellence.

60 YEARS . 5 AIRCRAFT TYPES . 1 NATION

TOOFANI | MYSTERE IV | ALIZE | JAGUAR | MIRAGE 2000

RAFALE 
INTERNATIONAL

DASSAULT AVIATION • SNECMA • THALES



WE AT SP GUIDE PUBLICATIONS FELICITATE THE IAF ON ITS 81ST ANNIVERSARY AND REGARD IT AS A PRIDE AND PRIVILEGE TO DEDICATE THIS SPECIAL ISSUE OF *SP'S AVIATION* TO THIS WONDERFUL ORGANISATION. THE IAF OF THE FUTURE WOULD BE CALLED UPON TO SHOULDER RESPONSIBILITIES THAT WOULD BE MUCH GREATER THAN WHAT IT HAS DONE IN THE PAST.

AS THE INDIAN AIR FORCE (IAF) celebrates its 81st anniversary, it is time to look back with pride on its glorious history of the last more than eight decades during which it has grown from a fledgling service equipped with a few vintage flying machines to now the fourth largest and a modern air force in the world, capable of shouldering the responsibilities that the nation bestows upon it. We at SP Guide Publications felicitate the IAF on this occasion and regard it as a matter of pride and privilege to dedicate this special issue of *SP's Aviation* to this wonderful organisation.

During the last five years, the IAF has been under a comprehensive modernisation programme that aims at a complete transformation of this fighting force and elevation of its strategic and tactical operational capabilities to a completely new level. The nation has already emerged as a regional power and has the aspirations of achieving the status of a global power in the years to come. As a result, the security interests of the nation transcend the national boundaries and extend from the Gulf of Oman to the Strait of Malacca. The IAF of the future will have to confront new challenges and would be called upon to shoulder responsibilities that would be much greater than what it has done in the past. In an exclusive interview with *SP's Aviation*, the Chief of the Air Staff Air Chief Marshal N.A.K. Browne said that reach, responsiveness and mobility of air power gives IAF the unique capability to quickly respond to emerging threats.

The IAF has been driving for new capabilities in all its segments including the combat fleet, strategic and tactical airlift or the rotary-wing regime. It has added a range of force multipliers such as the airborne warning and control systems based on the IL-76 platform, the airborne early warning and control system based on the Embraer 145 aircraft, in-flight refuelling capabilities with the IL-78, unmanned aerial vehicles, radars and aerostats. There is also a plan in place for the modernisation of airfield infrastructure that in effect will serve as a force multiplier. But perhaps the most unique feature of the ongoing exercise in transformation is the enhanced focus on human resource development, an aspect that had not received adequate attention in the past. Being a service that is required to deal with the most advanced and cutting-edge technologies, the quality of human resource assumes critical importance. Finally, it is the man or woman behind the machine that makes the difference. This philosophy has been clearly well understood by the present leadership as highlighted by Air Mar-

shal (Retd) Anil Chopra in an article appropriately titled as "People First Mission Always". Incidentally, till very recently, the author was himself tasked with implementing this critical component in the process of transformation.

While the IAF is undoubtedly flying high on several fronts, one issue that is of growing concern not only for the service but for the nation as well is the urgent need to enhance the operational potential of the combat fleet of the IAF. It is indeed a matter of serious concern as also somewhat enigmatic that such a critical need of national security is not being addressed with the urgency it warrants. The interminable delay in the conclusion of the contract for six squadrons of medium multi-role combat aircraft, the Rafale offered by the French aerospace major Dassault Aviation, ought to be a matter of serious concern as it directly impinges on national security and serves to dilute efforts of the IAF at transformation.

Apart from the regular features, this issue deals with a number of facets of the IAF as also of the global aerospace industry, military and civil aviation. Group Captain (Retd) A.K. Sachdev in his article writes how regional aviation has been a victim of government apathy. In another article on trends in business aviation, R. Chandrakanth reviews how there has been a considerable advancement in business jet technologies. He also says the 65th NBAA convention 2013 is going to be big and is the can't-miss business aviation event. Welcome aboard and happy landings!

Jai Hind!

A handwritten signature in blue ink, appearing to read 'Jayant Baranwal', written over a white background.

JAYANT BARANWAL
PUBLISHER & EDITOR-IN-CHIEF

G280 MAX SPEED: MACH 0.85
MAX RANGE: 3,600 NM
MAX ALTITUDE: 45,000 FT
Large-Cabin | Mid-Range



THE TOTAL PACKAGE

Delivering superiority in all aspects of a super mid-size aircraft, the Gulfstream G280® gives you outstanding performance, comfort and advanced technology. Add to that its exceptional fuel efficiency, low operating costs, and Gulfstream's award-winning worldwide product support network and it's clear that the G280 is everything you want in a new aircraft. And more.

INDIA: +91 98 182 95755 – ROHIT KAPUR rohit.kapur@arrowaircraft.com | Gulfstream Authorized Sales Representative
TOLL FREE 1800 103 2003

INTL: +65 6256 8301 – JASON AKOVENKO jason.akovenko@gulfstream.com | Regional Vice President

Range shown is based on NBAA IFR theoretical range at Mach 0.80 with four passengers. Actual range will be affected by ATC routing, operating speed, weather, outfitting options and other factors.

Gulfstream®
A GENERAL DYNAMICS COMPANY

GULFSTREAMG280.com



BETTING BIG ON BUSINESS AVIATION

NBAA 2013 is the can't-miss business aviation event of the year with key operators and industry leaders meeting in Las Vegas to conduct business, taking buying decisions and setting the stage for business aviation activity for the future

BY R. CHANDRAKANTH

IN 2012, THE NATIONAL Business Aviation Association (NBAA), the premier business aviation association in the US, ran a catchy media blitz of its campaign 'No Plane No Gain', accentuated during the 65th annual convention at Orlando. The campaign has been a runaway hit, so has been the NBAA convention, which is ranked sixth amongst the largest trade shows in the US. It is getting bigger and better. In 2012, the show closed with 25,150 people in attendance, a number comparable to the final attendee total of 26,077 in 2011 and 24,206 in 2010. Back in Las Vegas, Nevada, from October 22 to 24, the 66th annual meeting and convention promises to chart new paths in an increasingly competitive global economy which certainly is impacting business aviation. The 2012 show drew attendees from all 50 states of the US and 87 countries. "By

every measure, the 2012 show was a solid success," announced NBAA President and CEO Ed Bolen.

2013 is going to be bigger, but we don't know as yet what is going to grab eyeballs. Certainly on the horizon is a 'new bird' from the nests of Dassault Falcon. The industry is abuzz with Falcon 5X which the airframer is keeping it close to its chest.

NBAA 2013 is the can't-miss business aviation event of the year with key operators and industry leaders meeting in Las Vegas to conduct business, taking buying decisions and setting the stage for business aviation activity for the future.

To help negotiate the difficult times in a globally depressed economic scenario, the opening session will have presentations by the former US Treasury Secretary John Snow; Missouri congressman, outspoken general aviation (GA) advocate and House GA

Caucus co-chair Sam Graves and Michael Huerta, administrator of the Federal Aviation Administration (FAA), among others.

Ed Bolen said: "What's most encouraging for our industry is that support among the business aviation community for this event has been sustained, even through the turbulent economic climate we've seen in recent years."

STATIC DISPLAY AT HENDERSON AIRPORT

NBAA 2013 will have an extensive outdoor static display of aircraft located at nearby Henderson Executive Airport. The show will feature more than 1,000 exhibits displayed across one million square feet of floor space, as well as two static displays of aircraft. The show also features more than 100 education sessions covering topics of interest to all attendees, from those considering the use of an airplane to support their business needs, to those who have long used an airplane to help their businesses succeed. Dozens of maintenance and operations sessions will be offered by the exhibiting original equipment manufacturers.

In addition to the expansive outdoor static display of aircraft at Henderson Executive Airport (HND), NBAA will also offer, for the first time at an NBAA Convention, an indoor static display of aircraft on the main exhibit floor inside the Las Vegas Convention Center. Linda Peters, NBAA Vice President Exhibits, said the new indoor static display of aircraft provides attendees the valuable opportunity to examine between 10 and 15 light business airplanes and helicopters, just steps away from the show's other indoor exhibits.

While the convention's indoor static display of aircraft will feature lighter aircraft, including piston singles, light turboprops and helicopters, Peters noted that convention attendees will still have access to the show's traditional outdoor, airport-based static display of aircraft, which showcases a diverse variety of about 100 business aircraft, ranging from smaller types up through intercontinental business jets.

NEW FALCON TO BE UNLEASHED

Five decades ago, Dassault conceived and launched the Mystère-Falcon 20, its first true purpose-built business jet. Twenty different models have followed in the years since, each with the same sleek lines, smooth handling and peerless reliability and efficiency inherent in the first Falcon.

At NBAA 2013, Dassault Falcon promises to showcase a new jet, besides having on static display the 900LX, 2000S and the fly-by-wire 7X. On the opening day of the convention, Dassault will take the wraps off its much anticipated Falcon 5X. According to information available, the jet will have twin Snecma Silvercrests, the same engine that will power the upcoming Cessna Citation Longitude.

The aircraft will be flown using fly-by-wire controls that are now standard on all Falcon aircraft and will come with winglets as standard fit. Dassault has been tight-lipped about the project but sources indicate that the first flight will be in 2014 and entry into service in 2016.

Today, over 2,250 Falcons have been delivered to 82 countries around the world and the Falcon fleet has surpassed 16.2 million hours of flight time—testimony to the reputation for quality and performance that the Falcon family has acquired within the aviation community.

EMBRAER'S LEGACY 500 TO MAKE US DEBUT

The Brazilian aerospace major Embraer is bringing Legacy 650, Phenom 100, Phenom 300 and Lineage 1000. At the static display, Embraer will be displaying its fly-by-wire Legacy 500 in its first public US debut, along with a mock-up of the Legacy

450. Robb Report has named Phenom 100 and 300 as 'Best of the Best' in their categories. In July this year, Embraer delivered the 400th Phenom to a German firm, thus crossing a new milestone.

GULFSTREAM LINES UP

Gulfstream Aerospace is bringing the G650, G550, G450, G280 and G150. Gulfstream which designs, develops, manufactures, markets, services and supports the world's most technologically advanced business jets, has manufactured over 2,100 aircraft since 1958.

CESSNA SHOWCASES THE NEWEST

Cessna will once again have a first class, interactive display, providing a perfect opportunity to showcase its Citation Service Centres within the indoor exhibit and the newest additions to its product line, the M2, Sovereign, CX, CJ4 and Caravan EX at the outdoor static display area.

BEECHCRAFT

Beechcraft will field two new King Air 350i, a King Air 250 and 90GTx, the piston-powered Baron and Bonanza and the T-6C military trainer, AT-6 light attack airplane and a special-mission King Air 350ER. A highlight of the show will be an insight into Beechcraft's roots which will be through the beautiful Staggerwing biplane.

BOMBARDIER

Bombardier's static display will feature a mock-up of the Challenger 350, as well as a Challenger 300 and 605, the new Learjet 75 and a Global 6000. Bombardier is also celebrating the 50th year of the first flight of Learjet 23. So also is Pratt & Whitney Canada celebrating the 50th anniversary of the iconic PT6 engine.

OTHERS

Elliott Aviation, which recently announced a retrofit programme to install Garmin's G5000 flight deck in the Beechjet, will have a G5000 demo system at its booth. Elliott will also demo its new Honeywell Primus Epic CDS/R Phase V software and NZ-2010 FMS upgrade for the Hawker 800 series, which will allow pilots to shoot Waas LPV approaches.

Quite a few new jets feature Garmin's G3000 and G5000 flight decks, and some will be viewable at the Henderson Executive Airport static display or in the exhibit hall, including the Learjet 75, HondaJet and Cessna Citation X, Sovereign and M2. The Rockwell Collins Pro-Line Fusion flight deck is well represented, and too is Gulfstream's G280, Bombardier's Global 6000 and Embraer's Legacy 500.

HOST OF ISSUES TO BE DISCUSSED

A host of issues have been put on the agenda to be discussed by the industry, ranging from shortage of pilots and other business aviation professionals, professionalism to airmanship skills to the talent pipeline and more. The session on shortage of talent will be hosted by experts from Aviation Personnel International, Flight Safety Foundation, Kansas State University and Boeing Business Jets.

The important topics include business jet performance in a session titled Transport Aircraft Performance Planning presented by the FAA's Coby Johnson and Chris Jones; Automation Airmanship in the 21st Century; Operating and Doing Business in China, Understanding Fans, Aviation Apps for Tablets and Smart-phones and Business Aviation Pilot Training Toolkits—New Resources for an Ongoing Challenge. SP

SILVERCREST



SILVERCREST

THE NEW GENERATION BUSINESS JET ENGINE

T H E E S S E N C E O F A P E R F E C T E N G I N E

I N G R E D I E N T S : R E L I A B I L I T Y L O W E R F U E L C O S T S G R E E N E R E M I S S I O N S

E X P E R I E N C E T H E E S S E N C E O F A G R E A T E N G I N E , V I S I T U S A T N B A A S T A N D N 5 5 0 6



A DECADE OF NEGLECT

We do not need more regulations. The Indian civil aviation industry is probably the most regulated industry in the world. We need modification of the rules to conform to global standards, better oversight and more professional handling of business aviation, both from the authorities and the operators.



ROHIT KAPUR
PRESIDENT
BUSINESS AIRCRAFT
OPERATORS ASSOCIATION
(BAOA)

BUSINESS AVIATION IN INDIA can trace its roots to the early 2000s. Though a few large Indian companies such as Reliance, Tata and Birla groups had been utilising business aircraft even earlier, it was in the early 2000s that business aviation really started to be viewed as a tool for business growth by large- and mid-size Indian companies, which were enjoying the first flush of the benefits of liberalisation unleashed a decade earlier. Confident Indian business leaders were suddenly coming on their own, with their new found chutzpah for being global players. The traditional “Hindu growth rate” was a thing of the past, and the new Indian economy was growing and creeping towards double digit growth numbers.

PHOTOGRAPH: ANOOP KAMATH

2003-08: THE GOLDEN YEARS

With only about 25-30 business jets, about 150 helicopters and 60-70 turboprops in 2002-03, the growth of business aviation exploded exponentially to a 15-20 per cent compounded annual growth rate (CAGR) from 2003 onwards, even surpassing the growth numbers being shown by scheduled airlines. These were exciting times, with civil aviation being the cynosure of all eyes. Aviation start-ups such as Air Deccan, SpiceJet, Kingfisher and IndiGo were rewriting the way India travelled. The dodgy ways of the “Maharaja” was history.

The years 2003-08 were the golden years in India for the growth of civil aviation in general and business aviation in particular. Aircraft and helicopters were being added at a fast pace. Pilots and engineers, who had been out of jobs for years, were suddenly being sought after with a vengeance and salaries were touching a new high. Airline pilots, who had always viewed business aviation with disdain, suddenly discovered the advantages of switching jobs from airlines to the more exciting and rewarding world of business aviation. In fact, the Directorate General of Civil Aviation (DGCA) had to come out with a new rule to check the rampant poaching of pilots amongst airlines by insisting on a six months’ notice period. Helicopters were everywhere, whether for election flying, religious pilgrimages, geological surveys, offshore flying or plain carriage of passengers.

And then of course the Government of India (GoI) decided to step in and spoil the party. In 2007, the Ministry of Finance (MoF) introduced a new custom duty on import of aircraft and spares, 25 per cent (including 12.5 per cent CVD) on private aircraft and nothing on non-scheduled operators permit (NSOP). This was totally unprecedented anywhere else in the world, and came with an obvious mindset of taxing the “luxury” which was being used by business leaders in the country. It totally failed to understand the economic value which business aviation adds to the economy of a country. If one had to give one comparison, then the introduction of import duty on private aircraft import did as much damage to the growth of business aviation in India as the introduction of retroactive taxation did to the flow of foreign direct investment (FDI) to Indian economy in the Vodafone case in 2012.

To make matters worse, the law was bad in its structure. It provided a loophole for Indian companies to import aircraft under NSOP, and use it privately and get away from paying duty. This was naturally exploited by companies, who thought that they could get away from it. There was also an ambiguous DGCA order which clearly stated that company aircraft could be used by the company Directors for their own flights, a view not clearly shared by the custom authorities, which stated that every flight on an NSOP aircraft needed to be a flight for re-numeration. The custom authorities clamped down on the operators and a series of aircraft were impounded and released only after payment of bank guarantees. A witch-hunt started where even the law-abiding operators were harassed and made to feel like defaulters. Suddenly, owning an aircraft was not so great after all. In 2010, the MoF amended its earlier order and included the NSOPs to pay 2.5 per cent import duty as against 19 per cent by private aircraft. It was still a bad law and without any rationale.

In the meantime, the fleet of business aviation had grown even in the absence of infrastructure and modernisation of rules. Year 2008 saw the highest growth of business aviation in the country, close to 26 per cent, which implied that almost 70 aircraft and helicopters were imported into India that year. Even though

the fleet of business aviation was now clearly larger than the scheduled airlines in India, the rules were still made for commercial airlines and business aviation was expected to conform to certain rules which made no sense. The Government of India (GoI) had also started the process of privatisation of Delhi, Mumbai, Bengaluru and Hyderabad airports. Their lack of planning for business aviation made them sign voluminous agreements with the private airport developers, without catering to the growth and legitimate requirements of business aviation at these airports. As a result, the private airport developers’ genuinely felt that these airports are meant only for scheduled airlines, and business aviation was an unwanted irritant. This manifests in orders such as curfew timings at Mumbai for business aviation aircraft and penal parking charges. To make matters worse, the agreements did not allow any new airports to be developed within 150 km of the international airports, thereby closing the doors for dedicated business aviation airports in Delhi and Mumbai, as on the lines of Teterboro in New York, Seletar in Singapore, Luton in London and Le Bourget in Paris. So it left business aviation at the mercy of the airport developers, who had no use of it, thereby increasing hostility between the users and the owners. Neither did the Ministry of Civil Aviation (MoCA) make any plans for development of fixed base operators (FBOs), heliports, business aviation maintenance repair and overhaul (MROs), etc. Business aviation facilities remained concentrated between the metros of Delhi and Mumbai, even though the need was being felt in the growing Tier-II cities of India.

2009-12: THE SLOWDOWN YEARS

The years 2008-12 saw a steady decline in the growth of business aviation due to the taxation, regulatory and infrastructure issues. Even though the Indian economy continued to progress till the time it started slowing down in 2012, the gloom in the aviation circles started earlier. The scheduled airlines were not doing well having shot themselves in the foot, with poor cost control and ridiculous price wars. Air Deccan, having never made profits, was sold to Kingfisher, which itself was tottering on the verge of bankruptcy. SpiceJet, having started well, seemed to be stuttering, and Jet Airways, having bought out Sahara, seemed to have lost its way. The Indian Airlines and Air India merger was a disaster, having shown the world on how not to carry out a merger without proper planning. Suddenly, the pilots and engineers were laid off and thousands of young men and women who had done expensive training overseas to become pilots found themselves without jobs. The civil aviation industry was clearly in distress, but still the Government of India waffled on taking decisive steps, such as increasing FDI (it happened only in 2013) and lower taxes on aviation turbine fuel (ATF), which was priced at the highest rates globally.

There was still a huge requirement for business aviation in India, but suddenly owning an aircraft was so difficult, that it did not make sense any more. The helicopter industry remained stuck in the predetermined roles, and the government did not do

anything to open up new areas such as electronic news gathering (ENG), medical evacuation, police and traffic control, cleaning and maintenance of power lines and construction of roads, etc. in accessible areas of the North and Eastern India. The rules made it cost prohibitive to carry out these tasks. Besides this, the MRO industry was mired with taxation issues, which still remain, thus missing the opportunity to make India a true MRO hub in South Asia. China and other

**THE YEARS 2008-12 SAW
A STEADY DECLINE IN THE
GROWTH OF BUSINESS
AVIATION DUE TO THE
TAXATION, REGULATORY AND
INFRASTRUCTURE ISSUES**

Asian countries like Indonesia and Malaysia suddenly became the preferred destinations for international OEMS who had believed in the Indian story and stood by for years for things to change. Unfortunately, the change never came, while other countries were quick to seize the opportunity to embrace business aviation, by investing in infrastructure and opening up their skies.

2013: THE WAY FORWARD

So frequently the question is asked: Have we reached the bottom of the pit yet? As per the market indications, we have. Year 2013 has seen some positives. Even though Kingfisher declared bankruptcy, IndiGo proved to the country that only good business models will work. FDI in civil aviation was increased to 49 per cent, a move which allowed Jet-Etihad and AirAsia enter the Indian aviation industry. Tatas has also recently announced the launch of an airlines in partnership with Singapore Airlines, hopefully proving third time lucky. The new leadership in the MoCA and DGCA seem to recognise the needs of the business aviation industry, and have slowly been working towards carrying out some reforms in the regulatory environment. However, still a lot needs to be achieved.

To ensure that the next decade is also not lost as the previous one has, I would propose a 10-point initiative by the government, to help the ailing industry. Besides MoCA, this will also need inputs from the MoF and Ministry of Home Affairs (MHA), and therefore it needs to be an initiative at the Cabinet level, and not left to MoCA alone. The 10 points which need to be addressed are:

- **Recognise business aviation as a tool for economic growth:** Unless the perception changes, no worthwhile reforms can happen. A scheduled aircraft, full of 200-300 passengers, provides revenue to the airport in terms of passenger fee, landing charges, refuelling charges and air traffic control charges. A private aircraft with two to three business leaders which lands at an airport, provides an opportunity for multimillion-dollar worth of investments in the country, and facilitates the growth of industry in remotely connected interiors of India. It is for the GoI to understand what adds more value to the economy.
- **Remove the import duties on import of aircraft:** It is a retrograde tax and only creates barriers for the growth on business aviation in India. While the collection in terms of tax is minimal (by our calculations, approximately about ₹100 crore in five years), the losses in terms of opportunity are massive. Till date no one in the MoF has been able to explain the levy of CVD (12.5 per cent) on import of aircraft, when there is no worthwhile civil aircraft manufacturing industry in India to protect. This duty needs to go or to be reduced to a marginal two-three per cent on import of all aircraft, private or NSOP.
- **Encourage growth of the MRO industry:** Remove duties on import of spares, allow free zones and provide tax holidays on MRO activity. Tier-II hubs for MROs need to be encouraged. MROs need to be taken out of the international airports and given incentives to be established in Tier-II airports.
- **Revisit the agreements with private airport developers:** The rightful development of business aviation infrastructure needs to be part of all future agreements, and the present agreements must be revisited to include this. Private airport developers must plan for business aviation parking, hangars, FBOs and MROs. Similarly, the agreements must be revisited to allow dedicated business aviation airports around major cities. This is in the national interest and any oversight in previous agreements needs to be rectified.
- **Allow ease of money flow for aircraft purchase:** RBI circular allows up to \$50 million as advance for purchase of aircraft for scheduled airlines without reference to RBI. In case of NSOP

and private aircraft, it allows only \$1,00,000 as advance to be paid. The balance needs to be processed through RBI, which is a long and cumbersome process and invariably causes buyers to lose deals and pay penalties for delayed payments. RBI needs to change its rules to allow buyers to pay up to 10 per cent of aircraft value as advance payment without RBI permissions, subject to a maximum of \$10 million. This will go a long way in easing the aircraft purchase for business aviation.

- **Revamp the Bureau of Civil Aviation Security (BCAS) and replace it with a modern agency which is more in tune with the present needs of civil aviation in India.** The current BCAS is totally out of sync with present day aviation security requirements and needs to be replaced by a more up to date organisation, run by professionally trained personnel, more in line with global organisations.
- **Simplify the process of aircraft purchase for business aviation:** The present process is still overregulated, even though the Aircraft Acquisition Committee has been disbanded. Too many steps and too many agencies are involved.
- **Align business aviation operations with best practices and procedures** followed by FAA and EASA certification rather than coming out with knee-jerk and irrational orders. Some of the recent orders regarding fitting of FDRs in aircraft below 5,700 kg and issue of visas to foreign crew of business aviation aircraft are totally out of sync with international practices and have no rationale behind them. DGCA needs to have a separate division working under a JDG to deal exclusively with business aviation.
- **Plan the next level of infrastructure for helicopter industry:** Heliports at district level, ease of helicopter operations in the metropolitan cities, easing up helicopter roles for special tasks, need to be taken up on priority.
- **Consolidate the business aviation industry:** At present there are 149 NSOPs and a number of private aircraft operators. It is impossible for DGCA to monitor so many different NSOPs. MoCA needs to encourage consolidation so that the number of NSOPs reduces, and best practices are followed. If the custom duty on import of private aircraft is rationalised, it will reduce the number of NSOPs, as the balance has tilted in favour of NSOPs after private aircraft are asked to pay higher duties. Another method suggested is to encourage aircraft management, a concept which is practised worldwide. Small aircraft operators should be encouraged to outsource aircraft operations to larger companies for operations, just as aircraft maintenance is being outsourced at the moment. In fact, it is suggested that any operator who has less than two aircraft, should not be allowed to have its own operations, but must outsource to a professional aircraft management company, recognised by the DGCA. This will allow the best practices to be followed for operations and will make the job of DGCA oversight much easier.
The establishment of the Civil Aviation Authority (CAA) has been on the cards for some time, but is moving too slowly. It would be of great benefit to the civil aviation industry to have an independent CAA, which has the authority and powers to implement the civil aviation policy in the country. We do not need more regulations. The Indian civil aviation industry is probably the most regulated industry in the world. We need modification of the rules to conform to global standards, better oversight and more professional handling of business aviation, both from the authorities and the operators. This will only happen when business aviation is given its due importance by the authorities. All is still not lost; we have the next decade to make sure that business aviation is allowed to grow to its true potential. SP

GULFSTREAM G650:
IT CAN COVER SHORTER DISTANCES AT A SPEED OF MACH 0.925



TECHNOLOGICAL FEATS IN BUSINESS JETS

Whether it is the avionics, the engine, the communication systems, in-flight entertainment, the interiors—the business jet industry is up there—staying ahead of the aspirations of the high-flying

BY R. CHANDRAKANTH

TECHNOLOGIES SHAPE LIVES AND technologies are shaped around lives. Irrespective, they signal advancement, moving to a higher plane. If we look around, the first and most visible thing in recent times that comes to mind is mobile technology, how rapidly it has been evolving and becoming part of a cultural evolution and not just technological. The mobile technology domain, dynamic that it is, has short shelf life, unlike the topic we are going to look at—business jets. Aircraft technologies have longer gestation time and longer shelf life. Given this perspective, nevertheless we see that there is considerable advancement in business jet technologies, driven by factors such as cost-reduction, life-cycle cost, environmental concerns, need for comfort, need for speed and above all need for safety.

SUPERSONIC BUSINESS JETS

Let us begin with the need for speed. To mind comes supersonic and a supersonic business jet (SSBJ) which would be a small busi-

ness jet, intended to travel at speeds above Mach 1.0 and typically designed to carry about 10 passengers. At present, there are no SS-BJs, but several manufacturers are working on or have worked on designs. One of them is Aerion SBJ (supersonic business jet) which states that aircraft speeds haven't improved much in the past 20 years and that it can prove there is a viable alternative to business as usual. By focusing on fine-tuning the aerodynamic properties of an aircraft, Aerion technology coaxes new, higher levels of speed and efficient performance. During the past ten years, Aerion has successfully merged decades of airborne and ground-based aerodynamics research for a single mission—supersonic flight bereft of compromise.

What is Aerion's proposed supersonic business jet? It says it includes progressive, demonstrated wing technology; proven Pratt & Whitney propulsion systems and structural materials, manufacturing techniques and in-flight systems. It's an evolutionary solution with revolutionary results. Due to this there has

PHOTOGRAPH: GULFSTREAM

EMBRAER LEGACY 500:
LAUNCHED AT EBACE 2008, IT CAN
BE CONFIGURED TO CARRY UP TO 12
PASSENGERS



been increased market demand from a variety of aircraft manufacturers for Aerion's natural laminar flow (NLF) expertise and the company has set up Aerion Technologies consulting services. Aerion has found that the same proprietary technologies and design tools that enable a practical supersonic business jet can also be a game-changer in subsonic and transonic applications.

In 2013, Aerion Corporation announced that the next round of high-speed test flights in conjunction with NASA's Dryden Flight Research Center began with approximately ten flights to occur during a six- to eight-week period. These tests, using an Aerion phase two test article mounted under the centreline position of NASA's F-15B research aircraft flown at speeds up to Mach 2.0, are intended to measure the real-world robustness of supersonic natural laminar flow, a vital element in the company's design for the world's first supersonic business jet. Let us look at some of the airframers and how they are competing with the introduction of newer technologies.

BOMBARDIER'S INNOVATIVE TECHNOLOGIES

In October 1963, the first Learjet aircraft rocketed through the sky and the business jet industry was born. Now, 50 years young, the world's first family of business jets is still in the lead. Their unmatched styling, unrivalled performance and innovative technologies continue to inspire new generations of leaders around the world. This is 50 years of passionate leadership, this is 50 years of transforming flight, and this is Learjet.

The Canadian manufacturer Bombardier Aerospace continues to move towards certification of its Learjet 85 in the third quarter of 2014, the biggest and fastest of the family till date. Bombardier reports that the model will have a high-speed cruise of Mach 0.82 and a range of 3,000 nautical miles. Priced at \$19.7 million, it will occupy a market niche between the Learjet 60XR and Challenger-300. Also under development are the Learjet-70 and 75, both of which are

expected to enter service this year. The Learjet-70 is an upgrade of the Learjet-40 and the Learjet-75 is an enhanced version of the Learjet-45.

Bombardier's Challenger-350 is an upgrade of the Challenger-300, with new wings, more powerful Honeywell HTF7350 engines, more range, larger interior and Rockwell Collins Pro Line 21 advanced avionics.

GLOBAL FAMILY OF ULTRA LONG-RANGE JETS

Meanwhile, the aerospace major continues working towards the debut of its ultra long-range corporate jets—the Global 7000 and Global 8000. The Global 7000 will feature a spacious four-zone cabin, to carry ten passengers, giving them 20 per cent more living space than the cabin of the current model. The aircraft will have a high-speed cruise of Mach 0.90 and a range of 13,520 km at Mach 0.85. It will be powered by the next-generation General Electric Passport 20 16,500 lbf (73 kN) thrust engines to deliver significant efficiency and emissions advantages, including reduced NOx emissions and an eight per cent overall fuel efficiency when compared to the industry leading Global Express XRS aircraft. Entry into service is scheduled for 2016.

The Global 8000, able to fly farther than any other business jet, will feature a three-zone cabin and a range of 14,631 km at Mach 0.85. It will be powered by the next-generation GE Passport 20 16,500 lbf (73 kN) thrust engines to deliver significant efficiency and emissions advantages, including reduced NOx emissions and an eight per cent overall fuel efficiency when compared to the industry leading Global Express XRS aircraft. The Global 8000 jet will reach a high-speed cruise of Mach 0.90. Entry into service is scheduled for 2017.

**DUNCAN AVIATION WAS
AMONG THE FIRST TO INSTALL
A BROADBAND SYSTEM IN
A BUSINESS JET, ALLOWING
PASSENGERS TO USE THEIR
LAPTOPS TO ACCESS THE
INTERNET AND E-MAIL**

CESSNA'S SUBTLE WINGLETS

Cessna announced in 2011 the launch of its Citation Latitude midsize jet, expected to carry eight passengers at a maximum cruise speed of 442 knots. Cessna expects

PHOTOGRAPH: EMBRAER



DASSAULT FALCON:
ONE AMONG THE MOST
ENVIRONMENTALLY-
FRIENDLY JETS

it to enter service in 2015. Immediately following this is the super midsize jet – Longitude which is likely to have a range of about 4,000 nautical miles at Mach 0.82. Longitude is expected to be certified in 2017. The Citation M2 fills a gap between the Citation Mustang light jet and the CJ family. Cessna says its subtle winglets will give it a range of approximately 1,300 nautical miles and a maximum cruise speed of 400 knots.

Cessna's new CMS, which was developed for the just announced Citation Ten business jet, integrates the aircraft's avionics, electrical systems, communications and CMS via a fibre optic-connected, touch-screen controlled command system. This is a quantum leap beyond CMS as a distraction for bored passengers.

"The rapid evolution of mobile technology development is driving new and exciting introductions into the consumer product arena, which is greatly influencing how customers view cabin management systems today," says Cindy Halsey, Cessna's Vice President of Interior Design Engineering and Development. "What began as simple lighting and audio control systems has evolved into complex ambience, entertainment and cabin communication management systems. Technological developments such as flat screen monitors, DVDs, MP3 players, LED lighting, Internet, Wi-Fi, Blu-ray, OLED displays, graphical user interfaces (GUIs), iPhone, Android—and the list goes on at an unprecedented pace—are posing amazing opportunities and incredible challenges to the aviation sector."

"The Cessna CMS features an interactive, touch-screen system controller at each passenger seat for audio (digital media, MP3/iPhone), video (digital, Blu-ray), interactive moving map, cabin temperature, lights, window shades and even cabin diagnostics," says Halsey. "The dual club-seat cabin arrangement also includes 110- or 220-volt electrical outlets and multiple USB/device inputs. High-speed Internet browsing, satellite radio and cabin Wi-Fi are available as options."

DASSAULT AVIATION AT THE FOREFRONT OF RESEARCH

Dassault is consistently at the forefront of aviation research and development. Creating, refining and implementing the advances in technology and design that will improve the performance,

comfort, efficiency and environmental footprint of future generations of our aircraft. The company plays a key role in the Advisory Council for Aeronautical Research in Europe (ACARE) to develop an aviation strategic research agenda for 2020: the European Union's Clean Sky programme. This seeks to develop new technologies to reduce noxious emissions and noise levels on aircraft entering service at the beginning of the next decade, as well as the EU's SESAR next-generation air traffic management system, due within the same time frame. Dassault engineers are well on the way towards meeting aggressive new environmental goals set under these initiatives. These include a 50 per cent reduction in carbon dioxide (CO₂), an 80 per cent cut in nitrogen oxides (NOx) and a 50 per cent drop in perceived noise on the ground.

In the first quarter of 2013, Dassault received certification for its latest business jets—the Falcon 2000S and 2000LXS. And at the 66th annual convention of the National Business Aviation Association to be held later this month, it is unveiling a new aircraft; some speculate it could be midsize.

GULFSTREAM'S TECHNOLOGICALLY ADVANCED BUSINESS JET

Gulfstream has made enormous strides in technology development. Take the case of the G650; it is the gold standard in business aviation. The G650 can cover shorter distances at a speed of Mach 0.925. No traditional business jet will be closer to the speed of sound. The G650, the most technologically advanced business aircraft in the sky, comes with many advanced safety features such as enhanced vision system II, the head-up display (HUD) II and the synthetic vision-primary flight display (SV-PFD). Its Planeview II cockpit comes equipped with a triplex flight management system, automatic emergency descent mode, 3-D weather radar, advanced flight controls—in short, a full array of sophisticated, next-generation technology to improve pilot situational awareness and enhance safety. Gulfstream engineers paid particular attention to the cabin environment. In fact, they designed it from the inside out. Longer, wider and taller than any other cabin in its class, the G650 living environment provides comfortable accommodations for up to 18 passengers. The

cabin can be configured with a four-place conference table with two additional seats across the aisle for meals or meetings for up to six people. Enjoy wider seats, more aisle room and a large stateroom option for resting up between world capitals.

EMBRAER'S MIDLIGHT AND MIDSIZE JETS

Launched as a concept called the midlight jet (MLJ) in 2007, the Legacy 450 and its big brother the Legacy 500 are to enter service in the near future. Legacy 450 is designed to carry seven to eight passengers over 4,300 km. The aircraft has full fly-by-wire flight controls, a Collins Pro Line Fusion flight deck, Honeywell HF7500 series engines, and a full stand up flat floor cabin. The Legacy 500, which was launched at EBACE in 2008, can be configured to carry up to 12 passengers, and can carry eight passengers over 5,190 km, or four passengers over 5,600 km. Embraer's originally announced timeline for first flight and certification of the Legacy 500 had to be revised because software development for the aircraft's fly-by-wire control system was running behind schedule. Rockwell Collins is supplying its Pro Line Fusion integrated avionics suite for the Legacy 500's cockpit. Legacy 500 is scheduled for entry into service in early 2014 and Legacy 450 in late 2014.

BEECHCRAFT'S ADVANCED TURBOPROP TECHNOLOGY

Beechcraft designs, builds and supports versatile and globally renowned aircraft, including the King Air turboprops and the piston-engine Baron and Bonanza. The first new product from Beechcraft could be an 8/11-seater turboprop, powered by Pratt & Whitney single engine. It would use the composite fuselage of the Premier I light business jet. As for King Air 350i, it has top-end technology equipped with the Rockwell Collins Venue cabin management system and state-of-the-art Beechcraft FlexCabin capability. The King Air 350i sets the standard in cabin comfort, business capability, in-flight productivity and entertainment. It delivers unmatched fuel efficiency and the lowest operating cost per seat mile, making it the greenest aircraft in its class.

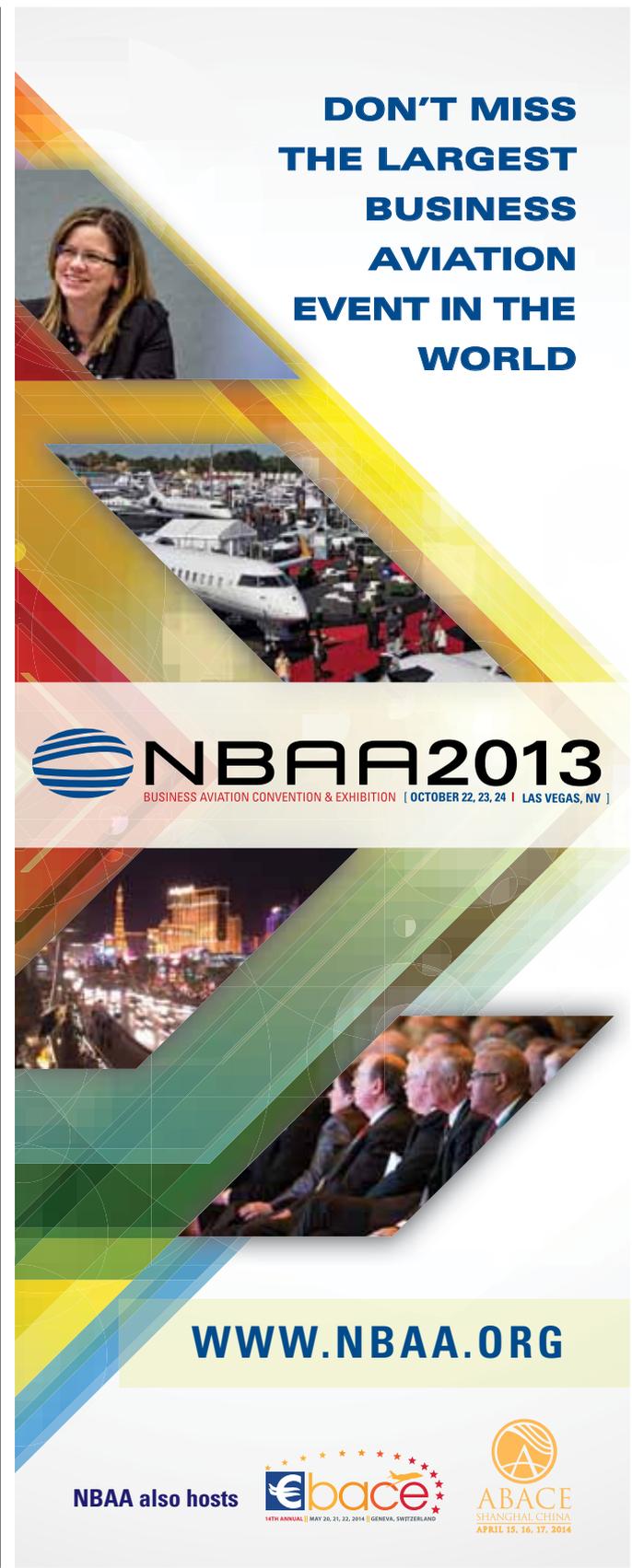
BUSINESS JET TRENDS

Honeywell predicts that nearly 10,000 new business jets valued at \$250 billion will be shipped during 2012-22 with a trend towards larger models. One can expect lot of technology development in that direction along with the need for going 'green'. Dassault claims that their Falcon is among their fleet of the most environmentally-friendly jets on the planet. The company implements its "eco-design" concept, "from the mining of raw materials to production, from in-service operation to end of service and recycling".

IN-FLIGHT ENTERTAINMENT

With customers demanding comfort and up to date in-flight entertainment, the industry has seen some marvellous developments. Companies such as Custom Control Concepts will turn one's jet into a screening room, install a concert-quality sound system and integrate their system with favourite entertainment devices, including video game consoles, smart phones and tablets. Staying connected whether on ground or in air is part of the technological strides made. Duncan Aviation was among the first to install a broadband system in a business jet, allowing passengers to use their laptops to access the Internet and e-mail. Since that first installation in early 2009, Duncan Aviation has installed many more systems in seven aircraft models.

Whether it is the avionics, the engine, the communication systems, in-flight entertainment, the interiors—the business jet industry is up there—staying ahead of the aspirations of the high-flying. 



DON'T MISS THE LARGEST BUSINESS AVIATION EVENT IN THE WORLD

NBAA 2013
BUSINESS AVIATION CONVENTION & EXHIBITION | OCTOBER 22, 23, 24 | LAS VEGAS, NV |

WWW.NBAA.ORG

NBAA also hosts  



RECORD BREAKER

Beechcraft secures largest general aviation propeller driven aircraft order in history

THIS HAS BECOME A year full of milestones for our company. First, we announced our emergence as Beechcraft Corporation in February. That was soon followed by the inaugural winglet flight of the 400XPR, the 4,000th delivery of the G36 Beechcraft Bonanza, and the celebration of two outstanding quarterly reports. Then, on August 1, another milestone moment occurred. Beechcraft announced that it had secured the largest general aviation propeller driven aircraft order in history. The order is for up to 105 King Air 350i aircraft, valued at \$788 million, and a comprehensive maintenance programme, valued at more than \$600 million, with the entire value of the deal totalling up to \$1.4 billion.

The customer—Wheels Up—is a new membership-based private aviation company formed by Marquis Jet founder Kenny Dichter. Wheels Up has forged an exclusive partnership with Beechcraft to offer members access to the King Air 350i for the first time, lowering the entry point for private aviation. Wheels Up is designed to appeal to individuals and corporations currently flying privately, as well as new entrants to private aviation.

The first 35 King Airs will be delivered between now and mid-2015 as Wheels Up initially focuses on the north-eastern United States. Nine aircraft will be delivered before the end of 2013. The deal includes options for 70 additional aircraft as Wheels Up expands nationally over the next two to three years.

“The Beechcraft King Air 350i is the perfect aircraft for Wheels Up due to its proven track record of tremendous flexibility and efficiency for regional travel,” said Beechcraft CEO Bill Boisture. “The pairing of the 350i and support from our world-class maintenance organisation with the innovative founders and management team of Wheels Up is a winning combination.”

The Wheels Up King Air 350i aircraft will have several special enhancements for Wheels Up members including state-of-the-art interiors, Wi-Fi connectivity and a luxury lavatory vanity. The Wheels Up deal also includes a comprehensive maintenance programme from Beechcraft in North America and Western Europe. It

will include service for airframe, engines, avionics and propellers; scheduled and unscheduled maintenance, labour, parts and consumables. From its Hawker Beechcraft Services Wilmington, Delaware, hub, which is strategically located for this programme, the maintenance programme will also include mobile AOG support.

“We are excited to offer the King Air 350i for the first time on an exclusive basis in a national fleet format as Wheels Up redefines private aviation’s entry point,” said Wheels Up founder and CEO Kenny Dichter. The substantial order also creates even greater optimism for Beechcraft employees, especially along the company’s final assembly line. “This is a huge morale builder,” said Bill Brown, Executive Vice President for Beechcraft’s Global Operations. “It’s always exciting to be building a plane to a customer’s specifications. And to do 35 identical airplanes creates even greater efficiencies, not only in Plant IV, but also in flight, paint and completions.”

Brown also assured that any aircraft order—large or small—is treated with the same attention to quality and safety by Beechcraft’s employees. And the same focus is given to supporting every customer’s needs.

With more than 7,000 deliveries, the King Air has been a top-selling aircraft for nearly 50 years. As its segment’s greenest aircraft, the King Air 350i can take more passengers farther on less fuel for consistent savings. State-of-the-art design and performance options represent new heights of power and durability. And the King Air 350i’s new interior is the most comfortable and capable cabin ever offered in its class.

King Airs serve a variety of missions ranging from traditional transport of personnel and high-value cargo, to electronic and imagery surveillance, air ambulance, airway calibration, photographic mapping, training and weather modification. SP

—By Ted Farid, Vice President, Sales, Asia-Pacific, Beechcraft

PHOTOGRAPH: BEECHCRAFT



VICTIM OF GOVERNMENT APATHY

The major factor impinging on the economics of regional aviation is policy framework relevant to civil aviation. While the lure of attractive metro-to-metro routes has overcome the inhibiting effects of policy, the less lucrative regional aviation has remained stunted.

BY GROUP CAPTAIN (RETD) A.K. SACHDEV



**POTENTIAL
UNTAPPED:**
CRJ-700 IN
AIR INDIA'S LIVERY

THE LAST DECADE COMMENCING 2003 when Air Deccan enticed the common man with a dream, appears, with the benefit of hindsight, to have been a wasted opportunity for Indian civil aviation. Airlines, irrespective of size, model and ownership, have bled and continue to bleed, while airports and supporting infrastructure for growth of aviation have been tardy in encouraging growth of civil aviation. For various reasons, aviation has compellingly gravitated towards metros and large cities, and so has the policy framework; witness the Airports Economic Regulatory Authority of India Act, 2008, Section 13 of which limits its jurisdiction only to “major airports” i.e. currently defined in Section 2 of the Act as those having an annual passenger throughput of 1.5 million, with no authority or concern for smaller (read regional) airports. Regional aviation in India has remained a stepchild sired by arbitrary policies, some inadequately pondered over and others inefficiently executed. As investment in airlines is directed at reaping returns, economics dictate the tenor and texture of an airline including the proportion of their total available capacity on regional routes.

CURRENT STATE OF REGIONAL AVIATION

The story of airlines falling under the definition of regional airlines is quite sordid. As this point in time, there is no operational regional airline in India. In the past, MDLR Airlines did start operations in the Northern region, only to shut down after two years. In the recent past, Air Mantra, launched by Religare Voyages, failed to establish itself in the market, losing its tenuous

hold as a start-up regional airline in a very short period of time. Air Costa appears closest to an actual take-off in the near future, while some others including Volk and Kairali Airlines wait in the wings. AirAsia India has also been talking about avoiding metros and favouring non-metros, but its network is yet to crystallise. It is hard to imagine a network that is “regional” in nature, i.e., a network that touches metros in only one region. Moreover, AirAsia has not announced any plans to acquire aircraft smaller than the A320s it plans to lease. Thus the economics of flying to smaller airports do not permit a positive prognosis for regional aviation.

The major factor impinging on the economics of regional aviation is policy framework relevant to civil aviation. According to the Centre for Asia Pacific Aviation (CAPA), “India has made no serious attempt to address the industry’s core structural challenges, particularly the fiscal and cost environment, which is particularly hostile now due to stubbornly high fuel prices compounded by a sharp depreciation of the rupee and a punitive ad valorem sales tax.” The remarkable and disquieting aspect of the government’s apathy towards civil aviation is that, despite constant plaintive refrains from all stakeholders, think-tanks and experts, the lack of concern has remained unyielding. While the lure of attractive metro-to-metro routes has overcome the inhibiting effects of policy, the less lucrative regional aviation has remained stunted. SpiceJet’s overture towards regional aviation by way of introducing smaller aircraft for Tier-II and Tier-III airports does not seem to have had the desired effect, at least not to a level of delight for SpiceJet. The

experience of Alliance Air has also not been too encouraging or inspiring for airlines aspiring to launch routes connecting smaller airports. Earlier, Kingfisher Airlines had also suffered much and for long, due to having committed to routes to the Northeast from which government policies make withdrawal near impossible. There have been some plans by the government to sweeten the regional experience for airlines by way of subsidies and sops. But their effect is yet to manifest itself. Meanwhile, the Ministry of Civil Aviation (MoCA) plans to convene a meeting of ministers and secretaries of all state governments to discuss steps to enhance regional connectivity. The idea is to hammer out a new policy on regional connectivity so as to render regional aviation more economically attractive to all stakeholders.

UPGRADING INFRASTRUCTURE

To increase the number of airports that an airline could fly to, the government has plans to invest in the development of some inactive airports while upgrading some others so that regional aviation could take-off. A figure of \$120 billion is sometimes banded about in this context. However, the Airports Authority of India (AAI), which should have been at the forefront of this initiative appears, too financially feeble to bear the burden. The public-private partnership (PPP) model has become the walking stick of the frail AAI. However, those airports that have already been improved using this model have not met with unmitigated success. The cost of operations of airlines has increased wherever this model has been used; the direct consequence has, of course, been an increase in the cost of travel for the passenger. Readers must have no doubt heard about the user development fee (UDF) and the airport development fee (ADF). However, what is not commonly known is that some airlines charge a common user terminal equipment (CUTE) fee which is installed by a private airport to replace an airline's existing check-in computer equipment. While airlines insist they do not need the CUTE system, airports insist it is better than the airlines' individual systems and have made it mandatory that airlines use it. In weary desperation, airlines have passed on the burden to the passenger. The recent decision of the government to privatise the management of six more airports is thus a mixed blessing. While more airports would be upgraded, which is good news for regional aviation, the cost of operating those airports is all set to travel upwards.

In a connected but disparate move, there have been iterations in recent weeks by the Civil Aviation Secretary K.N. Srivastava about government plans to set up 100 low-cost airports in smaller cities over the next two years. One of the peculiar features of low-cost carrier operations in India has been that there have been no low-cost airports so far and hence, the low-cost operators have had to cut costs in ways other than by reducing airport charges. This announcement, made at an international conference on 'Civil Aviation and Tourism' organised by ASSOCHAM in Delhi in August 2013 sounds improbable given the past record of AAI. However, the fact that the government is thinking on these lines, bodes well for the economics of regional airlines.

Foreign direct investment (FDI) in Indian carriers by foreign airlines was a long-standing demand of the industry; but this major step towards liberalisation also was not executed by the various ministries involved in a manner that inspired any ecstatic sentiment. While enhancement of the FDI limits would not have

THE REPLACEMENT OF THE DIRECTORATE GENERAL OF CIVIL AVIATION BY THE CIVIL AVIATION AUTHORITY IS A STEP THAT MAY BRING A FRESH APPROACH BY THE ESTABLISHMENT TOWARDS CIVIL AVIATION IN GENERAL

been a direct attributor towards bolstering regional aviation in India, its desirable effect of rejuvenating Indian airlines could have had the indirect consequence of empowering and emboldening domestic airlines to become more adventurous towards regional sectors. However, the ongoing trials and tribulations of the Jet-Etihad deal have cast a shadow over the future dividends of this policy. Any hope that might have been fancied in the FDI liberalisation being a positive contributory factor for regional aviation lies inert at the moment.

AIRCRAFT FOR REGIONAL AVIATION

The economics of regional aviation are also predicated to the choice of aircraft. While the most popular and convenient choice of aircraft for Indian domestic operations is the Airbus A320 or the Boeing 737, these two types are not ideal for flying to smaller airports. Firstly, this is so because in comparison to the metro-to-metro routes, the sector lengths are smaller. Besides, these two types are not economical to run on such short sectors both from the point of view of short-term and the life-cycle costs. Secondly, some of the smaller airports are not suitable for these types on account of inadequate runway length, runway surface strength, etc. Thus, the choice of smaller airports that these two types can fly to becomes restricted. The airlines do have an alternative, i.e., to induct aircraft more suitable for smaller sectors. However, this choice means higher cost of operation of the airline as it moves away from economy of scale to acquire varied equipment and manpower skills to cater to two types of aircraft. The choices are hard to make and their consequences tough to predict. SpiceJet's valiant foray into regional aviation has not been an unadulterated success story. AirAsia India is, even before commencing operations, making noises about improvements at some of the smaller airports.

If only the Indian public sector investment into aircraft manufacturing had fructified into a tangible result, it is possible that a realistic solution would have been thrown up by way of an inexpensive, indigenous small aircraft suited to regional aviation requirements. Our neighbour and arch rival, China, is in the process of developing a 90-seater and a 168-seater aircraft. Needless to say that when those enter service, they would be available to domestic users at a much lower price than their foreign equivalents. However, we are yet to produce any transport aircraft; the only prototype produced by the National Aeronautics Limited and the Hindustan Aeronautics Limited was a 14-seater. After the second prototype crashed, the programme is yet to recover. It could be argued that a reasonably priced, indigenously produced and maintained small transport aircraft may have provided appropriate impetus to regional aviation.

HOPES STILL

Regional aviation in India is afflicted by the same problems that affect Indian civil aviation as a whole; but the lack of adequate attention to infrastructure for regional aviation has led to a pitiable state of this segment of the industry. The replacement of the Directorate General of Civil Aviation (DGCA) by the Civil Aviation Authority (CAA) is a step that may bring a fresh approach by the establishment towards civil aviation in general. One hopes that CAA's policies will alter the economics of regional aviation adequately to permit full exploitation of its immense potential. SP



**ONE PARTNERSHIP.
ENDLESS POSSIBILITIES.**

Boeing is proud of its longstanding partnership with India. A partnership India can depend upon to meet its developing requirements, from surveillance, strike and mobility platforms to C4ISR, unmanned systems and support services. The most advanced systems and technologies providing the greatest value for India. That's a partnership of endless possibilities.



रक्षा मंत्री
भारत

MINISTER OF DEFENCE
INDIA

I am pleased to learn that SP Guide Publications is coming out with a special issue of *SP's Aviation* 10/2013 to commemorate the 81st anniversary of Indian Air Force.

Our Air Force deserves the best equipment in its endeavour to constantly build upon the air assets. Indian Air Force has been doing commendable service, both during war-like conditions and in peace time.

“Operation Rahat” conducted during the catastrophe that struck Uttarakhand recently bears testimony to its dedicated service towards our nation.

I hope that *SP's Aviation* 10/13 will be liked by its readers.

I wish the publication all success.

Jai Hind.

A.K. ANTONY



AIR CHIEF MARSHAL N.A.K. BROWNE
PVSM AVSM VM ADC

As the Indian Air Force completes 81 years of illustrious service to the nation, the proud men and women in blue deeply cherish IAF's glorious past while they prepare to embrace an exciting and yet challenging future. Having travelled an arduous path, our veterans have scripted numerous accounts of valour and sacrifice. It was indeed their boundless energy, bold imagination and sheer ingenuity that built IAF's rich legacy, brick by brick. On behalf of all serving air warriors, I salute their tenacity and leadership. Their vision will always serve as a beacon and will guide us in the completion of our mission.

Being an important pillar of national defence, IAF is firmly on the path of an unprecedented transformation that will provide our nation with a host of sovereign options. This accelerated capability enhancement plan envisions IAF's growth into a modern, potent and full-spectrum strategic force. The induction of advanced platforms and cutting edge technology is already demonstrating the huge potential of this transformation. In a short period, since their induction, the Mi-17 V5 and C-130J Super Hercules fleets have recorded remarkable operational successes. The dexterity of these platforms affords greater flexibility and enhanced reliability; as was highlighted by their stellar performance during 'Op Rahat'. The historic landing and subsequent operations of C-130J Super Hercules at DBO have demonstrated IAF's pioneering spirit and its steadfast resolve to employ these versatile platforms audaciously in achieving desired results. The recently inducted C-17 Globemaster III and Pilatus PC-7 Mk II also signify the multi-faceted dimension of IAF's transformation. While the C-17 brings with it an unparalleled boost to our strategic airlift capability, the PC-7 Mk II trainer aircraft adds tremendous value to our basic flying training requirements. It is my singular honour to lead the IAF during this historic phase and I assure the nation of our unstinted resolve to safeguard the nation's skies.

On this special occasion, I wish to acknowledge the indispensable role of our most precious resource – 'our people' –

in catalysing IAF's ongoing transformation. Fully committed to the core values of "Mission, Integrity and Excellence", our air warriors have been toiling hard to sharpen their skills and translate the newly acquired technologies into winning capabilities. These fine men and women have demonstrated tremendous grit and determination in pursuit of high professional standards. Success of major 'Air Force' level exercises in the first half of 2013 displayed their resilient character and illustrated the 'force multiplication' effect of a well honed combat force in the conduct of any campaign. It is indeed heartening that the high operational success of these events was achieved alongside a very good flight safety record. This clearly amplifies the outstanding benefits of embedding aerospace safety awareness, in the air and on ground, as a key component of mission accomplishment. The pivotal role of IAF's air warriors in saving precious lives during the rescue missions in Uttarakhand was emblematic of extraordinary tenacity and unstinted perseverance, even in the face of extreme odds. They have left an indelible mark in the hearts and minds of our fellow countrymen and have re-affirmed my faith in the enduring strength of our vision statement, "People First – Mission Always".

My best wishes to *SP's Aviation* team for a very informative and credible reportage on aerospace issues. The efforts by the publication in highlighting IAF's contribution in the noble tasks of national defence and nation building is indeed laudable. I wish readers of *SP's Aviation* all the best in their future endeavours.

Jai Hind!

AIR CHIEF MARSHAL
CHIEF OF THE AIR STAFF
INDIAN AIR FORCE



WE ARE TRAINING AND EQUIPPING OURSELVES TO TACKLE THE MYRIAD SITUATIONS ACROSS THE SPECTRUM OF CONFLICT

The Indian Air Force (IAF) is celebrating its 81st birthday on October 8. Ahead of the anniversary, **SP's Aviation** had an exclusive interview with the Chief of the Air Staff Air Chief Marshal **N.A.K. Browne** on the IAF's sincere efforts at transforming into a modern and well-equipped frontline air force.

SP's Aviation (SP's): Now that you have been at the helm of affairs for over two years, how far in your view has the Indian Air Force (IAF) progressed in its endeavour at transformation?

Chief of the Air Staff (CAS): IAF's transformation plan is progressing on track as envisaged in the long-term integrated perspective plan (LTIPP). Over the last two years, projects like the induction of new Su-30MKIs and the upgradation projects for the existing fleet of Mirage 2000 and MiG-29 have progressed to ensure that our future combat potential does not get degraded. Our strategic airlift capability has also been bolstered by the induction of the C-17 Globemaster III which along with C-130J Super Hercules aircraft as well as the upgraded An-32 fleet will significantly enhance our strategic airlift capability. Similarly, on the rotary-wing side, we have inducted the Mi-17 V5 helicopters, which as you know performed admirably during 'Operation Rahat', the rescue operations during Uttarakhand floods. The induction of Pilatus PC-7 MK-II basic trainer aircraft (BTA) and a host of simulators for our training as well as combat platforms have provided the necessary impetus and added tremendous value to our flying training process. As far as the progress of the medium multi-role combat aircraft (MMCRA), light combat aircraft (LCA) and fifth-generation fighter aircraft (FGFA) design and development (D&D) programmes are concerned, we are quite satisfied at the way things are moving now and are looking forward to their future inductions.

In order to absorb these new capabilities more efficiently, we have concurrently instituted a time-bound and comprehensive infrastructure upgradation plan which primarily focuses on creating contemporary operational and technical facilities. At the same time, we remain extremely focused on the growth and development of our biggest asset—our air warriors. The outstanding performance of these fine men and women during

various exercises and particularly during 'Ex Live Wire 13' and 'Operation Rahat' reinforces my faith in our inherent capability to continue scaling greater heights in the future. Personally speaking, I feel extremely honoured to be leading the IAF during this historic transformation phase and the privilege to command such a fine group of men and women.

SP's: Can you please elaborate on the concept behind the philosophy of "People First Mission Always" that you have personally inspired in the IAF?

CAS: I am of the firm belief that organisational growth and success in the true sense can only be achieved if we truly empower our air warriors. IAF's vision "People First Mission Always" therefore, rightly focuses on the pre-eminence of our air warriors in both our thoughts and actions even as we go about executing our daily mission. Towards this, we have adopted a multi-pronged approach to comprehensively address the needs of our air warriors, their families and create a stress-free working environment in the IAF. At this point, I would like to clarify that this 'people approach' is not purely welfare-centric, but it comprehensively addresses their training needs, personal needs, mentoring needs and also aims at equipping them with the best possible assets and right skills to execute their mission. On the infrastructure side, we are undertaking construction of dwelling units under Phase II of the MAP; modernising our existing messes and sports infrastructure; and modernising the existing as well as establishing new medical facilities for our air warriors. We have also initiated many special welfare loan schemes aimed at enhancing the quality of life of our personnel and their families. In fact we have not limited these welfare measures to the serving air warriors alone but have also extended them further to our veterans. This has amply been exemplified by our setting up of a Directorate of Air Veterans

last year which would specifically address all issues pertaining to the veterans.

SP's: Infrastructure development has been one of your major thrust areas. Can you please elaborate on the specific improvements in this area?

CAS: Yes, we are extremely conscious of the fact that infrastructure upgradation forms an important component of our capability enhancement plan and therefore, we are addressing these issues in a big way. On the operational front, a slew of infrastructural projects are under way at various locations pan IAF. These include the new proposed airbases at Kargil, Nyoma, Raipur and Ojhar; operational infrastructure at Hindon and Panagarh for operation of C-17 and C-130J aircraft; infrastructure for induction of Su-30 squadrons at Halwara, Sirsa, Chabua and Thanjavur; enhancement of operational and technical infrastructure at the advanced landing grounds in Arunachal Pradesh and existing airbases in the east. Additionally, we are also taking adequate measures as far as infrastructure development for the welfare of our air warriors is concerned, so that we can provide them with contemporary working and living conditions.

SP's: What in your perception are the major security challenges emerging before the nation, and to what extent is the IAF prepared to play its role in confronting these?

CAS: While it may be too early to write an obituary for conventional conflicts between nations, the major security challenges to our nation will continue to stem from the ever changing nature of war and the fast emerging geopolitical uncertainties in our neighbourhood. In an increasingly globalised world, these would encompass the war on radical groups, control of resources and religious extremism borne out of economic, demographic and societal tensions that are transnational in nature. The increasing use of space and cyberspace has added a new dimension to the spectrum of conflict. Specifically for us, the vacuum emerging post-US withdrawal from Afghanistan as well as the increasing forays in the contested areas along the line of actual control (LAC) constitute real and live concerns. Events like the 26/11 have highlighted the spectre of terrorism attacks in our urban areas, where restrained application of air power to minimise collateral damage needs to be factored in. Similarly, in other hostage/hijack scenarios, our resources may need to be deployed at short notice. Therefore, on our part, we are training and equipping ourselves to tackle the myriad situations across the spectrum of conflict. More importantly, we would need to maintain an agile and adaptive mindset in handling such contingencies.

SP's: What are the issues that continue to delay the finalisation of the medium multi-role combat aircraft (MMRCA) contract? In what time frame can we expect the IAF to receive this urgently needed shot in the arm?

CAS: The MMRCA is a large and a comprehensive project especially if we look at the importance of this programme for the IAF. The Contract Negotiation Committee (CNC) is currently examining various aspects of this project and trying to close all the issues related to licence production of the Rafale aircraft in India. Concurrently, a joint contract is in the process of being finalised between the Hindustan Aeronautics Ltd (HAL) and Dassault Aviation. I am confident that with all the efforts being made by the CNC, we will be able to conclude the contract negotiations at the earliest. We are hopeful that we will be able to process the case for soliciting the Cabinet Committee on Security (CCS) approval within this current financial year itself.

SP's: What is the status of the FGFA being developed in collaboration with Russia? What are the numbers that the IAF to receive in what time frame?

CAS: The FGFA programme is at the contract negotiation stage for the research and development (R&D) contract. The timelines for various stages of design and development would be formalised only after this contract is signed. Our plan is to induct six squadrons of the FGFA. Being a D&D project, you must understand that it would take us some time before we reach the induction stage.

SP's: What is the status of the intermediate jet trainer (IJT) project that is meant to replace the fleet of HJT-16 Kiran aircraft currently in service?

CAS: The IAF expects the initial operational clearance of the IJT to be cleared by December 2015 and deliveries to commence by 2017. While the Kiran fleet would be utilised till 2017, the number of Kiran Mk-I/IA aircraft would reduce substantially by 2016. Hence, any further delay in IJT induction beyond 2017 would certainly have an adverse effect on our Stage II (F) training. This constraint may eventually force us to look at other options.

SP's: What are the plans for induction of the Tejas LCA as an operational platform?

CAS: At present, the LCA is undergoing flight trials towards certification to initial operational capability (IOC) standards and this process is likely to be completed by November 2013. The first LCA, in IOC configuration, is planned to be inducted in 2014. Thereafter, the full operational capability (FOC) certification is expected to be complete by December 2014. IAF plans to induct a total of six squadrons of LCA, out of which four will be equipped with LCA Mk-II. While we are all aware of the long history of delays up to this point, we want to make sure that the aircraft meets IAF's full requirement.

SP's: Plans to replace the fleet of Cheetah helicopters appear to have run into difficulty once again. What is the status of this project as also plans of HAL to manufacture an equivalent platform?

CAS: As you know, the CBI is investigating certain allegations of wrongdoing regarding the procurement of 197 reconnaissance and surveillance helicopters (RSH) as a replacement for Cheetah helicopters. While the Indian Army is the lead service for processing the case, IAF is planned to get 64 helicopters out of this lot. On the indigenous front, HAL's plans to manufacture 187 (61 for IAF) light utility helicopters (LUH), under the 'Make' category and this project is already running over 30 months behind schedule. In fact, the ground test vehicle run for this project is now planned to commence from September 2014 onwards.

SP's: Unmanned aerial systems (UAS) are set to play a greater role in the conduct of warfare in the future. Does the IAF plan to foray into the domain of UAS in a big way and in what time frame?

CAS: The UAS or the remotely piloted vehicles (RPAs) as we call them have certainly proven themselves in the various asymmetrical conflicts over the last four decades. Recently, we have also seen them operate extensively in the Afghanistan-Pakistan theatre where they have been able to address many high value targets successfully. However, we are yet to witness their full potential and survivability in a highly contested environment and this would be possible only after examining their efficacy

in conflicts with comparable adversaries. The IAF also envisages a larger role for the UAS in the future and accordingly we have factored this in our modernisation plans. The employment of RPA's in combat role however would depend on the future operational requirements of the IAF and hence, the issue needs to be examined accordingly.

SP's: What steps is the IAF taking to exploit space-based capabilities for the conduct of operations in the future? What is the status of the proposal to establish a tri-service Aerospace Command?

CAS: Exploitation of space-based capabilities has become an important operational imperative in the present-day battlefield scenario. The armed forces in general and the IAF in particular have institutionalised requisite mechanisms for seamless exploitation of capabilities afforded by our space assets. IAF is also promoting awareness on exploitation of space assets through a three-tier structured training programme at select training institutes, aimed at enhancing the understanding of this important domain by future aerospace leaders. A study team with IAF as the lead service has been formed along with members from other services, to assess the requirements of the proposed Space Command and suggest a suitable model for implementation. The initial proposal put forth by the study team has been discussed in detail during the Chiefs of Staff Committee (COSC) meetings and this is currently being finalised and processed for the Government of India (GoI) approval. Once we have the 'in-principle' approval of the GoI, we would start the implementation process in a phased manner.

SP's: Development of the armed forces in India has generally been somewhat Pakistan-centric. How do you see the air power equation with China in the event of a full-scale military confrontation in the future?

CAS: Let me first correct the general perception in this regard. As far as IAF's transformation plan is concerned, it is certainly not adversary-specific but is rather based on an analysis of our overall capability requirements to tackle future challenges to our national security. IAF conducts regular threat perception analyses and correspondingly updates its plans which factor in all the envisaged threats and contingencies. While we may be currently having 34 combat squadrons due to phasing out of certain legacy platforms like the MiG-21, MiG-23 and MiG-25 aircraft, even with the existing strength, IAF has maintained adequate operational potential in terms of offensive capabilities to tackle any emergent situations impinging on India's national security.

SP's: A 45-squadron Air Force was conceived in the context of India's status in the geopolitical and geostrategic environment prevailing in the 1960s. Today, the strength of combat squadrons has declined to 34 and with the retirement of obsolete aircraft and delayed induction of MMRCA, strength of the combat fleet could decrease further. What is your vision of the shape and size of the IAF after a decade from now?

CAS: I agree with you that today IAF's squadron strength is 34 as against the sanctioned strength of 42 and this number is likely to remain so during the current plan period. However, despite this, our overall combat potential would not get affected mainly because of implementing a three-pronged modernisation strategy to acquire, upgrade and maintain our fleets of all airborne platforms. Accordingly, the phasing out of certain legacy aircraft in beginning of the Thirteenth Five Year Plan period would be offset by raising of new Su-30 squadrons. Also, the drawdown

in the total number of combat squadrons is being addressed through upgradation of some of the existing combat-worthy platforms like the Mirage 2000, Jaguar and MiG-29 as well as the planned new acquisitions like additional Su-30MKI, MMRCA, LCA and FGFA in the Twelfth and Thirteenth Five Year Plan periods. I am therefore quite confident that post the implementation of our transformation plan, IAF will be a force to reckon with.

SP's: The IAF has been conducting exercises jointly with the air forces of friendly foreign countries. Have these exercises in any way impacted the operational philosophy of the IAF?

CAS: We believe that learning is a continuous process and take pride in the fact that we have always encouraged our air warriors to learn and imbibe the best practices of other advanced air forces. The application of air power may differ per se on case to case basis due to geographical peculiarities and threat matrix of any country. However, the doctrinal precepts and the employment philosophy would by and large remain the same. Regular participation in bilateral and multilateral exercises has benefited the IAF in terms of exposure to the latest developments taking place in the field of military aviation and weapon systems. Our air warriors have also been exposed to a wealth of doctrinal and operational knowledge which I am sure will ultimately add to our capabilities and enable us to fine-tune our operational philosophy.

SP's: HAL has elaborate infrastructure and has licence produced even fourth-generation aircraft. In view of the renewed thrust at indigenisation, what must the Indian aerospace industry achieve high degree of self-reliance in consonance with the imperatives of national security?

CAS: You see, the private industry had largely remained a marginal player in India's effort to reduce its import dependency in the aviation sector. The new Defence Procurement Procedure (DPP) 2013 has provided a fresh impetus to the growth of Indian defence industry by mandating a higher preference to the 'Buy (Indian)', 'Buy and Make (Indian)' and 'Make' categorisation in capital procurement. I do hope that the Indian aerospace industry seizes this opportunity and contributes towards achieving strategic autonomy in the aviation sector. This approach would stimulate greater indigenisation and as far as we are concerned, we will continue to support the private industry in this endeavour. One of the first steps taken in that direction is the scheme for replacement of the Avro aircraft where the RFP mandates that the Indian production agency is to be picked out by the OEM, and has to be from the private sector. Another procurement that is being undertaken on a 'Buy (Indian)' basis is that of micro UAVs and this too has generated considerable interest among the private players. Although progress in this sphere has been slow, but we do hope that with the efforts being put in, it gains momentum soon.

SP's: India is now recognised as a nuclear power in the region. It is also a fact that delivery of nuclear weapons is a tri-services responsibility in which the IAF will have major role. Could you enlighten us on the status of the IAF in this regard?

CAS: The attributes of reach, responsiveness and mobility of air power gives IAF the unique capability to quickly respond to emerging threats. And these attributes also afford the IAF a prime role in addressing our security challenges—across the entire spectrum of conflict, nuclear included. All I can say is that the IAF is fully prepared to deal with any such contingency, if and when it may arise in the future. ■ **SP**

Always in Control



Special Mission Aircraft - Superior intelligence collection and battle management

- Long-endurance, high altitude jet or advanced turbo-prop platforms
- Onboard and ground C4I centers for mission control, situation awareness and intelligence dissemination
- Advanced communication systems for net-centric operations



Maritime Patrol



Signal Intelligence



Airborne Ground
Surveillance



Airborne Early
Warning



www.iai.co.il
market@elta.co.il



IAF SANS MMRCA

The issue of finalisation of the contract with Dassault Aviation for the MMRCA programme is still open-ended. In the last article of the five-part series on MMRCA, read how the tardy approach of the establishment in processing the case for the MMRCA could ultimately prove to be a disastrous blow for the IAF.

BY AIR MARSHAL (RETD) B.K. PANDEY

AWAITING CNC
CLEARANCE:
RAFALES IN FLIGHT

DURING A MEDIA BRIEFING a few days ago, Air Chief Marshal N.A.K. Browne, Chief of the Air Staff (CAS) and Chairman Chiefs of Staff Committee, stated that contract negotiations between the representatives of Dassault Aviation and the Indian Ministry of Defence (MoD) over the deal to procure 126 Rafale medium multi-role combat aircraft (MMRCA) from the French company were progressing satisfactorily. He went on to express hope that the contract negotiations would be completed in the next few months.

CONTINUED UNCERTAINTY

In the last week of July this year, the French Defence Minister Jean-Yves Le Drian visited Delhi during which high amongst the engagements of the diplomatic itinerary of his tour was interaction with the MoD on the inordinate delay in the finalisation of the \$20 billion MMRCA contract for the Indian Air Force (IAF) that Dassault Aviation of France had won in January 2012, in a gruelling and lengthy contest against five other contenders of global repute. The contract negotiations with the original equipment manufacturer (OEM) Dassault Aviation began thereafter;

but even after 21 months having gone by, there appears to be little certainty of the time frame in which the deal would be inked, repeated assurance from the highest echelons in the defence establishment notwithstanding. When questioned during a media briefing on the occasion of the high profile visit, the Minister of Defence A.K. Antony in fact had stated that the process of contract negotiations was extremely complex and it was not possible for him to lay down a time frame in which the issue is to be finalised. He added that even after the contract negotiations are over, there are many other steps that have to be gone through and all this would take time. Sources in the MoD have described the acquisition process for the MMRCA based on the Defence Procurement Procedure (DPP) as extremely complex owing to the plethora of technical and legal issues that the Contract Negotiations Committee must address while interacting with the OEM as also a host of smaller and medium enterprises for subcontracts under transfer of technology (ToT) and offset obligations. That leaves the issue of finalisation of the contract for the MMRCA still open-ended.

EROSION OF OPERATIONAL CAPABILITY OF THE IAF

With the fleets of vintage aircraft already overtaken by obsolescence and ought to have either been replaced years ago or now rapidly approaching the end of their total technical life, the size of the combat element of the IAF is shrinking at an alarming rate with consequent and inevitable blunting of its operational edge. As against the authorised strength of 39.5 squadrons, the IAF now has 34 squadrons and in another three to four years, with some of the aircraft from the fleets of the MiG-21 and MiG-27 being progressively phased out, the strength of the combat fleet could reduce to fewer than 30. By the year 2019, the MiG-21 and the MiG-27 fleets are slated to be retired from service altogether following which the strength of the fleet could well come down to 20 or so if no fighter aircraft are inducted by then. This figure is disconcertingly low especially when consequent to a re-evaluation of the geostrategic and security scenario in the region and the government having already approved enhancement in the size of the combat fleet of the IAF to 42.

INDUCTION OF COMBAT PLATFORMS INTO THE IAF

The IAF expects to receive another 100 (equivalent of five squadrons) of the Su-30MKI in the next two years thus completing the induction of the currently ordered total of 272 aircraft. However, induction of these five squadrons would enhance the strength of the combat fleet only to 25 providing only a partial relief to the IAF. The Tejas Mk I light combat aircraft (LCA), the indigenously designed, developed and produced light-weight multi-role jet fighter is expected to receive its initial operational clearance (IOC) by the end of this year as mandated by the Minister of Defence. Soon after the grant of IOC, the IAF should begin the process of induction. However, as stated by the CAS during the recent media briefing, the IAF expects to induct the first squadron of the Tejas LCA only by the end of 2015. Time frame for the final operational clearance (FOC) has been estimated to be achieved by the end of the same year i.e. 2015. However, there continues to be lingering uncertainty.

Presuming that the Tejas project moves forward as planned, the IAF can begin in 2016 the induction of the two squadrons of this aircraft already ordered from HAL. However, being a new induction, it may take a few years for this fleet to get over the usual teething problems and reach full strength as also become operationally effective. The numbers being small, even timely induction of the Tejas Mk I will add just two more squadrons taking the strength of the combat fleet to 27. This will make only a marginal difference in the overall combat potential of the IAF.

The IAF has made considerable investment in its effort to leap into the fifth-generation through the joint development with the Russian aerospace giant Sukhoi of the fifth-generation fighter aircraft (FGFA), a twin-seat variant of the Russian T-50 PAK FA that is in the flight test phase. As stated publicly, the IAF expects that this aircraft will be available for induction by 2020 i.e. seven years from now; but there may be some difficulty in this regard. The project for the Indian FGFA is still in the design stage and



IN CASE MMRCA DOES NOT HAPPEN IN TIME OR GETS DELAYED, THE NUMBER OF COMBAT SQUADRONS WILL DECLINE SHARPLY.
—AIR CHIEF MARSHAL N.A.K. BROWNE, CHIEF OF THE AIR STAFF
 DURING A PRESS CONFERENCE ON THE EVE OF 81ST ANNIVERSARY OF IAF

as an elaborate infrastructure for the manufacture of this new generation aircraft in India is to be set up from scratch by HAL and as the technology for this platform is expected to be much advanced, going by the most optimistic estimates based on innumerable imponderables, it may take up to a decade and a half from now if not more to operationalise the fleet i.e. by 2028, if the IAF is lucky. It is also understood that the numbers initially planned that was pitched at 214 aircraft (11 squadrons) has been revised downwards drastically to 144 aircraft (eight squadrons). This implies that even after the induction of the FGFA, the strength of the combat fleet will not exceed 35, well below the newly sanctioned figure of 42. It should also be borne in mind that with each passing year, the refurbished fleets of the MiG-29, Jaguar and the Mirage 2000 are also hurtling towards obsolescence.

Despite all the optimistic pronouncements from different quarters and levels, the future of the combat fleet of the IAF does not appear as bright as it ought to be. With this size and vintage of the combat fleet, the IAF will be ill-equipped to meet the challenges effectively even on a single front. The rapidly dwindling fleet of fighter aircraft should leave no one in doubt that not only is the deal for the 126 Rafale MMRCA becoming increasingly urgent and vital for the IAF even

if it has to just arrest the degradation of combat capability, the IAF must quickly decide to exercise the option built into the RFP for another 63 aircraft (three squadrons) and if possible even more to attain full sanctioned strength and the desired level of operational capability.

GENERAL ELECTIONS— A POSSIBLE IMPEDIMENT

A major stumbling block that could lead to further delay in the finalisation of the contract could be on account of the general elections that are expected to be held nationwide in May 2014. Firm dates are likely to be announced in the near future after which the model code of conduct would become effective. Once this happens, the government will be debarred from taking further steps towards finalisation of the contract. This means that the deal will go into limbo for some time till a new government at the Centre takes charge. What view the new government takes of the deal is anybody's guess. In any case, change of government at the Centre holds the possibility of pushing the whole procurement process into a state of paralysis at least for some time, adding to the delay.

THE FINAL WORD

If the deal is crucial for the IAF, its success is equally important for the OEM Dassault Aviation. The Indian MMRCA contract would be the first and perhaps the only sale of the Rafale outside France. Besides, the French Government has already ordered a significant reduction in the orders of this aircraft for the French Air Force. Continuing delay in finalisation of the contract or its cancellation could create serious difficulties for the French Government and the OEM to the point of being compelled to discontinue production. Should this happen, it will leave the IAF literally high and dry. The tardy approach of the establishment in processing the case for the MMRCA could ultimately prove to be a disastrous blow for the IAF. **SP**

PHOTOGRAPH: SP GUIDE PUBNS

MOVING AHEAD

The IAF is undergoing a major transformation, upgrading and inducting new aircraft. Read through the article to know about the latest platforms that are in the process of being inducted into the IAF's aircraft fleet.

BY AIR MARSHAL (RETD) B.K. PANDEY



FORCE MULTIPLIER:
AIRBUS A330 MRTT WITH
ALL THREE REFUELLING
HOSES EXTENDED

AS THE INDIAN AIR Force (IAF) celebrates its 81st anniversary this year, the planning and dedicated effort on the part of both Air Headquarters (Air HQ) and the Ministry of Defence (MoD) behind the ongoing programme of transformation is beginning to manifest itself in the latest platforms that are in the induction process or are slated to join the expanding fleet in the near future.

COMBAT AIRCRAFT

Contract negotiations for the 126 medium multi-role combat aircraft (MMRCA) are inching forward despite the innumerable impediments that have continually afflicted the programme since its inception in 2001. Young fighter pilots in the IAF are eagerly looking forward to the successful conclusion of this \$20 billion deal that will equip its combat fleet with the fourth-generation plus swing-role platform from Dassault Aviation of France. Fitted with the latest and most advanced avionics as well as capable of carrying the most sophisticated aerial weap-

ons, the Rafale will indeed be a formidable combat platform in the hands of future combat pilots of the IAF. As per the last estimate by Air HQ, the contract negotiations should be completed by the end of October this year and contract signed soon thereafter. Induction of this platform is expected to begin three years after signing the contract with the first 18 aircraft or nearly a squadron worth, delivered directly by the original equipment manufacturer (OEM). The remaining 108 aircraft will be manufactured by the Hindustan Aeronautics Limited (HAL) with transfer of technology (ToT) and deliveries commencing four years after signing of the contract.

The other combat platform to be inducted into the IAF in the near future would be the light combat aircraft (LCA) Tejas designed by the Aeronautical Development Agency (ADA) and built by HAL. The Minister of Defence A.K. Antony has specified end of 2013 as the deadline for initial operational clearance after which the induction of the aircraft into the IAF will commence. Final operational clearance as mandated by Antony is to

PHOTOGRAPH: AIRBUS MILITARY



FOR MISSIONS AS VARIED AS THE TERRAIN

It's the most versatile airlifter the world has ever seen. The C-130J Super Hercules is equally comfortable performing combat rescue, humanitarian relief and deep covert missions. In any kind of weather, at any time of day or night, the C-130J is the flexible airframe that's ready for India's most vital missions today — and tomorrow.

www.lockheedmartin.com/C130

LOCKHEED MARTIN 
We never forget who we're working for®

be ensured by December 2014. The IAF has placed an order for 40 LCA Tejas Mk I and has indicated a requirement for 124 Mk II version that will be equipped with the more powerful GE F-414 engine. Of these, 68 aircraft are expected to be inducted by the end of the Thirteenth Five Year Plan (2017-22).

The IAF is to leap into the fifth-generation with the induction of the Indo-Russian fifth-generation fighter aircraft (FGFA), a two-seat derivative of the Russian T-50 PAK FA. The FGFA is currently under development jointly between HAL and Sukhoi, the Russian aerospace major. The requirement initially indicated by the IAF was to be about 200, but appears to have been revised and the number has apparently been scaled down to 144. India has committed \$6 billion for the development of this platform and the total cost of the project is estimated at \$30 billion considerably higher than that for the MMRCA contract. The FGFA fleet is expected to be inducted beginning 2020.

THE TRANSPORT FLEET

In January 2008, the ageing transport fleet of the IAF received the first shot in the arm by way of an agreement with the US Government for procurement of six Lockheed Martin C-130J Super Hercules, a four-engine highly versatile transport aircraft for \$1.06 billion through the foreign military sales (FMS) programme of the US Government. These six aircraft based at Hindon are meant primarily for special operations and operationally have already rendered an excellent account of their attributes in the recent natural calamities and other tasks. Meanwhile, the Indian Government has cleared a proposal by the IAF for the procurement of another six C-130J Super Hercules aircraft at a cost of \$1.2 billion. These aircraft are to be based at Panagarh, a new airbase under Eastern Air Command.

Lockheed Martin's success was followed by an order for 10 Boeing C-17 Globemaster III heavy-lift aircraft priced at \$4.2 billion. Procured once again through the FMS route, three of these gigantic four-engine strategic airlifters have formally been inducted into the IAF on September 2, 2013, and are based at Hindon. Two more aircraft are to be delivered by the year end and another five in 2014. Sanction for another six of these machines is already in place; but firm orders would be placed for delivery in 2015 once the IAF was satisfied with the performance of the fleet. As and when the fleet strength goes up to 16, it will be split into two squadrons, one of which will be based at Panagarh.

Replacement for the An-32 fleet inducted in the early 1980s is planned through a 15 to 20-tonne class twin-jet multi-role transport aircraft (MTA) currently under development, jointly by HAL and the United Aircraft Corporation of Russia. The contract with Russia for the MTA project was concluded in May 2012, according to which the IAF will receive 45 of these aircraft beginning 2018.

A global tender valued at \$2.5 billion for the supply of 56 aircraft for the replacement of the medium capacity, twin-engine HS-748 Avro fleet procured in the 1960s from the UK,



VERSATILE MACHINE: BOEING
AH-64D APACHE BLOCK III

has been floated recently. The tender seeks around eight-tonne payload capacity aircraft and favours collaboration by the selected foreign OEM with an Indian company in the private sector of the Indian aerospace industry. As HAL is already overloaded with commitments, it has been excluded from this scheme. The Alenia Aeronautica C-27J Spartan and the Airbus Military's C295 could be amongst the likely contenders. Sixteen aircraft will be bought off-the-shelf from the selected vendor and 40 will be built in India, of which the first 16 aircraft will have 30 per cent indigenous content and the remaining 24 will have 60 per cent locally produced components.

ROTARY-WING FLEET

In the regime of the rotary-wing assets, the two major deals that are currently in the final stages of finalisation are for 22 Boeing AH-64D Apache Block III attack helicopters worth \$1.4 billion and for 15 CH-47F Chinook heavy-lift helicopters for \$1 billion. The Apache won against the Russian Mil Mi-28 Night Hunter that failed to meet a number of requirements during field evaluation and consequently withdrew from the race. The Chinook was pitted against the much larger Russian Mil Mi-26 which has a maximum take-off weight of 56 tonnes as against 22.6 tonnes of the former. However, as the Chinook can be transported aboard the C-17, an attribute that would facilitate its speedy deployment at distant locations, it was preferred over the Russian competitor.

FORCE MULTIPLIERS

In order to enhance operational capability of the fleet of combat aircraft without increasing numbers, the IAF is in the process of enhancing aerial refuelling capability through the induction of modern aerial tankers. In pursuit of this objective, through an open global tender, the IAF has selected the twin-engine A330 multi-role tanker transport (MRTT) aircraft, a new generation aerial tanker from Airbus Military. The A330 MRTT carries 111 tonnes of fuel and 30 tonnes of cargo. Employing the "probe-and-drogue" system as opposed to the "flying boom" system, the Airbus A330 MRTT can refuel in-flight aircraft of both Western and Russian origin. Also, as it has just two engines as against four on the IL-78 and employs far superior technology overall. The A330 offers a lower operating and life-cycle cost. Contract negotiations for the \$1.5 billion deal for six platforms, is likely to begin in the near future.

To strengthen aerial surveillance capability and provide a gap-free cover, the IAF has procured three Embraer 145 jets for \$210 million as the basic platform to serve as an airborne early warning and control system. The radar system with active array antenna unit and related sub-systems for these platforms, re-designated as Embraer 145i are being provided by the Centre for Airborne Systems, a laboratory under the Indian Defence Research and Development Organisation (DRDO). These platforms will be inducted into operational service once the developmental flight testing is completed after integration of systems with the airframe. **SP**



TEAMING UP WITH INDIA

ON DEFENCE AND SECURITY

For decades now, Saab has been supporting India's security goals as an active partner. Saab is a global, independent defence and security company and our longterm commitment to India includes R&D investments, customised solutions for the armed forces and extensive offset programmes. Today, we are reinforcing our operations, teaming up with Indian companies in order to support India as an emerging leader with global responsibilities.

We have made a long-term commitment to India's national security goals as a partner in developing an indigenous, self-sustaining defence industry of global dimensions. Saab's product offering to India includes cutting-edge technology for fighter aircraft, aeronautics, civil security, electronic warfare self-protection, as well as land and naval defence systems.





WE HAVE DRAWN UP VERY AMBITIOUS PLANS TO REVAMP OUR CAPABILITIES

Dr R.K. Tyagi, Chairman and Managing Director of HAL, in an interview with **SP's Aviation** gave out details of the state-owned enterprise's achievements.

SP's Aviation (SP's): What progress has Hindustan Aeronautics Ltd (HAL) made on indigenisation and self-reliance?

Dr R.K. Tyagi (CMD): HAL has always been very proud to be in the forefront contributing to India's defence preparedness and has contributed significantly towards indigenisation and self-reliance. HAL has been growing steadily over the years and it is the company's endeavour to achieve self-reliance in design and development and promote indigenisation in all related fields of aerospace. We have developed a robust supply chain and aerospace ecosystem across the country by providing requisite handholding to more than 2,400 suppliers across the country.

During the last decades, HAL has indigenously developed 15 types of aircraft and helicopters. Around 1,250 of these indigenous aircraft have been produced. The major aircraft/helicopters manufactured with indigenous design include Marut, Ajeet, Kiran MkI, Kiran MkII, HT-2, HPT-32, light combat aircraft (LCA), intermediate jet trainer (IJT) and the advanced light helicopter (ALH). The ALH is a 5.5-tonne class multi-role helicopter with modern design features. Helicopter production commenced in 2002 and more than 140 helicopters have been manufactured for various customers so far. A new variant of ALH suitable for high altitude operations by IAF and Army have been developed with a higher powered Shakti engine and several mission systems. The armed variant with air-to-air missiles, rockets and turret gun was delivered to Indian Army during Aero India 2013.

In addition to indigenously designed aircraft, HAL has produced 14 types of aircraft under licence. Aircraft in the current range of production are Su-30MKI, Hawk, Dornier Do-228 and Cheetah/Chetak. HAL's contribution to the armed forces by way of aircraft/helicopters and their maintenance is evident with the presence of HAL-built aircraft (both from indigenous design and licence manufacturing) in their existing fleet: fighter aircraft (80 per cent), trainers (93 per cent) and helicopters (65 per cent). The company is also involved in aircraft mid-life upgrades of Jaguar, MiG-27M, Dornier, Avro and Cheetah helicopter indigenously.

SP's: What has been achieved by HAL in the field of research & development (R&D)?

CMD: HAL believes that the key differentiator in today's warfare is home-grown platforms. In line with this belief, we continue to give thrust on R&D through increased funds allocation to the extent of around 10 per cent of our turnover. During the last one year, HAL has filed 149 patents and all across the technology spectrum, the figure has now gone up to 175.

SP's: What is the situation with regards to your efforts on modernisation?

CMD: HAL has embarked on modernisation and expansion

plan for its ongoing and new projects. New production units are planned with enhanced rate of production, reduced production cycle-times by incorporating several advanced defence aerospace technologies. We have drawn up very ambitious plans to revamp our capabilities and capacity. Key technologies like stealth, advanced sensors, highly integrated avionics suite, enhanced situational awareness, internal carriage of weapons, operational data link application, etc will be developed with the new co-development/co-production projects. The plan also includes bringing in critical and modern technologies in the areas of design, manufacture, maintenance and training by collaborating with leading technology suppliers across the globe through joint ventures. In the next five years, HAL has planned to invest more than ₹10,000 crore in modernisation and capacity augmentation.

SP's: What are your plans for the future?

CMD: HAL aims to achieve business excellence while pursuing its mandate of nation building. It has plans to add capacity to handle the future programmes like medium multi-role combat aircraft (MMRCA), fifth-generation fighter aircraft (FGFA), multi-role transport aircraft (MTA), light combat helicopter (LCH) and light utility helicopter (LUH), civil aviation aircraft and naval multi-role helicopter (NMRH). The LUH has gone past the design phase with successful realisation of the ground test vehicle. MTA has entered the conceptual design phase and the FGFA will be entering the detail design stage. These are encouraging signs for the future of aerospace in India.

SP's: What is the status of the Dhruv ALH project that understandably has been highly successful?

CMD: HAL designed, developed and produced Dhruv helicopters have been delivered to the Indian Army, Air Force, Navy and the Coast Guard as well as exported. The civil version of Dhruv has been certified by the Directorate General of Civil Aviation (DGCA) and delivered to the Oil and Natural Gas Corporation (ONGC), Jharkhand state government and the Border Security Force (BSF). The advanced technology features incorporated in the design of Dhruv include hinge-less main rotor and bearing-less tail rotor, integrated dynamic system encompassing main gear box and upper controls in a single housing, higher-powered Shakti engines, integrated architecture display system (glass cockpit), duplex automatic flight control system, redundancy with twin-engine, dual hydraulics and controls, 30 minute dry-run capability of gear boxes, crashworthy bottom structure, landing gear, crew seat and fuel tanks with self-sealing capability, extensive use of composite material on fuselage and rotor system, integration of role and optional equipment such as rescue hoist, stretchers and cargo-hook. **SP**

India and Rolls-Royce a powerful partnership



Rolls-Royce has had a long and proud history of partnership with the Indian Air Force since its establishment. We have powered many of its front-line aircraft and look forward to continuing this important relationship. Our partnership with Hindustan Aeronautics (HAL), continuous for 57 years, is equally significant. The success of these partnerships is founded on continuous development. In Rolls-Royce, we believe the development of technology, supported by a solid foundation of experience, makes a vital contribution to the future success of our customers and partners.

Trusted to deliver excellence.



Rolls-Royce

GAME CHANGER:
C-17 GLOBEMASTER III IN
IAF COLOURS



A LONG HAUL

For a few more years, the IAF's 17-strong fleet of Il-76 aircraft will continue to soldier on, possibly with a midlife upgrade, despite sharply reduced operational numbers. The 105 remaining An-32 aircraft are already undergoing a major upgrade. Still, they too will probably have to call it a day by about 2022. Where would that leave the IAF?

BY JOSEPH NORONHA

IN POPULAR PERCEPTION, AN air force's striking power flows only from its sharp, most visible and deadly component—combat aircraft. But in certain situations, the transport fleet, especially its strategic airlift component, may be quite crucial. Consider the situation that arose in 1988 in Male, a tiny island in the Indian Ocean more than 2,000 km from the southern tip of India. When a motley group of mercenaries tried to stage a coup, the Government of the Maldives appealed for help. Within 15 hours of the request, on the night of November 3, 1988, elements of 50 (Independent) Parachute Brigade based in Agra landed at Hulhule Airport, Male. The 400-strong contingent of para-commandos with equipment was airlifted by two Il-76MD four-engine strategic transport aircraft of the Indian Air Force (IAF). The commandos immediately secured the airport for reinforcements to be safely flown in, thus bringing the situation under control. The combat fleet was not called in.

Code named Cactus, this dramatic operation clearly highlighted the attributes of strategic airlift capability: respectable reach, heavy-lift and swift response. An operation of this kind might not have been possible just a few years earlier because the IAF's Il-76 aircraft were inducted only in 1985. The 43-tonne payload capac-

ity Il-76 jets as well as the 6.7-tonne payload An-32 medium-lift twin-turboprops acquired from early 1984 onwards were also copiously used in July 1987 during a massive airlift to swiftly establish, build up and sustain the Indian Peace Keeping Force (IPKF) in Sri Lanka.

Before 1984, the IAF's largest transport aircraft was the An-12 four-engine tactical turboprop of 1959 vintage with a payload capacity of 20 tonnes. Indeed, for most of its history since it was established in October 1932, the IAF has been a purely tactical air force. For many years after independence, the transport fleet was equipped with vintage planes like the C-47 Dakota, Fairchild C-119G Packet, de Havilland Canada DHC-4 Caribou, and later the An-12. The only new transport aircraft to be inducted in sizeable numbers was the Hawker Siddeley HS 748M Avro twin-turboprop of five-tonne payload capacity, licence produced by the Hindustan Aeronautics Limited (HAL).

Whenever the IAF was called upon for operational tasks, even verging on the strategic, it rose to the occasion with whatever assets it possessed. For instance, the sudden requirement in October 1947 to airlift an Army contingent to secure the improvised airfield at Srinagar and save it from being overrun by Pakistan-

supported militia was met by C-47 Dakotas, each of which could convey just 28 troops or 2,700 kg of load. And no fewer than 36 IAF transport aircraft, a mix of different types, were used in the airborne assault at Tangail in December 1971 that facilitated the Indian Army's march to Dhaka.

STRATEGIC LEAP FORWARD

That is why when the IAF's newest squadron, No. 81 Squadron 'Skylords', officially inducted the Boeing C-17 Globemaster III at the Hindon Airbase on September 2, 2013, it represented a quantum leap in strategic airlift capability. In the words of Defence Minister A.K. Antony, it was a "defining moment" for the IAF. The Chief of the Air Staff Air Chief Marshal N.A.K. Browne said, "The induction of ten C-17 aircraft promises to be a game-changer on how we conduct air transport operations. The C-17 fleet will provide tremendous flexibility in terms of operational response options in any future campaign." Government approval to buy the C-17 jets dates back to June 2011. The first aircraft landed in India on June 18, 2013, and so far, three have been received, the remaining seven are expected by November 2014. A follow-up order of six more C-17s is under consideration, making for a fleet strength of 16 aircraft by 2015-16.

The C-17, although over 20 years old, is still the most advanced strategic airlift aircraft in the world, thanks to Boeing's determination to keep pace with galloping technology. With its maximum payload of 75 tonnes, the plane can take-off from a 7,000-foot runway and land on a small, austere airstrip of just 3,000 feet length and 90 feet width. This impressive short-field performance is thanks to its four, fully-reversible Pratt & Whitney F117-PW-100 engines, each rated at 40,440 pounds thrust, coupled with an externally blown flap system that allows a steep, low-speed final approach and low landing speeds.

But it was the 2008 order for six Lockheed Martin C-130J Super Hercules aircraft that set the ball rolling for the long-overdue modernisation of the IAF transport fleet. The IAF is pursuing the induction of another six of these versatile planes. Although the four-engine C-130J turboprop is capable of all conventional military transport roles, its primary role is special operations, for which the IAF lacked dedicated aircraft so far. The plane can navigate with great accuracy even in pitch darkness at low level without the help of ground-based radio and navigational aids. It can operate from short, semi-prepared airstrips and has a range of 2,835 nautical miles without inflight refuelling.

THE NEXT DECADE

For a few more years, the IAF's 17-strong fleet of Il-76 aircraft will continue to soldier on, possibly with a midlife upgrade, despite sharply reduced operational numbers. The 105 remaining An-32 aircraft are already undergoing a major upgrade. Still, they too will probably have to call it a day by about 2022. Where would that leave the IAF?

Last month Boeing announced plans to close its long-running C-17 production line in late 2015. If the IAF hopes to acquire any more C-17 aircraft, it needs to act now. Boeing has proposed an advanced C-17 (previously designated the C-17B) as a future airlifter. Its design includes more powerful engines and an additional main landing gear to permit even shorter runway operations, but the US Air Force is yet to show interest in it. The only other Western option is the Airbus A400M.

IT IS IMPORTANT FOR THE IAF TO INDUCT SOME AIRCRAFT THAT BRIDGE THE GAP SO THAT PRECIOUS STRATEGIC AIRLIFT AIRCRAFT ARE NOT MISEMLOYED FOR TACTICAL TASKS

Since it is a new aircraft, it is likely to be flying for many more decades. With its 35-37 tonne payload capacity it can airlift armoured vehicles, but cannot lift as much as the IAF's older Il-76 or even half the load of the new C-17. From Russia, the Il-76MD-90A2 variant, also known as Il-476, which may eventually replace the current Il-76, might be a possible option. The Ukraine/Russia Antonov An-70 has also been under development for many years and may be in the market in the near future.

It is important for the IAF to induct some aircraft that bridge the gap so that precious strategic airlift aircraft are not misemployed for tactical tasks. The Indo-Russian joint venture multi-role transport aircraft (MTA) has been under consideration since 2007. The IAF's An-32 fleet is due to be replaced by 45 MTA around 2018 and more may be required. With its 15- to 20-tonne payload, the MTA would be capable of mainly tactical roles and a few strategic ones. However, the deal does not appear to be proceeding too smoothly.

At present, though practically obsolete, the HS 748M Avro continues in service with the IAF. A decision has been taken to induct 56 new aircraft (6- to 8-tonne class) as its replacement. While the initial 16 aircraft will be purchased outright, 40 must be manufactured in facilities to be established in collaboration with an Indian partner. But would such a small contract size attract private investors? A better choice might be from among several capable and proven aircraft in this category that are already operational around the world, like the Alenia C-27J Spartan, the EADS CASA CN-235 and the C-295. The smallest IAF transport aircraft with a sizeable fleet is the HAL-produced Dornier Do-228, a twin-turboprop light utility aircraft of 2.3-tonne payload capacity. About 40 are available and they are useful for communication duties and training.

NEEDED – STRATEGIC AND MORE

The current economic gloom cannot obscure the long-term growth trend of India's economy. It would be logical for the country's military and strategic capability to rise in tandem. A sizeable fleet of strategic airlift aircraft is necessary to meet the expanding roles envisaged for the IAF, so that it can confidently meet the full spectrum of contingencies that may arise in a potential area of interest that stretches from the Gulf of Aden to the Strait of Malacca. In addition, there may be need for special operations tasks as well as humanitarian assistance and disaster relief within or outside India. The requirement for a large body of security forces to be moved within the country at short notice is also a live possibility.

The IAF's strategic airlift capability has indeed come a long way over the last 80 years. However, its complement of modern aircraft, perhaps 16 C-17 Globemaster III and 12 C-130J Super Hercules, though eminently capable, may not be quite enough. While they would greatly enhance the IAF's strategic airlift and special operations capability, they would still constitute only a small fraction of the 220 aircraft that make up the transport fleet. Their induction cannot hide the sad fact that the bulk of this fleet is either obsolescent or obsolete and is in urgent need of replacement. The smaller day-to-day tasks that constitute most of any air force's flying commitments can only be met with tactical and utility transport aircraft, that right now in the IAF are a rapidly ageing and dwindling tribe. ■

NEW INNOVATIONS

The X2 technology is scalable to a variety of military missions including assault, armed reconnaissance, close-air support, combat search and rescue, and unmanned applications. This capability and the multi-role configuration of the S-97, makes it ideal to fulfil future military programmes by army, navy, marines, special forces worldwide, including India.



**INNOVATION
AT ITS BEST:**
SIKORSKY AIRCRAFT
X2 TECHNOLOGY
DEMONSTRATOR

SIKORSKY HAS A LONG history of innovation, starting with the invention of world's first practical helicopter. In keeping with its tradition, Sikorsky set out to accomplish a key performance objective in the next-generation of helicopters: a high cruise speed without compromising vertical take-off capability, as historically, vertical flight has required a compromise between hover performance and forward speed.

To overcome this challenge, Sikorsky has developed the X2 technology which combines a counter-rotating coaxial rotor, in place of one main rotor and a tail rotor, with a suite of integrated technologies. The X2 technology includes innovations such as an integrated fly-by-wire system that allows the engine/rotor/propulsion system to operate efficiently, with full control of rotor rpm throughout the flight envelope; high lift-to-drag counter-rotating rigid rotor blades; low drag hub fairings, active vibration control and an integrated auxiliary propulsion system.

The X2 technology allows a helicopter to cruise comfortably at 250 knots (460 kmph) while retaining such desirable attributes as excellent low speed handling, efficient hovering, and a seamless and simple transition to high speed. Current generation of helicopters have maximum speeds of 135/150 knots (248/277 kmph).

The Sikorsky Aircraft X2 technology demonstrator team has been named the winner of the 2010 Robert J. Collier Trophy, which is awarded annually to recognise the greatest achievements in aeronautics or astronautics in USA. The X2 technology

design is scalable for a variety of rotorcraft sizes and applications and opens up new possibilities for the industry.

The helicopter being developed on this platform is the S-97 Raider. The S-97 Raider affords low single pilot work load, low vibration and low acoustic signature, in addition to the enhanced cruise speed of 250 knots.

The S-97 Raider helicopter prototypes will feature twin coaxial counter-rotating main rotors and a pusher propeller. In addition to flying at nearly twice the speed of a conventional helicopter, the S-97 Raider prototype aircraft will incorporate other key performance parameters critical to combat operations — increased manoeuvrability, greater endurance and the ability to operate at high altitudes. Compared with other light military helicopters, the S-97 Raider prototypes would significantly reduce turning radius, while appreciably increasing the aircraft's payload, flight endurance and hot and high hover capability.

Furthermore, the X2 technology is scalable to a variety of military missions including assault, armed reconnaissance, close-air support, combat search and rescue, and unmanned applications. This capability and the multi-role configuration of the S-97, makes it ideal to fulfil future military programmes by army, navy, marines, special forces worldwide, including India.

Sikorsky is investing into other futuristic requirements as well, like optionally piloted helicopter with one pilot or no pilot and the X2 technology, and believes that the speed bar can possibly go up to 300 knots (550 kmph). **SP**

NEW TOOLS FOR NEW RULES



HPS GEN II
Day & Night



HPS GEN II
Symbology



Other Pilot LOS

HPS GEN II The HMD Solution for all Indian Helicopters

The new HPS GEN II gives helicopter pilots invaluable advantages. It enables each pilot to monitor and follow the other pilot's Line of Sight (LOS) and slave helicopter systems to it, thus reducing pilot intercommunication and workload. New 3D conformal symbology allows sorties to be carried out in Degraded Visibility Environment (DVE) when outside-cockpit vision is limited.

The HPS GEN II takes crew communication, coordination, situational awareness and flight safety to new levels.

Elbit Systems

NEXT IS NOW®

www.elbitsystems.com

UNDERSTANDING FORCE MULTIPLIERS



EYE IN THE SKY:
EMBRAER EMB 145
AEW&C AIRCRAFT

In the context of the IAF, acquisition of force multipliers took time but the pace has picked up in the last few years. Force multiplier technologies such as the AWACS and air refuellers are vulnerable and as their presence is a force multiplier, the loss of even one of those can severely degrade combat capability. This needs to be factored in during planning for operations.

BY GROUP CAPTAIN (RETD) B. MENON

FORCE MULTIPLICATION IN THE context of the military is the enhancement of capabilities of a force achieved by a combination of attributes without increase in the size of the force. A fallacy exists that expensive technology and the gadgets it spawns is the only force multiplier option. Training, experience, morale, motivation, strategy, innovative tactics and deception are all force multipliers. Force multipliers have existed long before the term was coined. High levels of training, esprit de corps, experienced leadership and innovative tactics turned armed rabble into the deadly armies of the Greeks, Romans and Mongols. The horse, the wheeled chariot and the elephant, with the mobility plus shock effect they projected, the standoff range of the long-bow, the musket and the cannon, all were force multipliers. Air power itself in that sense is a force multiplier.

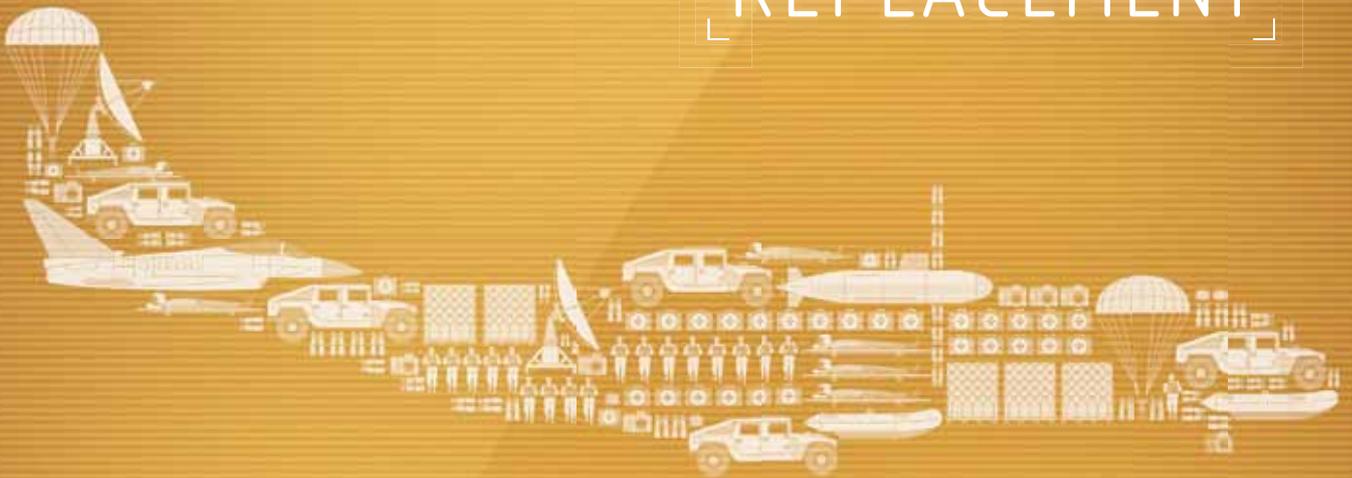
In the context of the Indian Air Force (IAF), acquisition of force multipliers took time but the pace has picked up in the last few years. The earlier obsession with high performance aircraft, often to the neglect of other systems such as precision-guided munitions (PGMs), night and all-weather operational capability, command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) is now history.

AIRBORNE WARNING AND CONTROL SYSTEMS (AWACS)

AWACS are basically radars, sensors and communications equipment, integrated and mounted on airborne platforms. The advantages of elevating the system are increased range with no terrain masking and reduced vulnerability by virtue of being airborne. Mobility of the platform facilitates deployment to distant locations and the position changes dictated by changes in tactical situations. Area air defence, which is critical in this era of long-range standoff air-to-ground weapons of enormous destructive potential, can only be really effective with AWACS. This makes it a prime force multiplier, enhancing the effectiveness of coverage while increasing the effectiveness of the combat aircraft. The AWACS helps fully exploit the capabilities of combat aircraft as it enables them to operate in a stealthier passive radar mode with the AWACS at the rear providing target information and even target tracking for missile guidance. Airborne battlefield management systems such as the US JSTARS are an extension of this concept.

The IAF inducted its first system based on the Russian IL-76 (A50 EI) four-engine jet aircraft in 2009. A smaller system based on the EMB 145 militarised version of the Brazilian Em-

THE TRUSTED PARTNER FOR THE AVRO REPLACEMENT



PERSONNEL



MILITARY PALLETS



MEDICAL SUPPLIES



SEARCH AND RESCUE



PARATROOPS



MILITARY VEHICLES



MEDICAL EVACUATION

C295



The C295 is optimised for personnel and cargo transport, paratroop airdrop and medical evacuation; and is an efficient complement to heavy airlifters. Proven in rough airstrips, hot and high conditions. The C295 does what the HS-748 Avro does, but with a lot more capability, flexibility and reliability! After 150,000 accumulated flight hours, the C295's higher utilisation rates and availability over similar aircraft mean it's proven to be simply more efficient. Therefore it has become the transport solution of choice in 16 countries. For daily transport missions, Airbus Military is your trusted partner.

 **AIRBUS MILITARY**

airbusmilitary.com

braer ERJ 145 twin-engine passenger jet has been acquired by the IAF and is in the process of development.

AIR-TO-AIR REFUELLING

This range extender is a potent force multiplier. All types of aircraft have the option of getting airborne with maximum load with minimum fuel and refuelling in the air to substantially extend range. Options for launch from secure bases deep inside own territory exist. This reduces the vulnerability of launching combat aircraft from exposed forward bases. Having air defence, strike aircraft and other assets on airborne readiness without fuel state worries, reduces response time significantly.

The IAF first inducted the Russian IL-78 tanker aircraft in 2003. Plans to induct the larger capacity Airbus A330 multi-role tanker transport (MRTT) based on the Airbus A330 wide-body long-range twin-passenger jet are progressing albeit slowly. In accordance with a policy decision, all future aircraft acquisitions will have in-flight refuelling capability.

PRECISION-GUIDED MUNITIONS

Weapon delivery accuracy is perhaps the most important ingredient in combat operations. Even a near miss is as good as a mile. Errors are generated by environmental considerations, altitude, variations in release parameters, aiming system inaccuracies and operator induced errors. Unguided weapons cannot correct such errors. Training reduces but does not eliminate operator errors. In combat, ideal release conditions will almost never be met. A classic case was the Thanh Hóa Bridge in North Vietnam that could not be destroyed even after 800 sorties using unguided bombs. Finally, a 12-aircraft mission with eight planes using first-generation laser-guided bombs destroyed one of the spans and another two similarly equipped smaller missions destroyed the bridge completely.

PGMs provide high accuracy and far larger release envelope. In air combat, the primary weapon is the guided missile and the same is the case with surface-to-air weapons. Even surface-to-surface weapons are now PGMs. The IAF received the first-generation infrared guidance air-to-air missile, the K-13, along with the MiG-21 in 1963. The SA-2 Dvina surface-to-air missile system came next. Air-to-ground PGMs came in much later. A guidance kit on an older generation aircraft along with a kit strapped on to an unguided bomb can make it a PGM. The Gulf War demonstrated the effectiveness of PGMs. Faced with more lethal ground-to-air weapons with longer ranges, weapon delivery distances have increased considerably and only PGMs have any chance of hitting targets with high degrees of accuracy. Compared to the cost of aircraft, PGMs are by far cheaper. The PGM thus is a formidable force multiplier.

ALL-WEATHER AND NIGHT CAPABILITY

Till the mid-1990s, the IAF had rather limited night and adverse weather combat capability especially in the air-to-ground role. The MiG-23/27, Jaguar and Mirage had a night capability, but it was constrained till acquisition aids and PGMs arrived on the scene. Night strike with unguided weapons is limited in its effectiveness except against soft-skinned and large targets. With ground forces acquiring night fighting capabilities, combat aircraft also need these capabilities. This holds true for transport and helicopter operations as well. The newer generation aircraft of the IAF now have the ability to operate at night and in adverse weather with target acquisition devices and PGMs along with new-generation electronic navigational aids. This ability is a force multiplier.

RECONNAISSANCE AND UNMANNED AERIAL VEHICLES (UAVS)

Locating the enemy is a pre-requisite for combat operations. Planning and force allocation are all dependent on reconnaissance to identify targets even before hostilities commence. Reconnaissance in the IAF was earlier undertaken by manned aircraft, some dedicated to the role and others with add-on kits. Reconnaissance kits are now in use giving this capability to most of the newer fighter acquisitions. Satellites and UAVs have largely replaced manned platforms in the dedicated reconnaissance role in the IAF, the former especially for strategic intelligence gathering.

Unmanned systems give a measure of plausible deniability in case the platform is destroyed over hostile or neutral territory and is a vital peacetime tool also. The IAF is now entering this league with satellite-based surveillance capability and a growing UAV fleet. The IAF is likely to induct unmanned aerial combat vehicles (UACVs) as the next step. The IAF already has the Israeli Aircraft Industries (IAI) Harop which is a small “kamikaze” UAV that destroys targets by diving into them. UAVs and UACVs are systems for use in high-threat environment and in situations where use of manned aircraft may escalate a low-intensity situation into all-out war. Reconnaissance platforms and UAVs are force multipliers.

STEALTH, ELECTRONIC COUNTERMEASURES, CAMOUFLAGE AND DECEPTION

Stealth decreases the vulnerability of a weapon system and so increases its effectiveness. Electronic countermeasures (ECM) degrade the effectiveness of enemy sensors and weapons guidance systems. The IAF has had some ECM capabilities for a few decades with few aircraft modified exclusively for this role. With the induction of the Jaguar and Mirage-2000, add on kits were procured to give ECM capabilities when required to almost any aircraft in these fleets. The Su-30MKI also has this capability.

Deception and camouflage are tools and when properly executed can be a force multiplier. In fact, some of the defensive self-protection suites on IAF aircraft use decoys. Stealth capability itself is a form of deception. With the fifth-generation fighter aircraft project materialising, the IAF will enter into the stealth arena.

OTHER ASPECTS

Training, leadership and experience are great force multipliers that have very often turned ill-equipped forces into lethal entities. Morale is another potent factor. However, unlike technological force multipliers, there is a downside to these. The danger is that inadequate training, poor leadership and low morale will rapidly degrade capabilities of a military organisation. No amount of hardware and technology can compensate for it.

Tactics and innovations, including out-of-the-box thinking, have made huge differences to the outcome of military conflicts. A simple innovation of reducing the turnaround time between sorties enhanced the effectiveness of Israeli Air Force fighters and was a critical force multiplier. Military organisations the world over sometimes discourage innovative thinking. One must remember that the birth of the air force as a distinct entity and the development of air power were products of such thinking in the face of stiff opposition.

In the Indian context, the establishment of institutions like the Tactics and Air Combat Development Establishment in the early 1970s brought about qualitative change in combat effectiveness.

Force multiplier technologies such as the AWACS and air refuellers are vulnerable and as their presence is a force multiplier, the loss of even one of those can severely degrade combat capability. This needs to be factored in during planning for operations. ■ SP



PHIL SHAW
CHIEF EXECUTIVE,
LOCKHEED MARTIN
INDIA

A DEVELOPING PARTNERSHIP

Lockheed Martin continues to engage with the IAF to understand customer requirements and offer relevant capabilities and solutions that are, like the C-130J, proven and without equal

THE YEAR 2008 MARKED a watershed in Indo-US relations with India placing an order for six C-130J Super Hercules four-engine military transport aircraft, the first military purchase from the US in four decades through a foreign military sale (FMS) agreement between the Governments of the US and India. All six C-130J Super Hercules aircraft were delivered to the Indian Air Force (IAF) in 2010 and 2011 under budget and ahead of schedule. The IAF officially began its C-130J operations in 2011.

The Indian Government then issued a letter of request for an additional six C-130J aircraft to which the US Government has responded with a letter of offer and acceptance. The process for finalising the order between the two governments is at an advanced stage. Recently, the Indian Ministry of Defence has accorded approval for the follow-on order.

This contract was India's first experience with the C-130 and the total purchase package was comprehensive. The contract included the six aircraft, aircrew and maintenance technician training, spare parts, ground support and test equipment, servicing carts, forklifts, loading vehicles, cargo pallets and a team of the US technical specialists based in India during a three-year initial support period. Also included in the package was India-unique operational equipment designed to increase special operations capabilities.

The C-130J is ideally suited to India's mission environment which often involves operating out of austere, high-elevation airstrips, semi-prepared surfaces and temperature extremes. The C-130J is powered by four Rolls-Royce AE2100 turboprop engines and Dowty six-bladed propellers that provide the aircraft tremendous power.

The IAF's C-130J Super Hercules aircraft feature a highly integrated and sophisticated configuration primarily designed to support India's special operations requirements. Equipped with an infrared detection set (IDS), the aircrew can perform precision low-level flights, airdrops and landings in blackout conditions. Self-protection systems and other features were included to ensure aircraft survival in hostile air defence environments. The aircraft is also equipped with air-to-air receiver refuelling capability for extended range operations. The IAF's fleet of six combat delivery C-130Js is operated by 77 Squadron at the Air Force Station, Hindon.

The IAF may be one of the newest C-130J Super Hercules operators, but lately, it's been one of the busiest, especially this past summer. The IAF has shown tremendous confidence in the C-130J utilising and showcasing its capabilities in various adverse situations. In June, the IAF



QUICK & EFFICIENT: C-130J EVACUATED 244 PEOPLE STRANDED IN UTTARAKHAND

deployed one of its C-130J to evacuate 244 people stranded in Uttarakhand by the devastating floods in the area. In August, an IAF C-130J was in the news again when a Veiled Vipers squadron crew landed a Super Hercules at Daulat Beg Oldie airstrip.

The C-130 Hercules knows austere airstrips. The rugged workhorse was designed to handle landing in the dirt and has done so successfully for almost 60 years. But the landing at Daulat Beg Oldie took austere to a new level, literally. Daulat Beg Oldie's dirt runway has the distinction of being the world's highest airstrip, located at 16,614 feet in a remote area of the Himalayan mountains. This landing marked the first time any aircraft in this weight class had landed at Daulat Beg Oldie. It's certainly a record for the Veiled Vipers crew operating the aircraft and a new mark for the worldwide C-130J fleet.

Making history isn't new for the IAF's C-130Js. In 2011, one of IAF Super Hercules fleet's first missions was a deployment to support relief operations in Sikkim after the massive earthquake in the treacherous Himalayan mountain region. This marked the first time a C-130 had ever landed in the region. From the highest of heights to the wettest of floods, IAF crew show that India's six C-130Js are ready for any mission, anywhere, anytime.

Lockheed Martin continues to engage with the IAF to understand customer requirements and offer relevant capabilities and solutions that are, like the C-130J, proven and without equal. **SP**

THE C-130 HERCULES KNOWS AUSTERE AIRSTRIPS. THE RUGGED WORKHORSE WAS DESIGNED TO HANDLE LANDING IN THE DIRT AND HAS DONE SO SUCCESSFULLY FOR ALMOST 60 YEARS.

RAFAEL'S HIGH-TECH AIR DEFENCE SYSTEMS

The company is steadily growing internationally with orders totalling \$2.4 billion and sales of \$1.8 billion for 2012



ISRAEL'S SECOND LARGEST GOVERNMENT-OWNED defence company—Rafael Advanced Defense Systems Ltd, designs, develops, manufactures and supplies a wide range of high-tech defence systems for air, land, sea and space applications. Rafael's know-how is embedded in almost all Israel Defense Forces (IDF) systems in operation today. The company is steadily growing internationally with orders totalling \$2.4 billion and sales of \$1.8 billion for 2012.

Rafael has a slew of air defence systems, some of which it exhibited for the first time in its entire portfolio of aerial solutions and systems at Aero India 2013 in Bengaluru. The versatility of the systems has captured the imagination of the international community.

Iron Dome is an air defence system to counteract short-range ballistic threats. Developed in less than three years, Iron Dome has in the last two years intercepted over 500 rockets that were fired into Israel from the Gaza Strip, with a success rate of over 80 per cent.

Spyder, or the Scientific Python Development Environment, is a quick reaction, low level surface-to-air missile system designed to counter attacks by aircraft, helicopters unmanned aerial vehicles (UAVs) and precision-guided munitions. The system provides effective protection of valuable assets, as well as first-class defence for forces located in the combat area. Spyder incorporates Rafael's most advanced, proven performance air-to-air missiles—the Derby active radar (RF) missile and Python-5, a dual waveband Imaging Infra Red (IIR) missile. The Spyder family includes Spyder-SR (short range) and Spyder-MR (medium range) systems.

David's Sling is an affordable and lethal solution against long-range artillery rockets (LRAR), short-range ballistic missiles

(SRBM), cruise missiles (CM) and traditional air defence threats. The system provides optimum protection for the homeland as well as forward deployed forces. David's Sling is in development by Rafael, in partnership with Raytheon USA. The system has already completed its first successful full interception test.

Python-5 is a fifth-generation air-to-air missile that provides the pilot engaging an enemy aircraft with a full sphere launch capability. It can be launched from very short to beyond-visual ranges (BVR) with greater kill probability, excellent resistance to countermeasures, irrespective of evasive target manoeuvres or deployment of countermeasures. It is also offered in an air defence configuration and its features include excellent acquisition and tracking performance; target lock-on-before and after launch capability and greater probability of kill.

Derby is an active radar air-to-air missile that provides fighter aircraft with outstanding and effective performance in both short ranges and BVR intercepts. The missile enables operational flexibility and multi-shot capability and can be launched at an enemy aircraft day or night and in all-weather conditions. It offers excellent performance and manoeuvrability in both medium- and short-range engagements. The missile is also offered in an air defence configuration and its features include—active radar seeker, look down/shoot down capability, lock on before launch mode for tight dogfights and lightweight.

Barak is a mature, operational anti-missile point defence naval surface-to-air missile system, designed to protect combat vessels against sea skimming missiles and aircraft threats. Barak is effective against highly manoeuvring, supersonic and low-altitude threats, as well as low radar cross section (RCS) targets. It is also effective against a full variety of free space threats. It is designed to engage multiple targets simultaneously. **SP**

Sikorsky S-70B SEAHAWK helicopter



Protecting us, whatever may come. One Powerful Idea.

Battle-proven technology. State-of-the-art equipment.

Anti-submarine and anti-surface mission solutions. The S-70B SEAHAWK® variant of the famed Sikorsky BLACK HAWK is the world's most capable maritime helicopter in service today.



United Technologies

United Technologies is committed to building a better India – today and tomorrow.



OTIS



PEOPLE FIRST MISSION ALWAYS

The IAF strives to develop human management as a verifiable, objective and transparent process, comparable in quality and output to the most advanced models in place

BY AIR MARSHAL (RETD) ANIL CHOPRA



BOOSTING MORALE: AIR CHIEF MARSHAL N.A.K. BROWNE INTERACTING WITH AIRCREW

ON TAKING OVER AS the Chief of the Air Staff, Air Chief Marshal N.A.K. Browne gave the Indian Air Force (IAF) a vision statement “People First Mission Always”. It underscored the importance that he placed on human resource in the IAF. The man/woman behind the machine is the pivot who would eventually decide the outcome of any operational endeavour. Coupled with the technology leap that the IAF is at present undergoing, it is therefore essential that they train the air warriors into professionals who can exploit the new systems to achieve the desired operational goals. There are processes spanning the functions of recruitment, training and developing the individual into a skilled next-generation air warrior who can excel in a high technology battlefield.

INDUCTION AND BRAND IAF

IAF faces similar challenges that any expanding high technology force faces. With the dawn of the information age and an expanding economy, personal aspirations have grown. Therefore, finding a perfect match between organisational and personal aspirations is one of the major challenges in the development of human resources. Indoctrination of service ethos and providing the air warriors with the skills and knowledge to operate and maintain modern systems is the main focus and is given constant attention. The IAF builds capability to adapt those to the rapidly changing aerospace environment. To ensure that the best join the IAF, the “Brand IAF” is being systematically projected across the country. Specially focused recruitment ral-

lies are conducted in low catchment areas to make the IAF a homogenous service. Motivational lectures are held in colleges and career fairs are organised around college clusters in big cities. Social media, including bulk SMS and e-mail communication are employed to target the youth. 'You Tube' is being used to upload motivational videos. Digital cinema halls, FM channels, news channels, magazines and newspapers are used to educate the young about the IAF in a big way. Over 50 lakh hits are registered daily on the IAF banner on jobs portal. The IAF is thus able to reach out to a large section of the youth in the country. With the number of applicants to join the officer cadre increasing to nearly three lakh, the IAF is setting up two additional Air Force Selection Boards. Similarly, for the airmen, two additional Airmen Selection Centres are being created. Applications can now be made online. The selection procedure has also been rationalised with the introduction of the 'Air Force Common Admission Test' (AFCAT). The IAF is currently short of approximately 800 officers. Training capacity at the Air Force Academy is being enhanced from the present 480 cadets to 750.

TRAINING

Air warriors today operate complex technological systems with near zero levels of error tolerance. Hence, there is a need to raise the training standards to the level mandated by modern inductions. IAF procured the Pilatus PC-7 Mk II recently for basic stage training. Stage II fighter training remains on the Hindustan Aeronautics Ltd (HAL)-built Kiran aircraft while the IAF awaits indigenous intermediate jet trainer (IJT) under development with HAL. The BAE Hawk advanced jet trainer (AJT) is used for advanced jet training. Helicopter and transport pilots train at Hakimpet and Yelahanka respectively. The government has already approved setting up of the Air Force Engineering College, which would help create a dedicated pool of engineers, specially groomed for the IAF. In respect of airmen training, trades have been restructured for optimal utilisation and also in consonance with the maintenance philosophy of the new systems being inducted. On the job training (OJT) has been introduced at all units to ensure air warriors get practical training in their respective trades. In-service courses are conducted at various seniority levels. To inculcate a habit of 'self-education' amongst the personnel, e-subscription of books and magazines are available on the Air Force Net in the station libraries.

The Centre for Leadership and Behavioral Studies (CLABS) conducts regular capsules on leadership at various IAF stations and during the 'in-service' courses. Additionally, leadership seminars are conducted regularly. Leadership courses have also been introduced for the airmen so that they become effective supervisors and leaders.

HR ISSUES

Career growth and motivation are requirements of the individual and the organisation. Officers are made aware of their performance at regular intervals, are guided about their growth in the organisation, and the system is fairly transparent. To ensure objectivity in criteria selections, the selection of officers is carried out by a panel of officers based upon merit, calibre and demonstrated performance. Officers are given an 'appraisal report feedback' at specified years of service and also a 'performance review' is carried out every quarter. Career progression pamphlets for all branches of the IAF are routinely updated and disseminated. The IAF's appraisal system has been appreciated by many other government departments.

The HR branch of the IAF has an intensive outreach programme through personal interaction, website posts and vari-

ous newsletters. Interactive HR seminars are conducted across Commands. Officers from the personnel directorate visit various stations and interact with air warriors. Personnel are encouraged to share their problems and aspirations through e-mail with the personnel branch for better career management. E-mail IDs of key appointments in the personnel branch are available in the public domain. There is also an open forum where personnel can post views and the responses can be read by all. The feedback helps the HR managers introduce policy changes in line with IAF's vision statement.

STRESS MANAGEMENT

The incidents of suicide and other stress-related issues are under close watch at all levels. Professional counsellors have been employed at all Air Force stations. Studies are routinely carried out to identify the stress inducers and personality traits to help cope with the inherent/perceived stresses of military life. Regular interaction between the men and officers through informal gatherings and organised sports activities are encouraged. A few air warriors have been trained as mentors to guide the newly enrolled personnel. Also 24x7 helplines have been set up. In order to create a system of structured informality and to increase interaction among all ranks, Air Chief Marshal Browne has introduced a concept of 'Cohesion Day', a day on which all ranks get together and participate in team activities related to work and sports. It serves as a forum for exchange of ideas and interactions with other branches for a better understanding of work-related issues and also in developing stronger bonds and camaraderie.

Efforts are continuously on to improve the standard of living of personnel based on changes taking place in society. Scales of accommodation have been revised recently. Educational facilities in Air Force Schools are being improved with the introduction of smart classrooms and use of Internet. A memorandum of understanding (MoU) with the Indira Gandhi National Open University (IGNOU) for 'Project Akashdeep' allows recognition of basic and in-service training imparted to the Airmen and NCs(E) for award of certificates, diplomas and associate degrees. MoUs with many other universities has resulted in allotment of seats for Air Force personnel at preferential fee structure.

The IAF appreciates the need to take care of retired personnel as they often face hardships on many issues. The IAF has thus set up a separate single portal under the aegis of 'Directorate of Air Veterans' to provide composite support to Air Veterans on pension benefits and other welfare issues. Handbooks on pensioners' benefits are prepared and distributed. An Air Force Placement Cell helps retired personnel in their resettlement.

Sustained effort and focus are required to achieve the desired standard of training, operational prowess, maintenance culture and administrative acumen to prepare the next-generation air warrior. The 'Brand IAF' has to be continuously strengthened to secure 'first-option' priority to attract quality manpower. Vocational training and productive resettlement have also to be proactively addressed. Proactive measures to integrate IAF personnel and the civilian workforce in certain sectors of the industry, such as defence production and R&D, would go a long way in military-civil integration and interchange of work ethics. The IAF plans to continuously revamp the HR model, wherein benchmarking of work output, accreditation of professional training while in service and total objectivity and transparency in individual assessment, would continue to be key result areas. The IAF strives to develop human management as a verifiable, objective and transparent process comparable in quality and output to the most advanced models in place. ■



DENNIS SWANSON
VICE PRESIDENT,
BOEING DEFENSE, SPACE &
SECURITY, INDIA

RELATIONSHIP GOING STRONG

With the recent deliveries of military aircraft such as the C-17 Globemaster III strategic airlift aircraft and P-8I maritime reconnaissance and anti-submarine aircraft, Boeing has begun to play a significant role in the mission-readiness and modernisation of the Indian armed forces

INDIA IS ONE OF the top countries for Boeing internationally in terms of market potential as well as the ability to harness the talent, innovation and aerospace capabilities that exist in the country. Boeing has steadily increased its presence in India over the last 70 years in both commercial and defence markets to bring the best of Boeing to India and the best of India to Boeing.

With the recent deliveries of military aircraft such as the C-17 Globemaster III strategic airlift aircraft and P-8I maritime reconnaissance and anti-submarine aircraft, Boeing has begun to play a significant role in the mission-readiness and modernisation of the Indian armed forces. The first P-8I maritime surveillance and anti-submarine warfare aircraft was delivered to the Indian Navy in 2013, with seven more deliveries due by 2015. The P-8I is an India-unique variant of the US Navy's P-8A Poseidon, which has been developed on the Boeing 737-800 platform. The Indian Government purchased eight Boeing P-8I long-range maritime reconnaissance and anti-submarine aircraft in a contract signed in January 2009.

India's Ministry of Defence signed an agreement with the US Government in June 2011 to acquire ten Boeing C-17 Globemaster III aircraft. Three of these have already been inducted into the Indian Air Force (IAF) this year and the remaining seven aircraft will be delivered by 2014. Procurement of the ten C-17 Globemaster III for the IAF is the largest defence contract signed by the Indian Government with the United States Government.

Boeing's defence portfolio also extends to AH-64D Apache attack helicopters, CH-47F Chinook heavy-lift helicopters, Harpoon missiles, unmanned systems, security solutions, airborne early warning and control systems, support and services and network-centric operating systems.

In the regime of industrial cooperation, Boeing is collaborating with India's public sector companies like the Hindustan Aeronautics Ltd (HAL), Bharat Electronics Ltd (BEL) and Electronics Corporation of India Limited (ECIL) as well as major private sector companies like the Tata Group, Larsen & Toubro, Dynamatic Technologies and Avantel. These industrial partners and suppliers are raising the bar to deliver world-class quality by imbibing the best practices, and apart

from driving efficiency and productivity are becoming an important part of the company's worldwide supply chain for some of the most advanced aircraft in the world.

Boeing's relationship with HAL began in 1991, when the Indian aerospace major became the single-source producer of 757 over-wing exit doors. HAL manufactures the 777 gear up-lock box, 777 flaperons, F/A-18 gun-bay doors, F/A-18 wire harnesses; P-8I weapons bay doors, P-8I tail cones and P-8I identification friend-or-foe transponders.

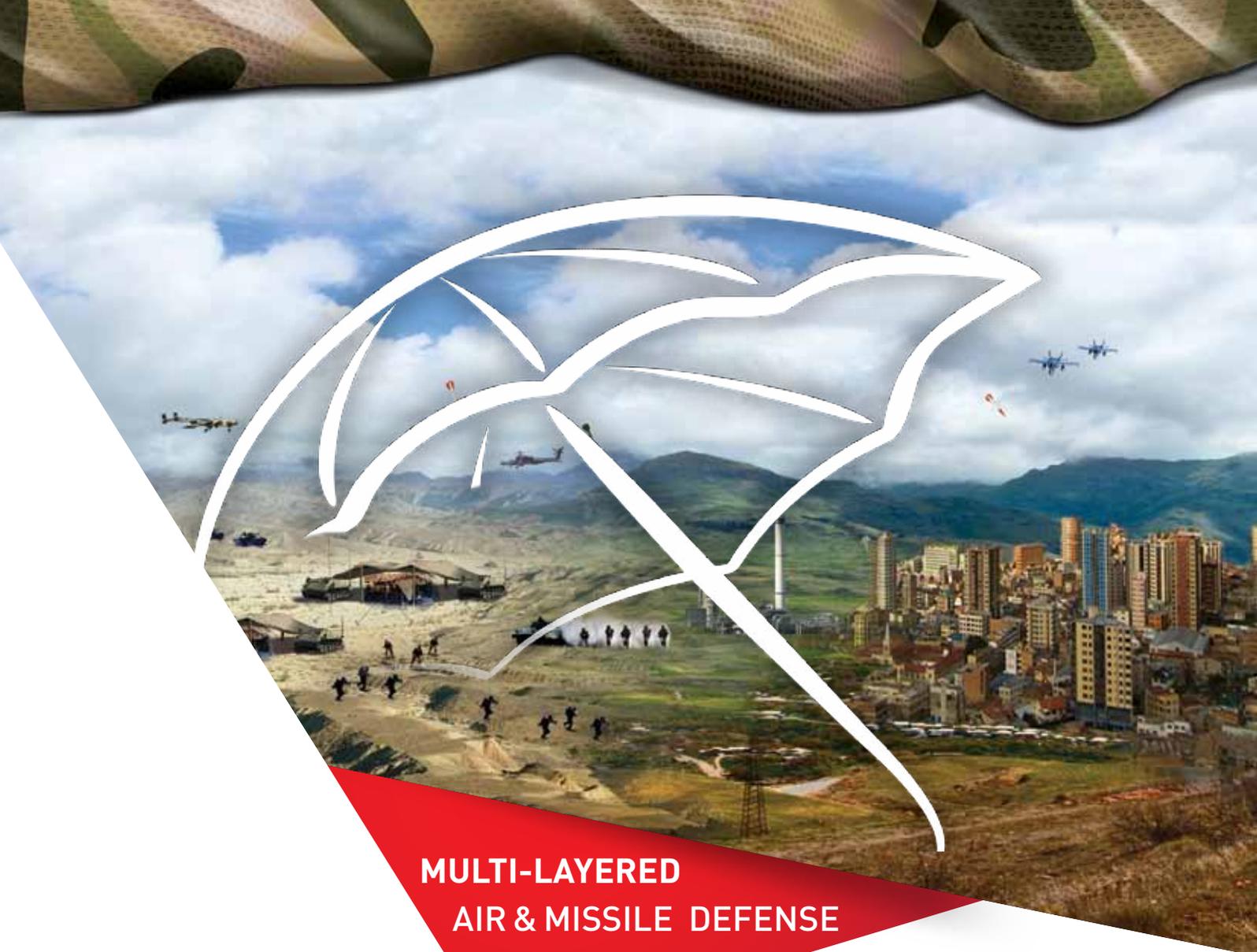
BEL has delivered the Indian-designed Data Link II for the P-8I, a communications system that will enable exchange of tactical data and messages between the Indian Navy aircraft, ships and shore establishments. BEL has also delivered the identification friend-or-foe interrogator, a battle management system that will enable P-8I aircraft to identify friendly aircraft and forces. Finally, BEL is on contract to provide F/A-18 flight deck cockpit panels.

Boeing opened the Boeing Analysis & Experimentation Centre (A&E Centre) in partnership with BEL in February 2009. Based in Bengaluru, the centre provides defence experimentation and decision support services to understand the future war-fighting needs of the Indian armed forces. The centre is staffed by former Indian military personnel along with modelling and simulation engineers from Boeing. ECIL provides the speech secrecy systems for the P-8I.

In addition to defence public sector undertakings, private companies play a large role in Boeing's industrial strategy. Dynamatic Technologies and Tata Advanced Materials Limited (TAML) have already delivered P-8I power and mission equipment cabinets. TAML is also on contract to provide P-8I auxiliary power unit door fairings. Dynamatic Technologies also manufactures the aft pylon and cargo ramp assemblies for Boeing's CH-47F Chinook. Avantel delivers the mobile satellite systems for the P 8I. Maini and TAL Manufacturing Solutions are on contract to provide ground support equipment for the C-17 Globemaster III.

Going forward, we remain focused on executing our programmes, working closely with our customers on their defence and security priorities as well as on expanding our partnerships with the Indian industry. [SP](#)

**IN ADDITION TO DEFENCE
PUBLIC SECTOR
UNDERTAKINGS, PRIVATE
COMPANIES PLAY A LARGE
ROLE IN BOEING'S INDUSTRIAL
STRATEGY**



**MULTI-LAYERED
AIR & MISSILE DEFENSE**

**Effective protection against all
airborne threats**



SPYDER-MR



SPYDER-SR



MIC4AD

SPYDER FAMILY – Mobile and stationary integrated air defense systems against all airborne threats.

MIC4AD – Modular integrated C4I system – commands and controls the operation of both air and missile defense missions.



www.rafael.co.il



FILLING THE GAP

The evolution of flying training in the IAF in the last 30 years has unfortunately been afflicted with inclination to gloss over problems, short-term fixes, delayed decision-making and at times, lack of clarity on the optimum vs the possible. The malaise has affected all stakeholders including the service, the aerospace industry and the bureaucracy.

BY GROUP CAPT (RETD) B. MENON

In the 1960s, flying training in the basic stage or Stage I was carried out on the single-engine HT-2 aircraft designed and built by the Hindustan Aeronautics Limited (HAL). In the intermediate stage or Stage II, training was carried out on the more powerful single-engine North American T6G Texan and its Harvard II variant. Trainees completing Stage II successfully were trifurcated into fighter, transport and helicopter streams and were trained in the advanced stage or Stage III on the De Havilland Vampire T-55 twin-seat jet trainer and F-52 single-seat fighter variants, the Dakota DC-3 twin-engine transport aircraft and the Bell-47G2 light utility helicopter for fighter, transport and helicopter streams respectively, before joining operational squadrons. Subsequently, the Alouette-III Chetak replaced the Bell-47 and the Hawker Hunter was introduced in the applied stage for the fighter stream. On withdrawal from service, the Hunter was replaced by the MiG-

21. With the phasing out of the Dakota, the HS-748 twin-engine medium capacity turboprop aircraft and the smaller twin-engine Dornier-228 were introduced for the transport stream. Later on, the AN-32 was inducted to augment the Avro fleet in Stage III.

With the phasing out of the T6G/Harvard, the HJT-16 Mk I Kiran aircraft was inducted for Stage II training. When the Vampire was phased out in the early 1970s, the Polish Iskra was inducted as a replacement. Subsequently, the Kiran Mk 1A and the Mk II were inducted with the latter along with the Iskra, ultimately becoming the training platform for the advanced stage. The HT-2 was replaced by HAL-built HPT-32 in the mid-1980s.

PROBLEM AREAS

With the strength of the Hunter fleet diminishing, on completion of Stage III training on Kiran Mk II/Iskra, pilots were sent

directly to the Operational Training Unit (OTU) equipped with the MiG-21. The transition presented a steep learning curve. The MiG-21 was not designed to be a transition trainer to take pilots from the docile subsonic jet trainer environment to high performance frontline fighters.

From the mid-1970s, pilot error accidents on the MiG-21 fleet, the majority involving inexperienced pilots, set alarm bells ringing. The urgent need for an advanced jet trainer (AJT) for the applied stage had been projected in the early 1980s by the La Fontain Committee set up to examine all aspects of training and flight safety. These recommendations remained unimplemented for over 25 years till the BAe Hawk-132 finally arrived in 2008. The price for the delay in acquisition of the Hawk AJT was increase in accident rates apart from cost escalation. With the disintegration of the USSR, spares support for the MiG-21 variants also became problematic.

Just when the AJT issue had been settled, albeit after 25 years, the next crisis erupted. The HPT-32 had a history of in-flight engine malfunction, poor power-off glide range and doubtful crashworthiness during forced landings on unprepared surfaces. The Lycoming engine that powered the HPT-32 is widely used in the world on a variety of aircraft and has a respectable safety record. However, on the HPT-32, it was surmised that the aircraft suffered frequent in-flight engine failure on account of a problem of integration of the engine with the airframe, resulting in fuel starvation in certain conditions of flight. Despite concerted effort by HAL and the IAF in consultation with the engine manufacturer, the issue remained unresolved. Finally, on account of persistent engine malfunction leading to accidents, several of them fatal, the HPT-32 fleet was grounded in mid-2009 and subsequently withdrawn from service impinging seriously on Stage I training as no replacement was readily available. A contract was signed by the IAF with HAL to install a parachute recovery system on the HPT-32 fleet. However, wisdom prevailed, and the somewhat bizarre plan and a costly exercise, was thankfully abandoned! The HPT-32 replacement, the tandem-seat turboprop HTT-40 trainer project of HAL, continues to be shrouded in uncertainty. The premature withdrawal of the HPT-32 came as a jolt to the IAF although warning flags were out ten years earlier. After a frantic search, the Swiss Pilatus PC-7 MkII, a de-rated version of the PC-9 trainer, was chosen and finally inducted beginning early this year. The current dilemma is whether to import more Pilatus aircraft or wait for the HTT-40 to take off.

The Kiran fleet is nearing the end of its service life and has already been overtaken by obsolescence. With Stage I training being conducted on Kiran aircraft since mid-2009, life of the Kiran fleet has been reduced further. Replacement of the Kiran by way of the HJT-36 intermediate jet trainer Sitara that has been under development by HAL, is still some years away. There may soon be a crisis situation related to aircraft for Stage II training, for which the IAF would have to find a solution till the IJT is made available.

With the HS-748 fleet being phased out and replacement for the ageing fleet of An-32 not readily available, aircraft for Stage III transport training may also become an issue. Although, projects for the replacement of the An-32 and Avro fleets have been initiated, these may take several years to materialise. Besides, given the fact that these new aircraft are likely to be sophisticated and would thus have high operating cost, their utilisation for basic transport training may neither be feasible cost-wise nor prudent.

Similar is the case with helicopter training with the

A TRAINER AIRCRAFT IS MEANT FOR BASIC FLYING TRAINING. EXPECTING MULTI-ROLE CAPABILITY RESULTS IN DEGRADED PERFORMANCE ACROSS THE BOARD APART FROM COST ESCALATION AND DELAY

Chetak/Cheetah fleet fast approaching the end of its life. Plans for replacement by a light utility helicopter (LUH), procured from abroad as well as manufactured by HAL, has not yet been finalised, but it is reasonably certain that the LUH will cost much more than the machines currently in use. It may be prudent for the IAF to explore low-cost options without further delay.

POSSIBLE OPTIONS

One option is to outsource basic training for all services and paramilitary operators to a non-military entity using a non-aerobatic trainer, as was done for a while in

the 1960s. Adequate infrastructure for this option does not exist as of now as also the quality of output may not be up to the mark for military aviation. These issues would have to be addressed with all seriousness. Training abroad is yet another option but will make the IAF appear in a bad light as the fourth largest air force unable to provide basic flying training in-house.

The next option is to use the PC-7 MkII class of aircraft for all three stages of basic flying training, thereafter the Hawk for the applied stage for fighters, light twin-engine aircraft for transport training and light single-engine helicopter for rotary-wing training. The manufacturers claim that the w. However, this will have to be evaluated before the final decision as also numbers enhanced suitably, if this option is adopted.

In the past, the IAF has been tardy in using simulators for flying and operational training. Lack of technology for realistic simulation was the problem which has been greatly reduced now. Even now, most of the tasks in the basic, intermediate, advanced and applied stages as well as in type conversion, are being carried out in the air whereas modern simulators can replace actual flying to a large extent with benefits of cost-savings, higher safety and lower infrastructure requirement and non-interference by adverse weather. Enhancement in the quantum of ground-based simulation used in conjunction with actual flying is an option worth considering. Increased use of unmanned aerial vehicles (UAVs) operationally is likely to reduce the number of pilots required to be trained. The US Air Force already trains more UAV operators annually than pilots and prefers to recruit non-fliers. Such trends should also be factored in.

THE MALAISE

Cost, indigenisation, technology demonstration, etc, are all factors in selecting a trainer aircraft but should not compromise the basic capability of imparting acceptable levels of flying expertise. To be fair to local development aspirations, the IAF has at times set the bar of qualitative requirements too high and changed parameters too often. A trainer aircraft is meant for basic flying training tasks and expecting multi-role capability may result in degraded performance across the board apart from cost escalation and delay.

The evolution of flying training in the IAF in the last 30 years has unfortunately been afflicted with inclination to gloss over problems, short-term fixes, delayed decision-making and at times, lack of clarity on the optimum vs the possible. The malaise has affected all stakeholders including the service, the aerospace industry and the bureaucracy. The ultimate result is the negative impact on the quality of training which will ultimately impact combat effectiveness, the fleet of sophisticated aircraft on the inventory notwithstanding. The subject is indeed appropriate for a case study in the premier management schools of the country. **SP**

FIRST A400M DELIVERY

The airlifter has the capability to fly distances up to 4,700 nm (8,700 km) at a cruising altitude up to 37,000 ft and at a speed of up to Mach 0.72, very similar to that of a turbofan-powered airlifter. It can even fly up to 40,000 ft for special operations.



AFTER MANY TRIALS AND tribulations, on September 30, Airbus Military delivered its first A400M, said to be most versatile airlifter of the 21st century. The A400M programme was launched in 2003 and the maiden flight took place on December 11, 2009, but the programme was plagued by one problem or the other, leading to cost overruns of about 6.2 billion euros.

The programme has been going through rough weather but then after the September 30 handover ceremony at the Airbus Military plant in Seville, Spain, Airbus Military officials are excited about the airlifter which is to take head on the competition from Lockheed Martin's C-130 Hercules. The ceremony was attended among others by HRH Prince of Asturias, French Minister of Defence Jean-Yves Le Drian, Spanish Minister of Defence Pedro Morenés, as well as other military authorities from France. Other partner nations and OCCAR representatives attended the ceremony along with EADS CEO Tom Enders and Airbus Military CEO Domingo Ureña-Raso. The French Minister termed the aircraft as a 'technological feat'.

ORDER BOOK

As of August 2013, Airbus Military had an order book of 174 A400M, of which France will be picking up 50, Germany 53, Spain 27 and Britain 22. The French have rescheduled their purchase and the Minister has clarified that France will take only 15 planes in its 2014-19 supply programme, down from 50 it had planned to take. EADS is worried that any downsizing of the deliveries by France will have a cascading effect on the programme which is backed by seven partners: NATO members Belgium, Britain, France, Germany, Luxembourg, Spain and Turkey, besides Malaysia.

The A400M has had problems with the complex engine and also the demanding requirements of the partner nations which resulted in inordinate delays.

MISSION CAPABILITIES

However, the aircraft is a versatile one which can perform three very different types of duties: tactical missions to the point of need and long-range strategic/logistic missions, besides serving as an air-to-air refuelling "tanker". Powered by four unique counter-rotating Europrop International (EPI) TP400 turboprop power plants, the A400M offers a wide flight envelope in terms of both speed and altitude. It is the ideal military transport aircraft to fulfil the most varied requirements of any nation around the globe in terms of military, humanitarian and any other "civic" mission for the benefit of society. The A400M can perform missions which previously required two or more different types of aircraft and which even then provided an imperfect solution. Its fuselage external width of 5.64 metres (18 ft 6 in) is equal to that of the A330/A340 wide-body aircraft. Its cargo hold has an inside usable width of four metres (13 ft), height of up to four metres (13 ft) and usable length of 17.71 metres (58 ft).

UNIQUE PAYLOAD CAPACITY

With a maximum payload of up to 37 tonnes (81,600 lb) and a volume of 340 cubic metres (12,000 cubic ft), the A400M can carry numerous pieces of outsize cargo including vehicles and helicopters that are too large or too heavy for previous generation tactical airlifters, for example, an NH90 or a CH-47 Chinook helicopter or two heavy armoured vehicles for military purposes. The A400M can also carry 116 personnel or paratroops.

The airlifter has the capability to fly distances up to 4,700 nm (8,700 km) at a cruising altitude up to 37,000 ft and at a speed of up to Mach 0.72. It can even fly up to 40,000 ft for special operations. Thanks to its unique short landing characteristics, the A400M is the only large airlifter that can fly equipment and personnel directly to the site of action. ^{SP}

—By R. Chandrakanth

TAPPING INDIA'S POTENTIAL



INDIGENISED:
HAL HANDED
OVER THE FIRST
HOME-MADE
HAWK MK 132
AIRCRAFT TO
THE INDIAN NAVY
RECENTLY

India cannot afford to remain reliant on foreign nations to enhance its aerospace prowess. India needs to be independent and indigenous in its approach. The aerospace community within the country has the potential, it only needs to be nurtured and supported to break the shackles of imports.

BY AIR MARSHAL (RETD) DHIRAJ KUKREJA

TECHNOLOGY HAS BECOME AN indispensable module of national security. It has even been termed as a force-multiplier. In order to deal with the broad spectrum of national security issues, strategies have to be formulated with emphasis on technology. While economic strength is the main pillar of national power, military capability of a nation must also be enhanced in tandem, for which the armed forces need to be equipped with state-of-the-art weapon systems. The volatile geopolitical and security situation in the region requires that India possess all-encompassing military wherewithal. This capability should be endowed with speedy response, adaptability to changing situations, long reach, precision targeting capabilities to minimise collateral damage and resources to transport all forms of national power wherever and whenever required.

Aerospace power, as represented by the Indian Air Force (IAF) and other aviation assets of the nation is the only answer. Wars fought in the recent past clearly establish that the 21st century belongs to aerospace power. Given the Indian aspirations to become a regional power with a global reach, it is necessary to possess an all-inclusive aerospace ability, preferably manufactured within the country.

LOOKING BACK

In the three to four decades after independence, India saw some contribution by the scientific committee towards nation building with organisations like the Council of Scientific and Industrial Research (CSIR), the Defence Research and Development Organisation (DRDO), and the Indian Space Research Organisation (ISRO) being the flag-bearers. However, the armed forces have always depended and continue to depend on foreign sources for military hardware. Even 66 years after independence, India still compares very poorly with advanced nations in respect of scientific temper.

As things stand, India's defence production base, especially in the aerospace sector, leaves much to be desired. Aerospace industry is technology-intensive and is intimately linked with several other industries of the nation. The Indian aerospace industry with the Hindustan Aeronautics Limited (HAL) at the helm has almost entirely been driven by military requirements, and the IAF has been the primary and captive customer. HAL, the oversized leviathan of the aviation industry in India, is just one of the three Indian defence industries among the top 100 in the world. With a turnover of about \$3 billion, HAL has a track

record of having manufactured 30 types of aircraft, both indigenous and manufactured under licence. Over the years, it has developed more than 2,000 tier-two suppliers and has production and R&D centres spread across the country. With a workforce of around 30,000, it is one of the largest aviation companies in Asia and is involved in almost all facets of aircraft manufacturing, namely, design, development, production, repair, overhaul of aircraft and engines, materials and systems. However, despite the impressive credentials as proclaimed, HAL has not been able to support the modernisation drive by the IAF.

Besides, nearly all its projects have suffered time and cost overruns. The sheer cost and complexity of aerospace technology, more so in the defence sector, requires a major drive towards indigenisation and self-reliance. Unfortunately, the Indian aerospace industry has been basking in the comfort zone on 'licensed production' with the bureaucracy harping on transfer of technology (ToT). While ToT would undoubtedly help introduce new technology in production, it would in no way help upgrade indigenous design and development capability as this would already have been done in the country of the original equipment manufacturer. There is, therefore, a need for a change of mindset to formulate fresh policies to facilitate correct decision-making across the spectrum of leadership, including political, scientific, bureaucratic and military.

POLICY FOCUS

The Science and Technology Policy promulgated in 2001 was intended to focus on revising administrative and management structures in the various departments. The Revised Policy of 2003 re-emphasised the goal of self-reliance with added focus on sustainable and knowledge-based development. However, mere acquisition of technology without the backing of the appropriate levels of knowledge limits the advantages and could even have a negative impact on the development of genuine indigenous capabilities.

A landmark decision in 2001 was to allow the private sector for defence production with 100 per cent participation and up to 26 per cent foreign direct investment (FDI). This change in policy facilitating entry of the private sector into the exclusive domain of the defence public sector undertakings (DPSUs), generated considerable anticipation in the boardrooms of many a corporate house. Over the years, however, the enthusiasm has waned as effort on the part of the government to provide the necessary thrust has been feeble. The demand of the private industry for an increase in FDI to at least 49 per cent has been accepted by the government albeit on a case by case basis. Prospective partners of the private companies need greater participation and incentives, if they are to share technology which has been developed by them after high investments in research and development (R&D).

The aerospace industry employs high technology and is a high-risk industry which consequently implies high cost. The time has come for the government to take the private sector as a partner with generous financial and technical support as leaving them entirely on their own can be detrimental to the entire aerospace industry. This can be achieved through the formation of an Aeronautics Commission that has been talked about for the last five decades, but without real progress on ground.

There is a debate within the country on the direction the industry must take in the future. While some advocate the achievement of a capability to fully design, develop and produce a weapon system, there are others who argue that the aerospace industry should concentrate only on certain niche technologies and competitive products in partnership with foreign collabo-

rators. The latter path would then mean that the nation would continue to depend upon import of advanced technology. If the private sector comes in with joint ventures and public-private partnership (PPP), it should be without riders or restrictions. Admittedly, India would still have to depend on imports for some time to come, but hopefully the path to self-reliance would open.

THE ROADMAP

During the last 15 years or so, the country has procured major airborne platforms and associated systems from the United States, Russia, UK, France, Italy, Brazil and Switzerland. The approach may be a good diplomatic and international trade initiative, but it is huge logistical, training and engineering challenge for the IAF and the other users. This process is driven by user requirement and lowest cost, but does not provide the necessary momentum for the local aerospace industry to become strong, competitive and self-reliant.

The Rustom UAV initiative is a unique experiment in the Indian context with the DRDO moving into a regime of concurrent engineering practices. The initial design efforts also take into consideration the production issues, with the production agency, a private company and not HAL, being involved in the development of the system from the design stage itself. If successful, this approach could become a trendsetter for projects in the future.

The government should formulate a national aerospace/aeronautics policy and put in place a department of aerospace/aeronautics, both to be guided by a long overdue National Aeronautics Commission. A proposal on this subject was first put forward in 1994 and later modified and re-submitted in 2004. As technology advances, costs rise on account of which even the advanced nations are now facing budget constraints. However, rising costs notwithstanding, the IAF would have to find the resources to fund aerospace R&D in defence and private sector laboratories under the tutelage of the Aeronautics Commission.

In an article penned on the eve of Aero India 1998 titled "Challenges Facing the Indian Aerospace Industry", while giving an argument for restructuring this strategic industry, the author had concluded: "Aero India is an appropriate milestone for the beginning of this exciting journey such that when Aero India 2000 heralds the new millennium, Indian aerospace industry will be on the path of reorganisation, reconstruction and a focussed future. Only then can events such as Aero India become a meaningful trade promotion activity benefiting Indian aerospace. For the present, they mean little." Sixteen years on, even after Aero India 2013, nothing much seems to have changed.

Movement of the aerospace industry towards indigenisation can only come from resolute leadership decisions. PPP that combines R&D, finance and industry is essential to absorb the cutting-edge technology that the aerospace industry so desperately needs. Those involved in decision-making, be they political leaders or the bureaucracy, should understand that they do not always know the best and hence consultations with the users, scientific community, academia are essential for induction of high technology. New policies have been promulgated to promote self-reliance in defence production, more so in the aerospace industry. Although this has been the stance of every successive government since independence, the Indian aerospace industry continues to be dependent on imports even for indigenous products.

India cannot afford to remain reliant on foreign nations to enhance its aerospace prowess. India needs to be independent and indigenous in its approach. The aerospace community within the country has the potential, it only needs to be nurtured and supported to break the shackles of imports. ■ SP

FOCUS ON CHINA

If the IAF has to avoid a humiliation in the air reminiscent of the 1962 debacle on land, it needs to concentrate single-mindedly on the PLAAF. More importantly, the government needs to accept the fact that recent Chinese actions represent a threat which could assume menacing proportions at a time of China's choosing.

BY GROUP CAPTAIN (RETD) A.K. SACHDEV



FIFTH-GENERATION AIRCRAFT:
J-20 IS EXPECTED TO JOIN
THE PLAAF BY 2020

STRATEGIC VISION WITH LONG-TERM perspective planning has not been a strength that the Indian defence establishment can boast of. Defence research and development (R&D) has been mediocre, defence production meagre and defence procurement clouded by considerations other than operational imperatives. As a result, the Indian military has never really experienced the confidence of being equipped to a level that permits full exploitation of its highly professional, motivated and patriotic human resources. The Indian Air Force (IAF), the defence arm that is most dependent on new, cutting-edge technologies, is the worst affected. The fourth largest air force in the world is now on the back foot in the face of the confrontational and aggressive stance adopted by China in the territorial dispute with India. Formulated in 2007, the IAF's Vision 2020 is an interesting document but its functional content may not be the answer to China's irrational and unpredictable behaviour. The time has come for the IAF to direct attention to an imminent threat from the People's Liberation Army Air Force (PLAAF). But the question is whether the IAF is ready for such a confrontation now or will be so even by 2020.

REVITALISATION OF THE PLAAF

China's Defence White Paper 2013 entitled "Diversified Employment of China's Armed Forces" sets out the role of the PLAAF in China's overall strategy of security with development. Dis-

seminated in April this year, it defines PLAAF's role as the mainstay for air operations, responsible for China's territorial air security and for maintaining a stable air defence posture nationwide. The document gives the PLAAF a total strength of 3,98,000 personnel organised into seven air commands located one each in the seven Military Area Commands (MACs) situated at Shenyang, Beijing, Lanzhou, Jinan, Nanjing, Guangzhou and Chengdu. Recent development of several airfields in Tibet and adjoining Lanzhou and Chengdu MACs ought to be of special concern to the IAF. The PLAAF also has one airborne corps for strategic tasks. To meet the requirements of offensive and defensive operations, the PLAAF has been modernising to develop a combat force structure that focuses on reconnaissance, strategic early warning, air strike, air and missile defence and strategic power projection. It is developing such advanced weaponry and equipment as new generation fighters, ground-to-air missiles and radar systems, improving its early warning, command and communications networks, strategic deterrence and long-range air strike capabilities. Given the high probability of confrontation, these aspects of modernisation impinge on India's security.

PLAAF COMPOSITION

Starting from 3,500 largely vintage combat aircraft at the beginning of this century, the PLAAF is well on its way to having a smaller but a fourth-generation air force with the J-10/J-11

in air superiority roles complementing its Su-27/Su-30 fleets, JF-17 in interceptor role and the J-20/J-31 as fifth-generation, stealth multi-role fighters. The J-20 was first test-flown in January 2011 while the J-31, a second fighter prototype the size of an F-35 with design characteristics similar to the J-20, first flew in October 2012. What texture of fifth-generation characteristics these two types would finally manifest, is for time to reveal as the power plant and leading-edge stealth technology currently appear to be out of China's reach. The power plant problem may be solved through the stratagem of buying more Su-35s from Russia with additional 117S engines forming part of the deal. Deliveries of 24 Su-35s and an unknown number of spare engines are expected to start in 2015, while the J-20 is slated to be operational in 2017. The J-20 prototype flew with 117S engines and if this engine is finally selected, the J20 would be a formidable aircraft.

To lend further potency to its offensive capability, in 2005, China ordered 30 IL-78 in-flight refuellers. Additionally, China continues to upgrade its H-6 bomber fleet, adapted from the Soviet Tu-16 design of 1950s vintage, with a new variant that possesses greater range and is armed with a long-range cruise missile. China has converted some of its old H-6 bombers as aerial tankers for some of its indigenous aircraft, increasing their combat radius. China is also developing AWACS capability on the IL-76 airframe while the Y-8 is being modified for airborne early warning (AEW) and signals intelligence (SIGINT) roles. China's aviation industry is developing a large transport aircraft, the Y-20, to supplement China's small fleet of strategic airlift assets, which currently consists of a limited number of Russian-made IL-76 aircraft. These heavy-lift transports are needed to support airborne command and control (C2), logistics, parachuting, aerial refuelling, reconnaissance operations and disaster relief.

Ongoing development of long-range unmanned aerial vehicles (UAVs), including the BZK-005, and unmanned combat aerial vehicles (UCAV) will provide the capability of long-range reconnaissance and strike missions. In the area of air defence, the PLAAF is focusing on long-range systems designed against aircraft and cruise missiles. Currently it holds the Russian S-400 surface-to-air missile (SAM) system (400 km range) and is developing indigenously the HQ-9 SAM (200 km plus range). Thus, by 2020, the PLAAF would be a large force with advanced aircraft and missiles representing formidable offensive and defensive capability.

IAF'S DISQUIET

According to a 2012 Pentagon report, the PLAAF has 1,570 fighters, 550 bombers, 300 transport aircraft plus another 1,450 older aircraft in its inventory. More than 400 fighters are in the fourth-generation class and by 2020, this number is expected to increase to 1,000 which would be around half the combat aircraft holding. The PLAAF has always had more aircraft than

the IAF; it is now well on its way to acquire a qualitative edge as well. India has depended on Russian and Western manufactures without any technological benefits through the several 'licensed production' contracts. The HF-24 was not exactly a successful aircraft and the Tejas programme is yet to materialise. The joint development of a fifth-generation aircraft with Russia is still in an embryonic stage and its future only imprecisely predictable. Thus the problem of equipping the IAF with fifth-generation aircraft continues to be a distant dream.

On the other hand, a bureaucratic approach to defence procurement has led to inordinate delays in giving to the IAF even what has been accepted by the Ministry of Defence as an operational requirement. HAL has been designated as the primary licensed production organisation for Rafale in India. However, even if the contract is concluded for the Rafale in the near future, the earliest HAL will manufacture the first aircraft would be 2018 followed by an annual output of six aircraft in the initial years. Harking back to the 2020 timeline, the IAF would have a maximum of 30-36 Rafales i.e. two squadrons on its inventory by then. Considering the fact that some older aircraft are going to breathe their last from now to 2020, the IAF's dream of 39.5 operational squadrons in that year appears unachievable.



CONCLUDING REMARKS

Space does not permit us to play scenarios involving the PLAAF and the IAF nor to compare their capabilities. Although IAF's Vision 2020 document alludes to a nuclear role for the IAF, a nuclear war with China may be discounted for obvious reasons. Even a full-scale conventional war is unlikely. The most likely scenario is a territorial intrusion blowing up into a conflagration involving modest volumes of

ground and air forces in a limited area of operations. The possibility of Pakistan exploiting such a situation to open a second front cannot be ruled out altogether.

Air power is not gladiatorial by nature; that is to say that aircraft of opposing air forces do not duel in the air to decide wins and losses. The air elements of contending forces may also be pitted against ground and naval forces of the adversary, used to defend territorial integrity of their own national expanse inclusive of oceanic exclusive economic zones and sea lanes of communication as also used for strategic strike against targets deep into enemy territory. This clearly highlights the limitations of the IAF in comparison to PLAAF in all these areas. If the IAF has to avoid a humiliation in the air reminiscent of the 1962 debacle on land, it needs to concentrate single-mindedly on the PLAAF. More importantly, the government needs to accept the fact that recent Chinese actions represent a threat which could assume menacing proportions at a time of China's choosing. The tremulous lack of resolve displayed by the government in recent months in the face of Chinese intrusions and transgressions is depressing, the landing of our C-130J at Daulat Beg Oldie notwithstanding. ■ SP



WE ARE OFTEN REFERRED TO AS A TECHNOLOGY SHOP

In a recent interview with **Jayant Baranwal**, Editor-in-Chief of **SP's Aviation**, **Colin Mahoney**, Senior Vice President, International and Service Solutions, Rockwell Collins, spoke at length about the company's business strategy.

SP's Aviation (SP's): Could you give a brief overview of Rockwell Collins?

Colin Mahoney (Mahoney): We are often referred to as a technology shop. When you think of Rockwell Collins, you think of it as an avionics provider, communication navigation surveillance provider, and secure communications provider. We started 80 years ago as a communications company and we have maintained the heritage and advanced the heritage. There are a number of things we do in aviation electronics, such as commercial entertainment systems in transport planes, in business airplanes, in flight entertainment, electro-mechanical systems, pilot control systems on a Boeing 787 and more. Our portfolio includes core aviation electronics, displays, autopilots, flight management systems, communication navigation surveillance, and mission computers. We have head-up guidance systems, which is very familiar in the defence environment and is becoming increasingly popular in the commercial environment.

SP's: What has been the expansion strategy and which are the target markets for your company?

Mahoney: We are present in 27 countries and have service centres in 13 countries. Our expansion strategy is to communicate more effectively. Nowadays, logistics is far more advanced. Our focus is on state-of-the-art asset management programme. Let's take the example of Air India which has entrusted us to manage all their avionics assets on the Boeing 787. They have decided not to own any but we guarantee availability. They leave everything to us — logistics, management, maintenance repair and overhaul (MRO).

In military, we have an offering called Flexforce which is performance based logistics. We manage all the assets and work in an availability environment. In business aviation, which is growing in India though there infrastructure challenges, we have appointed partners and trained them. We have a tie-up with Airworks for our service infrastructure. We got about four engineers who work with these entities to give us an extended footprint.

Global asset management pool is important for us. We move spare parts to make them readily available to the customers. We take about 82 hours to repair something across the board and spare parts availability allows us to be efficient. We earn our way on the airplanes and the trust of our customers helps in building future relations. We have a multifaceted expansion strategy for our Services Solutions business. Today, we have close to 8,000 aircraft under performance based agreements. More than 1,000 parts/repairs/exchanges shipped every day and we have over 3,000 satisfied customers.

SP's: How much do you spend on research and development?

Mahoney: We spend about 19-20 per cent of revenue that is one billion dollar in range. We are leading the way in spending in

new products and new programme developments; there could be some customer funded element to that. In the last five-six years, we are in the 20 per cent range and it is significant and our customer base appreciates that. When they bet on us as aviation electronics provider, products which are not easily changeable, the customers would want enduring and cutting-edge technology. We are focused and proud of making the customers competitive in defending nations or having a better airplane.

SP's: Which is beneficial for your company – foreign military sales (FMS) route or the direct commercial sales (DCS) route?

Mahoney: We are kind of agnostic. Our presence in India will drive results in either category. We think we are good and ultimately we cannot make you decide whether you want to procure via FMS or DCS. What we can do is make sure you are fully aware of everything we provide.

SP's: What specific areas have you identified for business development in conformity with Indian policies?

Mahoney: We opened the business development office in Gurgaon about 18 months ago. We have to understand the business here than sitting in Cedar Rapids, not just sales and marketing, engineering and programme management. It makes us collaborate with partners in India and to understand needs and help Indian entities know what is available. The Hyderabad centre is a cost-effective place to do business.

As regards specific business development standpoint, the journey that you have set up on advancing your network-centric communication and what we do fits very nicely with that. The partnership with Tatas on software defined radios (SDRs) are very good examples of defence business partnering. The company's strength in network-enabled communications, advanced, integrated avionics and communications systems for fixed- and rotary-wing aircraft, precision navigation and nose to tail systems for unmanned aerial vehicles (UAVs) aligns well with India's needs.

SP's: Could you tell us about the synergies between commercial and military systems and how this compatibility has given an edge to your company?

Mahoney: We are about 50:50 government and commercial and with the recent acquisition, if it goes through, we will be more commercial. If you go back 10 years, the flight deck in the military market had its own programme. Now the architecture is to have fusion products, components which are used in business aviation, air transport, modifiable by software. For instance take Embraer's KC-390 where there is fusion on the tanker as well as on the business jets (Legacy series) It is the same story on 767 tanker making it compatible on other aircraft. Dual use technology has been serving us very well. ■ **SP**

ON TURNING 80

Rolls-Royce is celebrating 80th anniversary of its partnership with Indian Air Force in 2013



POWERHOUSE:
ROLLS-ROYCE
AE2100 ENGINES
POWER C-130J
HERCULES

ROLLS-ROYCE IS CELEBRATING THE 80th anniversary of its partnership with the Indian Air Force (IAF) in 2013. The Group started its long and distinguished association with the Indian aerospace sector in 1932 with its Gypsy engines on the first Tata Aviation aircraft. A year later, the Indian Air Force took to the skies aircraft powered by Rolls-Royce Bristol Jupiter engines.

Since those pioneering days, Rolls-Royce has powered many famous aircraft in the Indian Air Force and Indian Navy colours. Currently, the Jaguar fleet is powered by Adour Mk811 engines while Adour Mk871 engines power the Hawk advanced jet trainer which trains India's future pilots.

AE3007 engines entered service in 2005 with Embraer jets and operate on VVIP and surveillance missions. The Rolls-Royce AE2100 engines that power C-130J Hercules tactical transport aircraft are the latest example of Rolls-Royce powering the Indian armed forces to even greater levels of mission performance.

However, our activity in India has expanded far beyond the supply of engines. Rolls-Royce has played a key role in the development of India's indigenous aerospace industry, largely through our partnership with the Hindustan Aeronautics Limited (HAL) in Bengaluru, which is now in its 57th year. Adour engines for the new fleet of Hawk trainers are the latest to roll off the HAL production line.

Most recently, we completed construction on a new manufacturing facility in Bengaluru for our International Aerospace Manufacturing Private Limited (IAMPL) joint venture with HAL, which will produce important components for the Trent family of civil engines.

Rolls-Royce can offer India a unique combination of experience and innovation that can help to improve the capability of our customers. We have a broad-based portfolio of engines that means that we are able to offer power solutions for the new

tanker programme, additional trainer and transport aircraft and amphibious patrol aircraft – such as the ShinMaywa US-2, powered by the Rolls-Royce AE2100.

In terms of new engine sales, we are hopeful that the requirements for additional AE2100-powered C-130J aircraft and Adour-powered Hawks will be confirmed shortly. The AE2100 engine is also the power plant for the C-27J aircraft which is also under consideration by the IAF, and would offer significant commonality benefits if selected alongside the C-130J fleet.

For the tanker programme, the Trent 700 offers real performance benefits for the A330 tanker aircraft selected for the Indian Air Force. It delivers unrivalled operational benefits in the “hot and high” conditions that are part of normal operational requirements in India and is proven to offer significant reductions in life-cycle cost for the IAF mission requirements.

We are also looking to work more closely with the Indian armed forces to enable them to benefit from some of the innovative support techniques that have been proven in other areas of our business, such as marine and civil and which are now being widely adopted by military customers looking to maximise the efficiency and effectiveness of their fleets. This is equally relevant both for new engines as they enter service and also for existing products in service.

Innovation is part of our DNA at Rolls-Royce. We invest nearly £1 billion per year on research and technology and we are uniquely placed to leverage that technology across our four business units. That means that our defence customers in India can benefit from engine and services technologies developed in our civil, marine and energy businesses.

We will continue to combine technology, our unique experience of the Indian market and new local partnerships to deliver further improvements in capability and affordability for our Indian customers. **SP**

THIS IS THE STORY of a pioneering pilot who became a world famous author and “poet of flight,” then met an early aviator’s typically mysterious death, solitary, sudden and never fully solved. Antoine de Saint-Exupéry was born into an aristocratic French family on June 29, 1900. In 1921, he joined the French Army and later took private flying lessons. After getting his pilot’s licence, he was transferred to the French Air Force. About this time, he was also involved in an air crash. The family of his fiancée persuaded him to leave the air force and take up a routine desk job. Sadly enough the engagement broke up not too long afterwards.

Another foray into flying in 1926 saw Saint-Exupéry become a successful commercial pilot. He delivered airmail in Europe, Africa and South America, pioneering new routes, despite the lack of suitable cockpit instruments. He flew for Aéropostale between Toulouse and Dakar, the westernmost city on the African mainland. He also had to mount rescue missions for downed aviators. He soon became famous as a pilot in his own country. In December 1935, Saint-Exupéry and his mechanic-navigator André Prévot were attempting to break the speed record in Paris to Saigon air race, competing for a prize of 1,50,000 francs. About 20 hours into the flight, they crashed in the Sahara. Both men miraculously survived, but found that they were in the desert with only a little food and drink, primitive maps, and absolutely no idea where they were. They stumbled around for a couple of days and soon experienced rapid dehydration in the intense heat. They began to see mirages and experience vivid hallucinations. After three days, a Bedouin on a camel discovered them and saved their lives. Saint-Exupéry later dwelt on this close encounter with death in his memoir *Wind, Sand and Stars*.

Then World War II began and Saint-Exupéry again joined the French Air Force, flying reconnaissance missions for some months. When France opted out of the War in 1940, he was demobilised. He spent two years in the United States trying to drum up support for a proposal to declare war on Nazi Germany. During this period, he also wrote three important works. But he yearned to return to combat, even though he was well past the permissible age for military

pilots. He also suffered from pain and ill-health on account of injuries sustained during five serious air crashes. It is said that he could not even dress himself in his flying suit or turn his head to the left to scan for enemy aircraft. Also, he was sometimes subject to depression. After much determination and personal lobbying, his efforts to return to active fly-

profession. I feel like a farmer, with the airstrips as my fields. Those that have once tasted this kind of fare will not forget it, ever. Not so, my friends? It is not a question of living dangerously. That formula is too arrogant, too presumptuous. I don’t care much for bullfighters. It’s not the danger I love. I know what I love. It is life itself.”

On July 31, 1944, Saint-Exupéry took off from an airstrip in Sardinia, Corsica, in an unarmed Lockheed P-38 (F-5B) variant on a reconnaissance mission. The aim was to collect intelligence on German troop movements in and around the Rhone Valley preceding the Allied invasion of southern France. He never returned. News of his disappearance spread across the world, but the cause remained a mystery for decades. It was conjectured that he was either shot down over the Mediterranean or there had been an accident. He was also known to be somewhat careless about use of oxygen in flight and may have become hypoxic, passed out and crashed. The wreckage was located only in May 2000, when a diver found debris spread over thousands of square metres off the coast of Marseille. In April 2004, official investigators confirmed that the fragments of wreckage were, indeed, from Saint-Exupéry’s aircraft. However, his body was never found.

By his lyrical aviation writings, loosely based on his own experiences, Antoine Saint-Exupéry brought a rare freshness to the grim business of wartime flying. He was awarded France’s highest literary awards and the US National Book Award for his literary gems. His works include *Night Flight* (1931), based on his experiences as an airmail pilot and as a Director of the Aeroposta Argentina airline; and *Wind, Sand and Stars* (1939), a memoir. He is best known for his novella *The Little Prince* (1943). Written for children and illustrated by the author himself, it tells the charming tale of a pilot stranded in the desert who meets a young prince fallen to earth from an asteroid. After Saint-Exupéry’s death, it was translated into about 250 languages and dialects, becoming a children’s classic and one of the best-selling books of all time. **SP**

— Group Captain (Retd)
Joseph Noronha, Goa



ANTOINE DE SAINT-EXUPÉRY (1900-44)

On July 31, 1944, he took off from an airstrip in Sardinia, Corsica, in an unarmed Lockheed P-38 (F-5B) variant on a reconnaissance mission. The aim was to collect intelligence on German troop movements in and around the Rhone Valley preceding the Allied invasion of southern France. He never returned.

ing bore fruit and he was permitted by General Dwight Eisenhower to join the Free French Air Force in North Africa. However, he was cleared to fly only five reconnaissance missions.

Truth to tell, Saint-Exupéry was not a stickler for rules and regulations, often extending poetic licence to the air. He had a habit of reading and writing while airborne. On one flight, he reportedly orbited for an hour so as to finish an engrossing novel. To his critics he had this to say: “I am very fortunate in my

QUICKROUNDUP

AIRBUS

Vietnam's VietJetAir has signed an MoU for up to 92 A320 family aircraft and will lease eight more from third party lessors. The agreement signed with Airbus covers for 42 A320neo, 14 A320ceo and six A321ceo, plus 30 purchase rights for the A320 family.

Airbus has announced a new lower weight variant of its versatile A330-300 wide-body aircraft that is optimised for use on domestic and regional routes in high growth markets with large populations and concentrated traffic flows like China.

BELGIAN AIR FORCE

The Defense Security Cooperation Agency has notified Congress of a possible FMS to Belgium of AIM-9X-2 Sidewinder Missiles and associated equipment, parts, training and logistical support for an estimated cost of \$68 million. The Belgian Air Force intends to acquire AIM-9X missiles as part of an overall military modernisation programme and to improve its interoperability with the US and other NATO allies.

BELL HELICOPTER

Bell Helicopter has announced at Helitech International 2013 that it has signed an agreement with Avincis Group for the sale of up to 20 helicopters comprised of the Bell 429, Bell 412 and Bell 412EPI aircraft, largely for use in life and rescue operations.

BOEING

The Boeing Company, Ridley Park, has been awarded a \$7,82,37,601 non-multi-year, no option, firm-fixed-price contract to definitise delivery order of basic ordering agreement for the MH-47G New Build (7 Aircraft).

Boeing and WestJet have announced that they have completed an order for 65 737 MAX airplanes, fulfilling the carrier's letter of intent to purchase the airplanes announced on August 29. The order, valued at \$6.3 billion at list prices, consists of 40 737 MAX 8s and 25 737 MAX 7s. The airplanes are a key component of the Calgary-based airline's fleet renewal initiative.

EUROCOPTER

Two firm orders were announced by Eurocopter at the UK Helitech International exposition in London for EC175 twin engine, middle class, VIP helicopters. Both rotorcrafts are to be delivered to the unnamed customers in 2016.

FRENCH AIR FORCE

The first familiarisation flight of a French Air Force crew flying an MQ-9 Reaper drone took place on September 24, 2013, at the Holloman air force base in New Mexico in the US. The flight, which lasted two hours, was intended to familiarise the crew with the handling of the aircraft and of its onboard sensors; the crew

MILITARY

ASIA-PACIFIC

BAE SUBMITS UAE TYPHOON BID



BAE Systems has formally submitted a bid to build 60 Eurofighter Typhoon jets for the United Arab Emirates (UAE). The Typhoon programme, developed by BAE, Italy's Finmeccanica and EADS, suffered a major setback last year when it lost out to French company Dassault for a major contract to supply India with 126 fighter jets. However, the aircraft has emerged as the favourite to win the UAE contract, which could be worth around £6 billion.

PILATUS PC-7 MK. II BOOSTS IAF PILOT TRAINING

Within 15 months of contract signing, the record on-time deliveries of aircraft and

logistic support material by Pilatus has enabled the IAF to complete induction of 18 aircraft as per the agreement. Further, a steady stream of additional aircraft is being added on a monthly basis and under the accelerated delivery schedule all 75 basic trainer aircraft are expected to be handed over to the Indian Air Force by mid-2015. The first training course on the new aircraft, which commenced during July with 80 students, is actually ahead of schedule. By the end of August, the fleet had already logged 3,000 flight hours with almost 5,600 landings.

AMERICAS

OVER 29,000 NEW AIRCRAFT REQUIRED IN THE NEXT 20 YEARS

According to Airbus' latest Global Market Forecast (GMF), in the next 20 years (2013-32), air traffic will grow at 4.7 per cent annually requiring over 29,220 new passenger and freighter aircraft valued at nearly \$4.4 trillion. Some 28,350 of these are passenger aircraft valued at \$4.1 trillion. Of these, some 10,400 will replace existing aircraft with more efficient ones. With today's fleet of 17,740 aircraft, it means that by 2032, the worldwide fleet will double to nearly 36,560 aircraft. By 2032, Asia-Pacific will lead the world

GRAND DISPLAYS ON AIR FORCE DAY

The Air Force Day Parade-cum-Investiture Ceremony at the Air Force Station at Hindon on October 8 will begin with flag bearing sky divers of Akash Ganga team dropping out of An-32 aircraft. The commencement of the parade will be marked by fly past of 'Ensign' formation comprising three Mi-17 V5 helicopters in 'Vic' formation trooping the Air Force ensign; the 'Chakra' formation comprising three Mi-25/35 in Vic formation would follow; "Hercules" formation comprising three C-130J Hercules aircraft and two An-32 aircraft in Echelon position on either side; and the 'Spectrum' formation comprising one An-32 aircraft in the lead with two Avro and two Dornier aircraft flying past in 'Echelon' position.

The fighter fly past will be led by three Jaguar aircraft in Vic formation closely followed by Bison (MiG-21), Baaz (MiG-29), Mirage (Mirage 2000) aircraft and Su-30MKI (Sukhoi) aircraft in Vic formation. Followed by a Su-30MKI aircraft and Tiger moth, one C-17 will also make its maiden appearance. Globe form



of two SU-30s will carry out low level fly past. The Sarang helicopter display will mark the grand finale to the ceremony.

Rehearsal by the air display team commenced from October 1, 2013, and to ensure a safe fly past on Air Force Day, the IAF urged the citizens of Delhi, Ghaziabad and its neighbourhood not to throw eatables and garbage in the open which would attract birds and be a threat to aircraft and pilot safety. ●

SHOW CALENDAR

9-11 October
MILITARY HELICOPTER INDIA
 The Oberoi, New Delhi, India
www.militaryhelicopterindia.com

15-17 October
MEDEVAC
 Copthorne Tara, London, UK
<http://www.medevacevent.com>

22-24 October
NBAA 2013- BUSINESS AVIATION CONVENTION & EXHIBITION
 Las Vegas Convention Center, Las Vegas, Nevada, USA
www.nbaa.org/events/bace/2013

29 October- 3 November
SEOUL INTERNATIONAL AEROSPACE & DEFENSE EXHIBITION
 Kintex Exhibition Center, Seoul, South Korea
www.seouladex.com

17-21 November
DUBAI AIRSHOW
 Dubai World Central, Jebel Ali, Dubai, UAE
www.dubaiairshow.aero

12-14 November
INTERNATIONAL FIGHTER
 America Square Conference Centre, London, UK
www.international-fighter.com

in traffic overtaking Europe and North America. Domestic flows are also set to rise strongly with domestic India growing at the fastest rate (nearly 10 per cent), followed by China and Brazil (seven per cent). Overall, with an above world average traffic growth rate of 5.5 per cent, Asia-Pacific will account for 36 per cent of all new passenger aircraft demand, followed by Europe (20 per cent) and North America (19 per cent).

EUROPE

FRENCH STRATEGIC AIR FORCE COMPLETES STRATEGIC FORCE EVALUATION MISSION

French Strategic Air Force has successfully carried out a full operational test of the "C135 Tanker/Mirage 2000N fighter/ASMPA (Aerospatiale Air-Sol Moyenne Portee) stand-off missile" operational chain. A representative training missile was used for the trial, which was intended to test the functionality of a real nuclear deterrence mission. A Mirage 2000N nuclear strike fighter flew for a mission lasting over three hours, which brought together all the significant phases of this type of

mission: flight at high altitude, refuelling from a C135FR tanker of Squadron 2/91 "Bretagne" to increase range, low altitude penetration flight, terrain-following approach and firing of an ASMPA missile (without a nuclear charge) onto the target. This operation was jointly carried out by the staff and resources of the French Air Force, the Directorate General of Armaments and contractor MBDA.

CIVIL AVIATION

EUROPE

AIRBUS' LATEST A330 VERSION



The newly-unveiled A330-300 domestic/regional version benefits from Airbus continued investments in the most efficient midsize wide-body jetliner operating today, providing a highly reliable, cost-effective and modern aircraft for growing passenger markets such as China and India. Its increased capacity of 356-400 seats combined with a lower operational weight, optimised thrust engines, a latest-technology cockpit and tailored passenger cabin will provide the new A330-300 with unit costs similar to Airbus' single-aisle A321. In matching the A330-300 to shorter-range operations, its cabin will incorporate modern lightweight slim-line economy seats (weighing just over half that of typical long-haul seats), galleys optimised for food service on domestic/regional routes (with the capacity for one meal, plus a snack for travel times of two/three hours), and the elimination of crew rest areas utilised on long-distance flights.

INDUSTRY

ASIA-PACIFIC

CHINA'S AFC MODEL MAKES DEBUT AT BEIJING AVIATION EXPO

An AFC model launched by the Aviation Industry Corporation of China (AVIC) made its debut at the 15th Beijing Aviation Exhibition at the China National Convention Center in Beijing. In the series of fighters developed by AVIC, the

QUICKROUNDUP

consisted of two pilot/operators with prior experience of the French UAV systems.

GENERAL ATOMICS

General Atomics Aeronautical Systems, Inc., has been awarded an \$8,65,56,544 cost-plus-incentive-fee modification which definitises letter contract modification for fiscal year 2013 Gray Eagle performance-based logistics product support for Block 1 programme of record and quick reaction capability.

HONEYWELL

Honeywell International Inc., Aerospace-Clearwater Defense, has been awarded a \$48,54,58,000 indefinite-delivery/indefinite-quantity contract to perform acquisition and sustainment for the embedded global positioning system inertial navigation system.

IAE

ICBC Financial Leasing Co. Ltd, a subsidiary of the Industrial and Commercial Bank of China (ICBC), has entered into an agreement under which IAE International Aero Engines AG's V2500 engines will power 17 firm and three option A320 series aircraft. This brings the total number of V2500 engines ordered by ICBC Leasing to 37.

JAPAN

The Defense Security Cooperation Agency has notified Congress of a possible FMS to Japan of an E-767 airborne warning and control system (AWACS) mission computing upgrade and associated equipment, parts, training and logistical support for an estimated cost of \$950 million.

MITSUBISHI HEAVY INDUSTRIES

Mitsubishi Heavy Industries Ltd (MHI) has received an order from Telesat, a leading global satellite operator headquartered in Ottawa, Canada, to provide launch services for Telesat's new state-of-the-art Telstar 12 VANTAGE satellite.

NORTHROP GRUMMAN

Northrop Grumman Technical Services Inc., Hill Air Force Base, has been awarded a \$10,15,86,478 modification to previously awarded contract for the exercising of contract line item numbers for the sustainment of the propulsion/ground/guidance/reentry system reentry vehicle systems of the intercontinental ballistic missile (ICBM) weapon system under the ICBM partial bridge contract.

QINGDAO AIRLINES

Qingdao Airlines, a newly established airline based in the Eastern Chinese coastal city of Qingdao, Shandong Province, has signed a purchase agreement with

QUICKROUNDUP

Airbus for a total of 23 A320 family aircraft, including five A320neo and 18 A320XLR. The deal is subject to approval from China's Central Government. The first delivery is expected to begin in 2016.

RAYTHEON

Raytheon has been awarded \$39 million for firm-fixed-price delivery order against a previously issued basic ordering agreement for the procurement of 15 AN/APG-79 AESA radar systems for the F/A-18 E/F aircraft.

ROLLS-ROYCE

Rolls-Royce, Indianapolis, Ind., has been awarded a maximum \$406 million fixed-price with an economic-price-adjustment, requirements contract for T-56 engine supply support. This contract was a sole-source acquisition.

TURBOMECA

Turbomeca will support the fleet of RTM 322 engines powering the UK Ministry of Defence (MoD) Merlin and Apache helicopters under an innovative service contract, worth £367 million (around \$587 million). The six-year contract provides the UK MoD with a guaranteed level of availability for its RTM 322 engines.

TURKISH AIRLINES

As part of its expansion in India and meeting the growing passenger base, Turkish Airlines had deployed B777-300ER on its Mumbai-Istanbul-Mumbai route from July 1, 2013. This aircraft was deployed on flights from Mumbai to Istanbul for the initial period of three months and will now continue to deploy B777-300ER on its Mumbai-Istanbul-Mumbai route until March 31, 2014.

UNITED TECHNOLOGIES CORP

United Technologies Corp., Pratt & Whitney Military Engines, has been awarded a \$21,48,43,107 modification to the previously awarded F-35 Lightning II Lot VI low rate initial production advance acquisition contract for providing initial spare modules, initial spare parts, replenishment spare parts, and production non-recurring efforts, including tooling, for the US Navy and US Marine Corps, US Air Force, UK, Italy, the Netherlands, Turkey, Canada, Australia, Denmark and Norway.

US

The US Department of Defense and Lockheed Martin have signed two F-35 contracts on September 27, valued at \$8.3 billion, for a total of 71 F-35 Lightning II aircraft to be produced in the sixth and seventh low-rate initial production (LRIP) lots. These agreements are a significant milestone for the F-35 programme, and reflect cost reduction initiatives shared by government and industry.

APPOINTMENTS

EADS

EADS has announced three top management nominations for its new Airbus Defence & Space Division, to be operational in 2014.

- Pilar Albiac-Murillo, currently Cassidian's Chief Operating Officer and CEO of Cassidian Spain, will be Executive Vice President Operations.
- Christian Scherer, currently Chief Sales Officer and Head of International Operations within Cassidian, will become Executive Vice President Sales & Marketing for Airbus Defence & Space.
- Lars Immisch, currently Head of Compensation and Benefits within the EADS/Airbus Human Resources organisation, will be the new Division's Executive Vice President for HR.

L-3 COMMUNICATIONS

L-3 Communications has announced the promotion of Ron Cook to Corporate Senior Vice President.

LOCKHEED MARTIN CANADA

Lockheed Martin has announced the appointment of Lt General (Retd) Charles Bouchard as the country lead for Lockheed Martin Canada.

NORTHROP GRUMMAN

Northrop Grumman Corporation has inducted William H. Hernandez, retired Senior Vice President and Chief Financial Officer of PPG Industries, Inc, to its Board of Directors.

RAYTHEON

Raytheon has appointed John D. Harris as Vice President of Business Development and CEO of Raytheon International, Inc.

SAFRAN

Michel Dechelotte has been appointed as Senior Vice President Public Affairs, Safran.

THALES

Marie-Françoise Walbaum has been co-opted as a Member of the Board of Directors, Thales.

THALES ALENIA SPACE

Thales Alenia Space has appointed Julia Maris as Vice President, Public and Regulatory Affairs.

UTC AEROSPACE SYSTEMS

David Gitlin has been appointed as President of the Aircraft Systems business segment of UTC Aerospace Systems.

AFC model is a multi-purpose advanced fighter designed to meet the demand of this kind of fighter in the future international arms trading, according to sources. The fighter adopts the design of single seat, double engines, twin vertical tails and normal layout with such features as high stealth performance, low cost, large bomb load, large combat radius and perfect integration of systems.

to mature technologies associated with adaptive bypass flow associated with a third stream of air, which will enable efficiency improvements in long-range persistence and high thrust combat manoeuvres as well as in transonic and supersonic flight conditions.

AMERICAS

P&W ADVANCING SIXTH-GEN MILITARY ENGINE TECHNOLOGY

Pratt & Whitney and the US Air Force Research Laboratory (AFRL) have begun testing of Pratt & Whitney's unique, adaptive supersonic fighter engine fan rig based on a full-scale F135 development fan to advance the next-generation of military fighter engine technology. The purpose of the adaptive fan rig test is

EUROPE

SNECMA AND ASTRIUM SIGN AGREEMENT

Snecma (Safran) has signed an agreement with Astrium concerning the production of the cryogenic propulsion systems (using liquid hydrogen and oxygen) for the 18 recently ordered Ariane 5 launchers. According to the terms of this contract, Astrium will order long-lead items from Snecma, along with start-up of the corresponding production operations. The two companies plan to sign the complete production contract by the end of this year. •

NEED FOR DIRECTION

IN RESPONSE TO A proposal by the Indian Air Force (IAF) in May this year, the Ministry of Defence (MoD) issued a request for proposal (RFP) to eight foreign aerospace majors inviting participation in joint production in India of an eight-tonne payload capacity, twin-engine, medium-transport aircraft to replace the ageing fleet of Hawker Siddeley 748M Avro aircraft. Part of this fleet had been acquired from the UK in the 1960s and later manufactured under licence at Kanpur by the Indian aerospace major the Hindustan Aeronautics Limited (HAL).

The recipients of the RFP included Embraer, Lockheed Martin, Airbus, Ilyushin, Antonov, Casa, Saab and Alenia Aeronautica, all heavy-weights in the global aerospace industry. Estimates of the value of the contract vary from ₹12,000 crore to ₹28,000 crore. The RFP stipulated that the first 16 aircraft would be bought off-the-shelf in a 'fly away' and the remaining 40 would have to be manufactured in India in collaboration with an Indian company only in the private sector. The indigenous content of the aircraft manufactured in India would have to be progressively enhanced. It would be the responsibility of the foreign vendor bagging the contract to identify the Indian partner and formulate detailed production plans and sharing of responsibilities. Media reports indicate that Reliance, Mahindra Defence Systems, Larsen & Toubro and the Tata Group could be keen to partner in the project. The potential bidders have been given five months time as against the normal time frame of three months to submit techno-commercial proposals after finalising partnership arrangement with an Indian company.

However, the criterion for selection of an Indian company to partner with the foreign vendor appears somewhat stringent. To be eligible, the prospective partner must necessarily be a public limited company that has been registered for a minimum of ten years with foreign holding at a maximum of 26 per cent. It must have capital assets in India of ₹100 crore or more and a minimum annual turnover of ₹1,000 crore during the last three years. Thus, the small and medium companies and even those that are large but not consistently profitable would be automatically excluded. Only the large Indian business houses with respectable record of financial performance would be eligible to participate.

A notable aspect of the project is that HAL has been left out not through oversight but because the industrial capac-

ity of the Indian aerospace major has already been overstretched with mega projects such as the production of Sukhoi-30MKI and Tejas combat aircraft, intermediate and advanced jet trainers, different versions of the advanced light helicopter, development of the light combat helicopter and the light utility helicopter, upgrade of the MiG-29 and Mirage 2000 fleets and possibly the \$20-billion mega deal for the Rafale. But perhaps the overriding consideration was the purposeful intent of giving the Indian industry in the private sector an opportunity to develop manufacturing capability in the aerospace sector, a privilege denied for long.

The response from foreign vendors is expected in the near future but it appears that there are some uncertainties. While the Indian private sector has developed expertise in the manufacture of components and aero structures, even the leading Indian companies are unsure of their capability to undertake assembly and systems integration of complete aircraft, especially in the category of medium- or large-size platforms. Besides, the quantum of the firm order being just a miniscule 40, it does not provide for economy of scale or the returns to justify the sizeable investments required to set up the elaborate infrastructure required. The fact that the Indian private sector is not overtly enthusiastic to participate in this project, ought to not therefore be surprising.

A more viable option possibly would have been to simultaneously target the civil aviation market for the demand of regional aviation aircraft and the product suitably adapted for military application including for special missions. This incidentally was the case when the HS-748 Avro was licence produced by HAL for both the military and civil aviation market. There is no reason why such a model cannot be adopted again. Unfortunately, there appears to be a chasm between the private and public sector segments of the Indian aerospace industry.

While the insipid response from the private sector in all likelihood would be a setback for the plans of the IAF to breathe new life into the Indian aerospace industry in the private sector, it will certainly be welcome news for HAL. However, unless such issues that have a national dimension are steered by the highest echelons of the government, the Indian aerospace industry as a whole will continue to be afflicted by disconcerting lack of coherence and direction. **SP**

—By Air Marshal (Retd)
B.K. Pandey



While the Indian private sector has developed expertise in the manufacture of components and aero structures, even the leading Indian companies are unsure of their capability to undertake assembly and systems integration of complete aircraft, especially in the category of medium- or large-size platforms

1964

Our Journey Starts as Guide Publications was founded by its Founder Publisher & Founder Editor Shri S P Baranwal...

Apart from many publications written, edited and published by the Founder, Military Yearbook is introduced in 1965...

1974

Military Yearbook continues relentlessly with collective support from dignitaries including the Prime Ministers and Presidents of India...

1984

50
JUST 1 STEP SHORT OF

WE SHALL BE 50 THIS YEAR

2014

Guide Publications is rechristened as SP Guide Publications offering tribute and gratitude to its Founder...Also envisioned is the path of introduction of a few magazines...

2013

Military Yearbook is rechristened as SP's Military Yearbook conveying gratitude to Founder Publisher...

SP's Aviation, SP's Land Forces, SP's Naval Forces are launched starting from '98 and within a span of a few years...

SP's Airbuz, SP's M.A.I. follows the intensity of magazines introduction...

1994

2004

50 YEARS

1964 - 2014



50 YEARS

SP GUIDE PUBLICATIONS



1,000 deliveries haven't changed the world. Only the way the world flies.

With our 1,000th E-Jet delivery, we pause to celebrate. And to applaud what our family of aircraft has meant for all of commercial aviation. For our airline customers. And for their passengers as well — those who benefit most directly from E-Jets as champions of change.

In that visionary role, E-Jets marked the creation of a whole new category — right-sized aircraft that blurred the line between regional and mainline jets. Aircraft that delivered a superior passenger experience, whether on short hauls or five-hour legs. Tools that carriers have used to build or expand their networks incrementally and therefore more profitably.

The result has been greater connectivity, more frequency, more choices for travelers. In fact, E-Jets have helped open whole new markets. For entirely new segments of consumers. People who now can afford the magic of flight for the very first time. It's an experience that still remains beyond the reach of many. But it seems a little closer as each E-Jet rolls off the line.

1000+ E-JETS. 65 AIRLINES. 45 COUNTRIES.

LOVE WHAT YOU FLY



Commercial Aviation