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Seven and surging, Aero India this year echoes the optimism that has spelt hope for a beleaguered world grappling with the overwhelming implications of an economic slump. Impervious to convulsions gripping the capital markets, the upsurge in defence spending continues unabated—with India leading from the front. Be it the massive $10 billion (Rs 50,000 crore) deal for Medium Multi-Role Combat Aircraft for the Indian Air Force (IAF) or the huge inventory of helicopters the armed forces are looking to pick from the foreign defence market at a cost running into some staggering figures, lure of the lucre and the rich bargains to be struck have charged the atmosphere like never before.

With a track record of six successful air shows, Aero India is now acknowledged as the fourth largest air show in the world bringing together players in the global aerospace industry, big and small, to showcase their products and capabilities and to explore new opportunities for collaboration. More importantly, the exposition would provide a unique platform for the Indian aerospace industry, both in the public and private sector, for networking and integration with the global aerospace industry.

February 11 to 15 holds promise of scripting the most spectacular pacts and packaged deals for the Indian defence establishment. Cynosure of defence manufacturers across the globe, India plays host to around 550 companies from 50 different countries who are showcasing their products and services. At the forefront are companies from Germany and France with 31 each. Following close on their heels are UK (26), Russia (24), the US (22), Italy (19), Belgium (17), Israel (11) and Australia (10). Over 100 aircraft—military and civil, as also Unmanned Aerial Vehicles—are expected to take part in flying and static display. One would get to see the latest in the regime of Unmanned Aerial Vehicles (UAV), especially the miniature versions from Israel.

The team at SP's heartily congratulates the event organisers—the Ministry of Defence and the Confederation of Indian Industry—for their immense effort to make this airshow a resounding success.

Let the show begin!

Jayant Baranwal
Publisher & Editor-in-Chief

Further on.

Delivering integrated surveillance capability

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STEALTHY:
The X-47B Unmanned Combat Air System

Unmanned Wings

Most UAV manufacturers are developing payloads and synergetic support systems also to be used for non-military applications like counter-terror operations, disaster management, border and urban surveillance, and crop diagnosis

By Air Marshal (Retd) B.N. Gokhale

I heard some one say the other day ".....last of the fighter pilots may already have been born." It wasn't music to my ears, especially having been a fighter pilot all through my career and even after hanging my overall recently, I read with great interest the progress of the Medium Multi Role Combat Aircraft (MMRCA) programme of the Indian Air Force (IAF), as well as the futuristic Indo-Russian Fifth Generation Fighter Aircraft (FGFA) programme. But this operator of Unmanned Aerial Vehicle (UAV) was very emphatic about what he had said and began enumerating a number of futuristic applications on the anvil in this field. These sound interesting.

Having celebrated the century of manned aviation just six years ago, it seems somewhat strange that in just a decade from now i.e. on March 6, 2018, we will celebrate the 100th anniversary of unmanned aviation. As per the broad definition, unmanned aviation encompasses a wide range of airborne platforms, starting originally from an 'aerial torpedo' or the forerunner of today's cruise missile and Precision Guided Munition (PGM), to the futuristic astral-planes being developed to fly in the atmospheres of other galaxies. Other applications from this 'family tree' include the recoverable aero models, target drones, decoys, reconnaissance as well as armed platforms; which are collectively known as Unmanned Aerial Vehicle (UAV). This term is already changing to Unmanned Aircraft Systems (UAS), with increasing number of 'dull and dangerous' missions; presently flown by combat pilots both, fixed and rotary wing, being taken over by such robotic flying machines.

In addition to the flight itself, the development of unmanned aircraft hinged on the confluence of three critical technologies. There was a need to incorporate automatic stabilisation, remote control and autonomous navigation. Elmer Sperry of USA was the first person to attempt an unmanned aircraft design to address all the three issues on a single platform. The efforts resulted in the invention of an Aerial Torpedo. Soon after this event, efforts were being made both in the US and the UK to design radio controlled recoverable aerial targets which were successfully flown in September 1924. Target drones were introduced in 1930 as a spin-off from these early efforts. Prior to World War II, a large number were being flown regularly in both the countries to train their anti-aircraft gunners. Interestingly, some of these were assembled by one 19 year old Norma Jean Dougherty, an employee, who later became a successful Hollywood star popularly known as Marilyn Monroe!

In the later years, unmanned aviation progressed rather slowly, with USAF using such machines mainly as reconnaissance drones in the Vietnam War. Although research work on miniaturisation, incorporating inertial navigation and GPS as well as data link continued, it was the Israeli Defence Forces that were the first to exploit the capability of these platforms. In the Yom Kippur war of 1973 with Syrian intention of recapturing the Golan Heights, Israel used their UAVs to gain critical information on the advancing armour, which helped them to set up an ambush and achieve a decisive victory despite Syrian numerical superiority. However, the world came to know about the potential of the UAV only after the 1982 Bekaa Valley opera-

tions, where Israeli Defence Forces used them as force multipliers in varied roles such as reconnaissance, spoof missions and Electronic Warfare (EW).

IAF planners saw a great potential in these platforms and inducted UAVs in the year 2000. Searcher II and Heron UAVs have distinguished themselves over the past few years by delivering electro optical/infrared (EO/IR), EW and now Synthetic Aperture Radar (SAR) intelligence, without exposing pilots to risk. Within a short span of their induction, the IAF has been able to exploit ground and airborne relays to extend operating ranges and also use them in different terrains including the Himalayan heights. The preparations during Operation Parakram have given the IAF the expertise in reducing the 'sensor to shooter' cycle. On the other hand, deployment in different parts of the country has enabled the IAF to acquire additional infrastructure, which will help in exploiting the UAVs in different roles including disaster management and internal security. Apart from the IAF, the Indian Army and the Indian Navy have also bought similar platforms enabling commonality in training, sharing of infrastructure and maintenance. DRDO meanwhile has also embarked on indigenous programmes for three different types of UAVs, Rustam Medium-Altitude Long Endurance (MALE), Pawan optimised for short-range and Gagan, a tactical UAV. An agreement for foreign collaboration to assist in these programmes was signed in Aero India 2005.

PARAFOIL LANDING: The I-View by IAI

The various roles for which UAVs are being utilised by the IAF are collation of intelligence including reconnaissance and surveillance of the designated area, UAV assisted fighter/helicopter strike (UAFS/UAHS) as well as laser designation of targets. In addition, these can be used for Battle Damage Assessment (BDA) and for real time inputs during BAS/BAI missions to strike aircraft. Use of SAR and IR gives this platform near all weather 24x7 capabilities. UAVs are also used for gathering ELINT and using the inputs along with COMINT to evade and intercept enemy fighters and helicopters. Other role being considered is a weapon platform like the American Predator, paving way to future use of UCAV. Additionally long endurance of UAV enables availability for extended periods, a distinct advantage over manned aircraft if engaged in similar roles.

Most of the UAV manufacturers are developing payloads and synergetic support systems also to be used for non-military applications including counter terrorism operations, disaster management, border and urban surveillance, ground and sea traffic monitoring, crop diagnosis, ground mapping to name a few. With micro and nanotechnologies developing rapidly their applications in both military and civil UAVs are also being worked upon.

The unmanned systems acquired by the IAF have been continuously upgraded. Add-ons such as Automatic Take Off and Landing (ATOL) systems, satellite communication data links, better radio relays and advanced payloads are also being contemplated. It is a very versatile platform, a force multiplier and hence it needs to be accorded the necessary impetus for attaining an integrated operational status.

Unmanned Systems, as expected are technology intensive and therefore their exploitation also poses a number of challenges. With the anticipated expansion of the UAV fleet, these will need to be addressed holistically. Some of these are Human Resource Management, Inter Operability with other Platforms, Standardisation of Unmanned Systems, Communications, Network Centric Operations and Air Traffic Management to name a few. These are amplified below.

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AIDING WAR ON TERROR: High Endurance and Long-range UAV Global Hawk by Northrop

A PIONEER: IAI's Heron

Is the UAV truly unmanned? In fact, there is a full team of operators and maintenance crew on the ground required to operate the UAV. The Operation Crew which is responsible for the conduct of the mission generally consists of a Mission Commander (MC) double banking also as an Internal Pilot (IP), an External Pilot (EP) and an Observer (OB) who also works as the Special Load Operator and Imagery Interpreter. The technical team is headed by a Technical Officer/System Engineer who not only ensures maintenance of UAV and systems but also doubles up as a Data Acquisition System (DAS) operator for health monitoring of UAV and systems. The UAVs are not only technology intensive but have marginal error tolerance especially in critical conditions of flight like take-off and landing, evading enemy interception and during emergencies such as loss of link . The fleet therefore requires highly skilled and motivated manpower. By design, this platform is ideally suited for long duration sorties, correspondingly crew requirement also multiplies. With probable weaponisation in the coming years it is essential that all the HR issues such as selection, training, work ethos, CRM as well as career progression need a constant review. Use of simulators for EP in particular, would help in reducing the extensive training schedules and also help in promoting CRM for co-ordinated actions during emergencies.

Next is the issue of Inter Operability of UAV with other platforms including strike aircraft and helicopters. The ability of this system to exchange data with a number of other systems has been proved beyond doubt. This aspect of interoperability has been demonstrated recently in all operations of UAV in Operation Enduring Freedom, conflict in Lebanon and in the Afghan war. The IAF too is capable of streaming live videos for all C4I2 users along with provision of ESM data. Successful trials reveal that ESM and SAR imagery can be very usefully integrated. Due to its wide coverage, long endurance and continued presence in the AOR, use of UAV can be exploited with synergy of effort. Multiple payloads can facilitate this vehicle to locate and designate hostile emitters, with live video streaming for any Commander to decide and shape the battle. The present usage of this platform is a stepping stone for more complex and interwoven air campaigns in which the UAV will be the eyes of any commander.

Network Centric Operations (NCO) is a concept of operations envisioned by the IAF to achieve information superiority and mission success by effectively linking and networking knowledgeable entities in a battle space. Key components of

NCO include information sharing and collaboration which will promote shared situational awareness and overall mission success. However, a significant challenge in the implementation of NCO will be, achieving the rapid information sharing not only intra but inter-service as well. This could become problematic if the software protocols and architecture are different for each Service. To promote true interoperability between forces, all relevant stakeholders will need to access data generated by UAV in a common network, regardless of different platforms.

Based on requirements projected from their Armed Forces, UAV designers and manufacturers in Europe and US are already working on common architecture to enable System Interoperability. Induction of similar UAV Systems by IAF, Army and Navy has brought about a need for standardised system architecture for all existing and future UAV Systems. Since the three Services are presently operating UAVs from a common manufacturer, all ground stations, data terminals and their architecture are similar. However, growth of the UAV fleet of the three services is likely to increase by 100 per cent in the next four to five years and nearly five fold in the next decade. With several UAV manufacturers and subsystem developers waiting to flood the Indian military and civilian markets in the years ahead, a requirement of interoperability with common standards/architecture is the need of the hour. Standardisation resulting in effective interoperability would help in finding solutions to issues such as constraints of bandwidth, airspace management and mobility. Standardisation would help in focussing effort and create competition, which are two crucial elements, needed to accelerate technological progress. The adoption of protocols and standards within the telecommunication and computer industries have certainly shaped and accelerated the current technology revolution. When standards are adopted for the UAV usage, industry will need to respond accordingly. Standards will help in reducing training costs, decreased programme risk, increased interoperability and lower operating costs.

Next are the present limitations of reliable navigation and seamless data-linking. These become prerequisites for the UAV to undertake complex missions aimed at manoeuvring in a restricted tactical area with limitations of terrain and, in urban areas. However, performance of current surveillance and reconnaissance UAV systems is limited by their inability to seamlessly and reliably navigate and send back data in urban environments in day and

MINI ROTARY:
Georgia Tech's GT-MAX

LATEST DEVELOPMENTS

The uses and forms of UAVs have grown more varied. These can be used for reconnaissance, intelligence-gathering, real time imagery, surveillance of a designated area and for attack. More challenging roles have been and are being envisioned which include combat missions with specialized platforms. These can fly autonomously based on pre-programmed flight plans or more complex dynamic automation systems. Today they range from slingshot-launched spybots to global guardians. In fact, the acronym itself may be morphing into unmanned aerial systems (UAS) to indicate that these are not just aircraft, but systems that include ground stations and other elements.

Following UAVs are covered in the latest developments in this field:

1. Zephyr being developed by **QinetiQ** in the UK
2. Neuron being developed as the European Unmanned Combat Air Vehicle (UCAV) by **Dassault**.
3. X-47 Pegasus UCAV-N, by **Northrop Grumman** for USA.
4. A160 Hummingbird Unmanned Rotorcraft by **Boeing Integrated Defence Systems**, for USA.
5. Taranis Unmanned Combat Air Vehicle (UCAV) by **BAE Systems** for UK

Zephyr High-Altitude Long-Endurance UAV, UK: Zephyr family of solar-electric-powered unmanned air vehicles is being developed by QinetiQ in the UK with the UK Ministry of Defence, under a jointly funded programme. The Zephyr high-altitude, long-endurance (HALE) autonomous unmanned system can provide high-quality surveillance data over large areas in real time. The system is capable of capturing and disseminating information, while operating at altitudes of more than 18km. The QinetiQ development programme aims at providing a HALE UAV for long-endurance operations of up to three months at altitudes above the weather and air traffic (above 50,000ft), offering an operational low-cost persistent military capability by the end of the decade.

Neuron—Unmanned Combat Air Vehicle Demonstrator, Europe: Neuron is the European Unmanned Combat Air Vehicle (UCAV) demonstrator for the development, integration and validation of UCAV technologies. The operational UCAV is expected to be a larger design than the Neuron demonstrator. A main aim of the Neuron programme is to sustain and develop European manufacturers' aeronautic and other technologies for next-generation combat aircraft and UAVs. The UCAV will be able to launch precision-guided munitions from an internal weapons bay and will have a stealth airframe with reduced radar and infrared cross-sections. Neuron will have the capability to carry two laser guided 250kg (550lb) bombs in two weapon bays. The air vehicle is expected to have an endurance of several hours and high subsonic speed i.e. a maximum speed of Mach 0.7 to Mach 0.8. The unmanned Neuron will be controlled from ground based stations and from control stations in combat aircraft such as the French Rafale or the Swedish Gripen.

X-47 Pegasus Naval Unmanned Combat Air Vehicle, USA: The Pegasus unmanned air vehicle was initially developed under private funding by the Integrated Systems Sector of Northrop Grumman at El Segundo in California. Pegasus received its X-47A designation in June 2001. The airframe is a stealthy planform design. It is diamond-kite shaped with a 55° backward sweep on the leading edge and a 35° forward sweep on the trailing edge. The X-47A has a wingspan of 8.47m and is 8.5m long; the dimensions of the X-47B have yet to be finalised. The vehicle is robustly built for carrier take-off and landings and uses a conventional wheeled take-off and landing with an arrestor hook.

A160 Hummingbird Unmanned Rotorcraft, USA: The A160 Hummingbird long-endurance helicopter UAV is capable of carrying out persistent intelligence, surveillance and reconnaissance, target acquisition, communications relay and precision resupply missions. The air vehicle, with optimum-speed rotor, operates autonomously and is planned to fly at 260km/h at a maximum altitude of 9,150m and hover capability up to 4,570m for up to 20 hours. Boeing Integrated Defence Systems, advanced systems division is building three A160 Hummingbird UAVs for the US Defense Advanced Research Projects Agency (DARPA) and eight for the US Special Operations Command (SOCOM).

Taranis Unmanned Combat Air Vehicle Demonstrator, UK: In December 2006, the UK MoD announced that the contract for the Taranis unmanned air vehicle demonstrator programme had been awarded to a team led by BAE Systems. The industrial participation in the £124 million joint programme will be managed at BAE Systems, of Warton in Lancashire, as prime contractor and industrial team leader. A fully developed Taranis air vehicle will be capable of delivering weapons to a battlefield in another continent with a high level of autonomy. Taranis will be one of the world's largest unmanned air vehicles.

By Lt General (Retd) V.K. Kapoor

night/all weather conditions. It is practically impossible to obtain a miniature, lightweight solution, which operates over relatively long ranges and can be used as a robust, autonomous system. Although GPS technology is usable for indoor operations, it is susceptible to jamming, interference and multi-path reception of the same signal making it unreliable in many scenarios.

While using ground based data-links, the Ground Control Stations (GCS) and their Data Terminals have to be sited to give maximum unhindered coverage. Though this aspect could be ignored in flat, open terrain, it assumes significance in areas with uneven terrain/high rise buildings or trees in close proximity of the GCS site. LOS (Line of Sight) limitations may also dictate deployment of additional GCS in forward locations to observe targets. However, this may not be feasible in a rapidly changing tactical scenario. Satellite data-links also have inadequate indoor/urban accuracy due to multi-path signal, refraction, diffraction, sky-wave affects and absorption. In UAV operations, an enormous amount of data exchange is inevitable. During this process apart from reliability, secured communication protocols also become extremely essential.

Therefore use of multiple paths for transferring data from the controller to sensor to the recipient, would enable seamless exchange of data ensuring continued success of the mission. Towards this, a 'Multiple Path User Network (MULPUN)' would need to be put in place. This network could utilise the existing hardware for dedicated data-links and add-on satellite data-links, as well as create a VPN using existing cellular networks and portable convergence routers. These would need to be assembled at the architectural and protocol level to allow use of standard equipment and applications without sacrificing performance in critical scenarios and provide satisfactory results using high data rate links. Secure communication protocols would enable the requisite security for the transmitted data. With multimedia data applications, immediate viewing on handheld PDA/phone screens may also be possible in near real-time, ideal for NSG operations.

Air traffic management is another challenge which will need to be addressed with increasing numbers of UAV both in military and civil use. Since military UAV like the Global Hawk are flying in air spaces common to Civil Aviation traffic, FAA and Euro Control have already drafted regulations to help in air traffic management. Developing on the concept of 'sense and avoid', Russia has also issued instructions for UAV operations, based on the use of transponders using Global Navigation Satellite System (GNSS). In order to understand the nuances a concept of Optionally Piloted Air Vehicle (OPAV) is being developed. It is something in between a piloted aircraft and a UAV. While Bell Company already has a helicopter OPAV already flying, so are Russian 'Irkut-850' and German Stemme S-10 VT fixed wing OPAV. These not only serve as excellent 'flying laboratories' to

LONG ENDURANCE:
Elbit Systems' Hermes 450

try newer technologies and concepts, but also help in solving issues such as certification, standardisation and formulation of air traffic regulations. Since the UAV are quite susceptible to adverse weather conditions, OPAV could also help in developing procedures and limits for weather penetration.

It is reported that US armed forces fly more than 350,000 hours every year on UAV and that Israeli Defence Forces log almost 50 per cent of their total air effort on such remotely operated platforms. With numbers of UAVs on the increase, indigenisation assumes great importance. India needs to develop the capability to make on her own platforms like the large size Global Hawk, stealthy X-47B, armed Predator, mini rotary GT-Max and the six-inch diameter Micro UAV, Black Widow. It is heartening to note that not only DRDO which is collaborating with other countries, but the Indian private industry along with foreign partners, is also planning to enter this field. With the indigenous expertise in software, concerted efforts in manufacturing UAV and necessary ground support equipment would greatly benefit the country's armed and paramilitary forces and also the civil sector. India needs to use the spin-offs from the offset clause in this area.

Moore's Law predicts that the speed of microprocessors will reach parity with the human brain around 2015. It is also estimated that the memory capacity of a computer will equal that of the human closer to 2030. Hence the futuristic applications of UAVs are phenomenal. Future UAVs will evolve from being remotely operated to independent robots, able to self actualise the task. But such ultimate autonomy will require capabilities similar to the human brain in terms of speed and memory. As to how many lines of software code equate to 'thinking' is still not clear, but indigenous efforts in Robotics and Artificial Intelligence will need to be developed rapidly to ensure that India does not miss out on the next RMA.

As it approaches its own centennial in 2018, unmanned aviation points towards an impressive future. Think of a scenario, the most wanted mastermind is celebrating a recently executed terrorist attack. More than the damage caused, he is regaling the celebrity status in the media coverage. Suddenly clutching at his throat, the mastermind is gasping for air, with death just a moment away. His henchmen are shocked and in the hustle that follows no one has noticed a small honey-bee like flying creature which has fired the fatal poison dart; controlled remotely many miles away by a team, determined to eliminate the scourge of terrorism.

Fiction! Far fetched! Undoubtedly it sounds so. But with nanotechnology and many other scientific applications like solar powered flutter wings and multiple communication channels, it may not be too far into the future that one hopes to witness a scenario painted above.

The UAV operator I mentioned in the beginning may have sounded as if 'kite flying', possibly, but that too, remotely. ■

IMPROVED:
The C-130J Super Hercules

In need of facelift

The last two decades have seen the launch of just three new designs in military transport aircraft: the Boeing C-17 Globemaster III, the EADS-CASA C-295 and Alenia's C-27J Spartan

By Group Captain (Retd) Joseph Noronha, Goa

Crises often reveal glaring deficiencies in contingency planning with air transport capability lagging woefully behind. Most armed forces including those of the major powers are equipped with transport aircraft of the 1960s and 1970s vintage that are technologically obsolete and operationally inadequate. The current global military transport fleet consists of more than 2,300 tactical airlift aircraft with an average age of 26 years and around 50 strategic airlift aircraft of which most are operated by the US and the Commonwealth of Independent States. The ubiquitous Lockheed Martin C-130, for instance, began production in 1954. Strangely, the last two decades have seen the launch of just three new designs in military transport aircraft: the Boeing C-17 Globemaster III, the EADS-CASA C-295 and, last year, Alenia's C-27J Spartan. Airbus's own much-awaited A400M has been dogged by delays and is yet to get airborne.


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NEW ENTRANT:
Alenia's C-27J Spartan

INTERMINABLE DELAYS

Indeed, the state of the military air transport fleets of the major powers is rather depressing. The American scene appears particularly bleak. The global war on terror has sharply accelerated aircraft utilisation rates, yet plans to induct new aircraft seem lost somewhere in the political labyrinth. The C-17 Globemaster III remains the backbone of US inter-theatre transport operations around the world. Improvements in the C-130J Super Hercules, which entered production in 1997, have improved the plane's range, cruise ceiling, time to climb, speed and airfield requirements. Yet, the trend in airlift demand is likely to place a premium on aircraft that can carry more than a C-130J. Consequently, the levels of C-17 flight hours remain well above USAF projections.

Stretched by the demands of the war on terror, particularly the frequent need to land on unpaved airstrips, the RAF is badly affected by the revised delivery schedule of the Airbus A400M. The 25 new planes on order that were to arrive in 2010, will be delivered in 2012. Meanwhile, NATO has been trying to make good its shortfall in strategic airlift. In March 2006, under the Strategic Airlift Interim Solution, NATO put a multinational airlift contract into effect. Six Antonov An-124-100 strategic airlift aircraft, leased from Russia, will be available to 15 NATO members. NATO also plans to buy three C-17s. Member countries will receive allocated flight hours relative to their participation. Side-by-side, the European Air Transport Fleet initiative, which could enter operation in 2014, will pool aircraft like the A400M and the C-130J.

Russia in this respect is no better off. There are around 300 transport aircraft in service with the Russian Air Force, including An-12 Cub, An-72 Coaler, An-124 Condor and Il-76 Candid planes. Most of these entered service in the 1960s and 1970s and are considered unsafe by modern standards. However, comprehensive upgrading could extend their service life until 2020-2025. The Chinese situation has hitherto been a couple of notches worse than the Russian, but the much stronger Chinese economy will probably permit it to keep pace with military transport aircraft requirements in the foreseeable future.

Dogged by obsolescence and shortages in its transport fleets, the Indian Air Force (IAF) operates 14 Ilyushin Il-76 aircraft for tactical and strategic airlift, and six IL-78s for in-flight refuelling. Apart from the obsolescent HS-748 Avros, it has a fleet of 90 Antonov An-32 and 28 Dornier Do 228 utility aircraft. In an effort to infuse fresh life into its transport fleet, the IAF will begin an upgrade programme for its An-32s and Do 228s this year. The upgrade is intended to improve the avionics, increase the engine lifespan, and improve range and payload so they can remain operational for another 15 to 20 years. Six C-130J Super Hercules have also been contracted for delivery in 2011.

AIRCRAFT ON OFFER

The Airbus A400M is a direct result of a commonly felt need by eight European air forces for a new generation, multi-role military transport to replace the ageing C-130 Hercules and C-160 Transall. The aircraft incorporates leading state-of-the-art technology and can operate in many configurations including cargo transport, troop transport, MEDEVAC, aerial refuelling, and electronic surveillance. Since survivability of transport aircraft in the tactical battle area is open to question, the A400M could be fitted with an extensive ECM suite.

A series of smart design decisions regarding load carrying capacity, extensive use of modern materials, multi-role capability and a multinational industrial programme were expected to leave the aircraft well positioned to take overall market share from Lockheed Martin's C-130J Hercules. The catch: It won't be ready in time. In January, EADS announced that the first A400M delivery would be postponed until at least 2012. Critics also say it is overweight and underpowered. As a result, Lockheed Martin expects to sell more of its competing planes. The traditional Boeing-Airbus rivalry is absent in this segment since Boeing seems too preoccupied with its 787 Dreamliner.

Embraer is also considering a new transport aircraft, the C-390, which will be the company's first cargo plane and its heaviest aircraft, carrying approximately 19 tonnes of freight. Size-wise it will be between the C-27J and the C-130J. The aircraft's maiden flight is expected around 2011.

Turning to light military transport aircraft, there are three main options at present: Alenia's C-27J Spartan, EADS-CASA's C-295M and that old faithful—Antonov's An-32. The C-27J Spartan is a twin-turboprop, medium-sized military transport aircraft. The aircraft was selected as the Joint Cargo Aircraft for the US military. Italy received its first C-27J in October 2006 and the US Army received its first in September last year.

So far as India is concerned, the success of the BrahMos missile project needs to be replicated in the Indo-Russian Multi-role Transport Aircraft (MRTA) project. In 2002, the two countries agreed to a 50-50 joint venture between Hindustan Aeronautics Limited and Ilyushin Aviation Complex/Rosoboronexport to develop the MRTA with a payload capacity of 18.5 tonnes, a range of 2,500 km and a speed of 870 km/hour. The twin bypass turbo-jet is expected to fly soon and enter service by 2015. While the IAF plans to acquire 45 such aircraft, the Russian market could absorb 100 planes within the next 12 years. However, latest reports suggest that the deal has not been finalised as yet. If the deal doesn't come through, India could look at partnering the Embraer's C-390 programme which is very similar to what is needed by the IAF and also in an advanced stage of development. ■

EAGERLY AWAITED: The A400M

Emerging from the Shadows

Almost overnight, business jets are considered to be, at best, out-of-sync with public opinion; at worst, ostentatious and hedonistic toys of the opulent. Time to sieve fact from fallacy.

By Joseph Noronha, Goa

SIZE MATTERS: Dassault's Falcon 7X is a French-built large-cabin, long range business jet manufactured by Dassault Aviation

When the current heads of America's business jet manufacturers grow old and grey, they may still remember December 3, 2008 with a shudder. On that day the bosses of General Motors, Ford and Chrysler made their way to Washington, DC to plead for a bailout, forsaking their sleek private jets and preferring to travel by hybrid car instead. It was the modern equivalent of the monarchs of yore shedding their royal trappings in favour of sackcloth and ashes. The intensity of the reaction to their previous trip to Washington in corporate jets left the business aviation community stunned. Almost overnight, business jets are considered to be, at best, out-of-sync with public opinion; at worst, ostentatious and hedonistic toys of the opulent.

Is it a sign of the times that the car moguls did not attempt to defend their jets as productivity-enhancing and time-saving tools? Corporate jets are officially out of favour with US politicians, who now have the power to rescue or demolish 'sick' companies. Such is the disdain for private aircraft that it has been enshrined in legislation. How quickly things go wrong. The same business tycoons who months ago were eagerly marking time till the promised delivery of their own jets are now running for cover. Nor is the current suspicion of business jets unique to the USA. The June 2008 allegations of 'evasion' of customs duty on import of scores of business aircraft into India are too recent to be forgotten.

THE REAL BEAUTY IS IN THE EFFICIENCY.

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PICTURE OF ELEGANCE:
The ultra-long-range Gulfstream G650

TRAVEL IN COMFORT:
Inside the Embraer Lineage 1000 executive jet

The global market

The brouhaha over US tycoons and their jets is only the latest sign that the worldwide boom in business jet sales could be coming to an end. Many factors are responsible. The global credit crunch and declining corporate profits are the prime culprits. Suddenly there is no money to 'splurge' on business aviation. About half of business jet customers pay cash; the other half of sales are financed, and many banks just aren't lending. An increase in inventory of pre-owned aircraft and decline in business activity makes a significant slowdown in demand likely. The strengthening dollar also means that prices go up for the rest of the world, already deeply affected by recessionary winds.

There are currently an estimated 16,000 business jets worldwide with just 500 lying idle. North America has the largest share, with about two-thirds of all private aeroplanes, followed by Europe with about 15 per cent. 2008 was the fifth consecutive year of expansion, with a record 1,200 new business jets delivered. Though some analysts are hopeful that peak deliveries are a year or so away others believe the figure for 2008 is unlikely to be exceeded; rather a three to four year decline in annual production should be expected, with growth unlikely to resume until 2013. With the American share of new deliveries falling to around 30 per cent, hopes of growth now rest on the Gulf, Brazil, India and China.

According to UBS, a Swiss bank, the number of used business jets available worldwide for sale at the end of November 2008 rose an astonishing 62 per cent compared with a year earlier, to reach an all-time high. The market has few serious buyers, too much supply (used and new delivery slots) and pricing that has fallen more than 25 per cent over the past six to eight weeks. Struggling companies, it appears, agree with the philosophy of the US Congress that in hard times a good way to save money is to sell a jet. While sellers are still hoping for high prices, buyers are cannily seeking low prices. Trouble is, till the two positions match, the market will be flooded with unwanted jets. Some say this is the worst market they have ever seen. Order cancellations could reach double-digit levels in 2009.

As recession bites deep into Europe, business jet sales are falling everywhere. The Russians were once big buyers. However, since their stock market tanked, demand has cooled considerably. But despite the global economic turmoil, the Middle East business jet market seems to be unaffected and continues to grow. The business jet fleet there jumped by 30 per cent in 2008. With about 700 new jets on order, it seems the good times can only get better. But the recent crash in oil prices, welcomed in the rest of the world, could dampen the party though only slightly. Oil prices are likely to move upwards and stabilise at realistic levels possibly in a year or so as the global economy recovers.

In India, though turboprops have traditionally dominated business aviation, there has been a marked preference for jets in recent times. Currently, the country has about 100 turboprop aircraft and nearly that many business jets. The Indian economy would be affected by the global meltdown but to a lesser degree as compared with the other advanced economies. That there is still confidence in the Indian market is manifest in the fact that Embraer has an order for over 30 business jets from India and there have been a number of fresh enquiries. Embraer showcased the Phenom 100 and the Phenom 300 business jets as also the Lineage 1000 executive jet in the luxury class in Mumbai recently and is all set to display their new products at Aero India 2009 at Bangalore as well.

Blurs & a few bright spots

All in all, it is clear that the business jet industry seems set for a reality check. Hawker Beechcraft has already cut its workforce

and revised delivery schedules. Textron Inc. will eliminate an additional 2,000 jobs at its Cessna unit, the world's biggest maker of business jets, as corporate customers defer and cancel orders because of lower earnings and problems obtaining financing. Cessna hopes to ship slightly more than the 475 Citation jets of last year, but fewer than the 535 originally expected.

Embraer has already lowered its delivery forecasts for this year to reflect only orders from clients who have clearly indicated their ability to take delivery (read, with enough money to pay). The 2009 forecast for its business jets is now 145 aircraft, down from the previous estimate of 195 to 200. This includes 110 Phenom 100 very light jets and Phenom 300 light jets, a far cry from the 150 earlier expected.

Take the Very Light Jet (VLJ) segment, for instance. After scores of bright forecasts, and visions of thousands of VLJs crisscrossing the skies, 2008 was indeed a year of truth. While Cessna progressed with deliveries of its Mustang VLJ and Embraer completed the certification process for the Phenom 100, the industry is yet to recover from the twin bankruptcies of Adam Aircraft and Eclipse Aviation. The all new Eclipse 500 which is relatively cheap to buy and operate, was expected to spur a burgeoning air-taxi business, but DayJet's demise put paid to those hopes. Eclipse Aviation's assets are to be sold to a subsidiary of Luxembourg-based ETIRC Aviation. Can Eclipse rise from the ashes and resurrect the VLJ prospects?

Although 2009 holds much uncertainty for the business aviation industry, it could also see many key milestones being achieved. Innovative manufacturers continue to work behind the scenes producing new designs, hopeful that the market downturn will not be prolonged. Last year saw several new programme launches such as the midsize Bombardier Learjet 85, the large-cabin Citation Columbus, the ultra-long-range Gulfstream G650 and midsize G250, after a new design drought of several years. This year, Cessna hopes to obtain certification of its light business jet, the CJ4; Embraer's Lineage 1000 is earmarked for service entry this quarter while the smaller Phenom 300 light jet is due for certification and service entry in the third and fourth quarter respectively. The Phenom 300s and 100s could play a pivotal role for the start-up air taxi operators.

Politics to the fore

The American business jet industry has been the target of a wave of political attacks. It was officially proposed that bank executives be forced to disown travel by private aircraft, such as business jets, if they are to qualify for bailout money. Similar restrictions were tied to earlier federal bailouts for auto companies. And what of the consequences for business aviation? There are complaints that such legislation would kill high-paying, high-quality manufacturing jobs as well as curtail economic recovery in the aviation industry even as government tries to revive other sectors. Fortunately the offending language has since been removed. However, the strident criticism of corporate jets seems to have struck a chord.

The business aviation community is aghast. The National Business Association of America points out that 86 per cent of passengers aboard business airplanes are not senior company officials but mid-level employees including salespersons, engineers, or other specialists. The president of the European Business Aviation Association is urging companies and individuals to fully use corporate aircraft during the economic downturn. "With a faltering economy and diminishing business confidence, now is the time to re-establish the business by getting out and seeking new clients and deals, and servicing the customer base more proactively and efficiently than ever," he says.

Another thorny issue is that the US Transportation Security Administration (TSA) proposes to lower the weight minimum of private aircraft that require security screening from 45,540 kg to 5,675 kg or anything larger than a Cessna CJ1. The regulations are intended to establish baseline standards of security for general aviation operations. They would require flight crews to undergo fingerprint-based criminal history records and terrorist name checks, designate security coordinators, conduct watch list matching of passengers, and check and validate property on board for unauthorised people and accessible weapons. Such measures, if adopted in the USA, could rapidly spread worldwide. Industry representatives, while appreciating the need for enhanced security, feel these measures would pose major challenges for business aviation since they ignore its distinctive nature.

In conclusion

It is perhaps understandable that many people hold top business executives accountable for the current perilous state of the world economy. And what more potent symbol of high-flying profligacy than corporate jets? To the impartial observer, however, these jets are highly effective productivity tools, assets that can be employed to advantage. They help businesses expand into new markets, form partnerships, ferry customers, seal deals and expedite vital maintenance. In so doing, they create jobs and generate tax revenue. Any asset can be misused and business aircraft are no exception. Computers and company cars are also open to misuse. Should they be discarded?

For the time being at least, growth of the market for business jets seem to have slowed down. But all is not lost. The more pragmatic businesses in America are keeping their jets under wraps, or hiding them in the garden shed. They probably hope that like most other misguided moralistic campaigns in history, this one too shall pass. The industry, meanwhile, is focussing on new business jet designs that are scheduled to enter service early in the next decade, when growth, prosperity, optimism and sanity should hopefully have returned. ■

FORMIDABLE: The US F-22 Raptor incorporates all the attributes of a Fifth Generation fighter

GenNext Fighters

Development is progressing from the past decade's fighters towards what is known as the Fifth Generation fighters in the current millennium

By Air Marshal (Retd) V.K. Bhatia

More than a century after the first heavier-than-air machine leapt off the ground, the evolution of fighter aircraft has been a saga best described by the die-hard determination and extraordinary imagination of the designers coupled with continuous advancements in technology. Both put together have been responsible for ushering in revolution in military aviation giving the present day fighters combat capabilities that were unimaginable earlier. From the doddering bi/tri planes of the First World War to the present day mean machines, the transformation has been fantastic. Categorised into various generations, development is progressing from the past decade's fighters towards what is known as the Fifth Generation fighters in the current millennium. But, what are the characteristics of the latest aircraft and what are the trends in fighter development?

Fifth Generation fighters

Attributes that characterise the Fifth Generation of fighter aircraft include highly advanced avionics and stealthy sensory suites, affording the pilot a comprehensive view of the entire battle-space. Also characterising Fifth Generation is a comprehensive stealthy airframe design and a combination of airframe

and engines to provide efficient supersonic speeds, that is, 'supercruise' capability. But that is not all. The Fifth Generation fighter is aimed to have a 'first look, first shoot and first kill' capability in all conditions of flight and tactical situations. In other words, it must be able to far outstrip its rivals in all departments of aerial combat—that is, detection, identification, acquisition, engagement and destruction. Aircraft that can stand scrutiny in this regard are the Lockheed Martin F-22 Raptor and the not yet operational F-35 JSF (Joint Strike Fighter), and possibly the MiG MFI and Sukhoi Su-47 with question marks still attached to their future development and production because of the PAK-FA becoming a more viable Russian alternative. However, so far, only the F-22 Raptor has been inducted for operational service with the United States Air Force (USAF). Also, it is the only aircraft considered to have all the attributes of a Fifth Generation aircraft and merits a somewhat detailed study.

F-22, the Raptor

Designed to be a Fifth Generation aircraft from the word go, the Raptor incorporates low-observables configuration and construction which has been balanced to give an optimum mix of stealth and agility, unlike in the case of the earlier F-117 that flaunted a stealthy airframe but little agility. To reduce the radar signature of the aircraft further, antennae have been located in leading or the trailing edges of wings and fins, or flush with surfaces. In addition, all production aircraft have been coated with new Boeing-developed stealthy paint intended to enhance low-visibility attributes. The Raptor is powered by two 156kN (35,000 lb st) class Pratt & Whitney F119-PW-100 advanced technology reheated turbofans, each fitted with a two-dimensional, convergent/divergent thrust vectoring (20 deg up/down in the vertical plane) exhaust nozzle for enhanced performance and manoeuvrability. The powerful engines ensure short take-off and supersonic cruise and manoeuvring (supercruise) in the region of M 1.5 without afterburning.

The aircraft is equipped with highly integrated avionics for single pilot operation and rapid reaction. Radar, Radar Warning Receiver (RWR) and communication/identification are managed by a single system presenting only relevant data and the emissions are controlled (passive to fully active) in stages, according to tactical situation. Common Integrated Processors (CIPs) handle all avionics functions, including self-protection and radio, and automatically reconfigure to compensate for faults and failures. The aircraft is equipped with Inter/intra-Flight Data Link which allows all Raptors in a flight to share target and system data without voice communication.

The heart of the Raptor is its state-of-the-art AN/APG-77 Active Electronically Scanned Array (AESA) multi-mode radar, capable of interleaving air-to-air search and multi-target track functions. It also incorporates weather mapping mode with provisions for air-to-ground modes and side arrays. The radar is reported to be capable of detecting 1.2 meter target at range of approximately 109 nautical miles (201 km). Even this highly capable radar was to be replaced by new AESA radar in 2008 that will eventually incorporate advanced air-to-ground computer software. Fused situational awareness information is displayed to pilot via four colour liquid crystal multi-function displays. Cockpit and instruments illumination is fully Night Vision Goggles (NVG) compatible. The common integrated processors (CIPs) also contain mission software that uses tailorable mission planning data for sensor emitter management and multi-sensor fusion. The CIPs are rated at more than 700 million instructions per second (MIPS) with growth to 2,000 MIPS and signal processing capacity greater than 20 billion operations per second (Bops) with expansion capability to 50 Bops. One CIP contains more than 300 Mbytes of memory with growth potential to 650 Mbytes. There is plenty of spare capacity in the systems to support future growth. The aircraft has provisions for infra-red search & track and side-mounted phased-array radar.

Raptor has the unique capability to carry all its weapons for its primary air dominance role internally in the fuselage bays in addition to a long-barrel 20 mm cannon. Three internal bays can carry two AIM-9M Sidewinder or Next Generation AIM-9X close combat missiles (one in each side bay) and six AIM-120C Beyond Visual Range air-to-air missiles and/or precision-guided GBU-32 Joint Direct Attack Munition. It can also carry under-wing stores (if stealth is not an overriding factor for a particular mission) on four hard-points capable of carrying 5,000 lb (2,268 kg) each. Other weaponry against surface targets envisaged for use by the Raptor includes the BLU-109 Penetrator, the wind-corrected munitions dispenser (WCMD), AGM-88 HARM anti-radiation missile, GBU-22 Paveway 3 guidance unit for LGBs, new Small Diameter Bomb and the low-cost autonomous attack system submunitions dispenser package. With all the attributes of a Fifth Generation fighter, the F-22 Raptor is indeed the most formidable combat aircraft ever produced. The synergy that results from combining stealth, speed, information fusion, situational awareness and the ability to operate within and interact with a broad array of networked systems in a single platform represents a quantum jump in capability and survivability over contemporary fighters. The European Eurofighter EF A2000, Typhoon and the French Rafale come pretty close to the Raptor except that they lack stealth and vectored-thrust capabilities – deficiencies which could prove to be crippling in combat scenarios against the Raptor. That is why these, otherwise highly capable aircraft, have fallen short of being called Fifth Generation fighters.

F-35, Lightning II

A sibling of F-22, the Raptor, F-35 joint strike fighter (JSF) is another Fifth Generation fighter from The Lockheed Martin design team, whose development is progressing at a feverish tempo.

EN-LIGHTNING:
US F-35 Joint Strike Fighter

The JSF programme was created in the US to initially replace various aircraft on the inventory of its armed forces. But as of now, eight more nations have joined the programme and many others waiting in the wings or making up their minds to become partners in the now highly transformed international programme. The JSF is being developed in three variants i.e. F-35A – conventional take-off and landing (CTOL), F-35B – short take-off and vertical landing (STOVL) and the F-35C – carrier variant for conventional, marine and carrier operations, respectively. The improvements over the current Fourth or Four+ Generation fighters include durable, low-maintenance stealth technology; integrated avionics and sensor fusion that combine information from off/onboard sensors to increase the pilot's situational awareness and improve identification and weapon delivery, and to relay information quickly to other C2 (Command & Control) nodes.

The main sensor on board the F-35 is its AN/APG-81 AESA radar designed by Northrop Grumman Electronic Systems. This is augmented by the EOTS (Electro-Optical Targeting System) designed by Lockheed Martin and BAE. Further E-O sensors form part of the AN/AAS-37 system which acts as missile warning system and can aid in navigation and night operations. The F-35 is also capable of nearly carrying all the weapons described for the Raptor, above.

Russian response & Indo-Russian collaboration

The Russians came up with their own designs in response to the US F-22 Raptor. These were from two major design bureaus; MiG 1.42 or 1.44 from RAC MiG Corporation and the Su-47 from Sukhoi. Radically different from each other, both designs were touted as the answer to the US Raptor. However, development in both the cases was severely hampered due to financial difficulties in Russia. Finally, Sukhoi was chosen to lead the design for the new combat aircraft called, PAK-FA which roughly stands for 'Prospective Aircraft System of the Frontline Aviation'. The PAK-FA will incorporate technology from both the Su-47 and the MiG 1.44. To ease its financial concerns India was invited as a fifty-fifty partner to join the programme. Overcoming its initial hesitation/apprehension, in January 2007, India formally resumed fresh negotiations with Russia over PAK-FA Fifth Generation fighter development programme which has now been firmed up as a joint collaborative endeavour on a 50:50 partnership.

From the reports available, the aircraft will be stealthy, have the ability to supercruise, be outfitted with the Next Generation air-to-air, air-to-surface and air-to-ship missiles, and incorporate AESA radar. It will be powered by the Saturn AL-41F thrust vectoring engines. It is estimated to be similar in size to the F-22. It is as yet uncertain how low the Radar Cross Section (RCS) of the PAK-FA will be. This will be Russia's first attempt at making a 'stealth' aircraft from a scratch though, all latest production variants of Russian military aircraft use Radar-Absorbing Materials that lower RCS to that of less than 1.2 m objects. It is also unclear whether the PAK-FA will use conventional stealth, which is used by the USA or 'Plasma Stealth' reported to have been successfully developed and used by Russia.

DEADLY:
Russia's PAK-FA 5th Gen fighter

The Indian version will be somewhat different from the Russian version as it will be customized to Indian requirements. For example, unlike the Russian single-pilot fighter, the Indian variant will have a twin-seat configuration based on its operational doctrine for combat operations. Although, development work is at a nascent stage, the Russian side has expressed optimism that a prototype will be ready for its maiden flight by 2012. But the availability of this FGFA (Fifth Generation Fighter Aircraft) in the IAF as an operational fleet is not likely to come about before the end of the next decade. ■

'IAF's key objective is to arrest force depletion'

Deputy Chief of Air Staff Air Marshal N.A.K. Browne, AVSM VM talks at length about the Indian Air Force's rapid strides at modernisation with effective use of aerospace and modern technology

SP Guide Publications (SP's): What are the various steps being taken towards modernising the IAF for it to become a well-balanced, continental and strategic air force in the true sense in terms of combat power, support systems and infrastructure?

Deputy Chief of Air Staff (DCAS): In the overall context, IAF's principle objective is to arrest force depletion by suitable replacements and carry out mid-life upgrades to maintain operational relevance of existing fleets and gradually build up to requisite force levels in fighter, transport and helicopter fleets along with AD Systems, force multipliers and weapons. The option of utilisation of aerospace and modern technology has significant impact on a force like the IAF. To meet these challenges we constantly review our equipment, organisational and training policies so as to ensure efficient utilisation of resources to meet the laid down objectives in a comprehensive fashion. Modernisation is a continuous process and due to certain constraints in the past, the IAF modernisation plan had progressed slowly. However, with the new procurement procedure in place and availability of funds for capital acquisitions, IAF is progressing well on its modernisation plan. It is our endeavour to make good all deficiencies, upgrade the existing equipment, infrastructure and procure state-of-the-art weapon systems. These include systems like advanced combat aircraft, Network Centric Warfare systems, enhanced airlift capability etc. We already have the planned inductions of 230 Su-30 MKI aircraft along with MMRCA (at a later date), which would arrest the dwindling combat squadron strength. Additional FRAs, AWACS and precision weapons are planned for procurement to enhance reach, persistence and precision.

SP's: Could you please elaborate on the 'Upgrade Programmes'?

DCAS: The aim of the IAF is to carry out mid-life upgrade to maintain operational relevance of existing fleets. Towards this, all fleets which have residual life are scheduled for upgrade and life extension where technically feasible. A systematic upgrade plan is already in motion to ensure requisite capability is retained by the IAF in all types of contingencies.

As far as the fighter fleet is concerned, the MiG-21 is the oldest aircraft in the inventory and a number of its variants are in service. After considering the residual life and operational

utilisation, only a limited number of aircraft were planned for upgrade. Upgrade primarily included an effective radar and compatible avionics for enhancing its role in air-to-air and air-to-ground modes. The project has been completed and all the aircraft planned for upgrade are operational in IAF squadrons. Another fleet that has recently achieved its final operational clearance for the upgrade so far is the MiG-27. This includes the entire suite of new navigational and attack systems for enhancing weapon delivery accuracy and range of weapons. Last of the MiG series for upgrade is the MiG-29 aircraft. This fleet is undergoing its modification which is also linked to its life extension. The contract for upgrade of MiG-29 was signed in March 2008. The upgrade process has commenced in Russia on the initial six aircraft. Series upgrade will be carried out in India at 11 BRD (Nasik). The upgrade includes new avionics and cockpit layout besides modification of its fuel system for AAR (Air-to-air Refuelling). These modifications will increase the operational effectiveness and will allow usage of this fleet for another 15 years.

As far as Jaguars are concerned, from their initial induction in the IAF in 1979, they have undergone a number of modifications for increasing lethality and survivability. In fact the first major modification of the older NAVWASS system has been completed and in the second phase, additional features are being added besides state-of-the-art navigation system DARIN III. This will further increase the operational capability of this long range strike aircraft.

The Mirage-2000 is also scheduled for upgrade due to the changing operational environment. A new radar, on board computers and a new EW suite along with long range air-to-air & air-to-surface weapons will enhance its potency. Contract negotiations are likely to commence shortly. Initially, four aircraft will be upgraded with OEM involvement. Follow on upgrade will be carried out in India by HAL.

Su-30 MKIs are being produced in India in different batches. To ensure technological advantage, all aircraft of previous batches are being planned to be upgraded to new and updated standards. In fact, Su-30 upgrade is a continuous programme and has already commenced.

In respect of the transport fleet, upgrade of the AN-32 fleet is planned so that it can operate in the prevailing environment and comply with all ICAO requirements. Upgraded avionics will enable its operation in dense air traffic conditions. No major upgrade is planned for the IL-76 fleet and the AVRO, as the cost of upgrading these fleets would be high and the benefit that accrues will be limited due to their residual life and limited availability of spares. The upgrade of Dornier is primarily focused towards improving its avionics suite and the process is likely to commence in 2009-10 in order to ensure that the complete fleet retains the same standard and can operate in dense air traffic environment complying with all ICAO requirements.

In respect of helicopters, no upgrade is planned for the MI-26 fleet due to the limited numbers and restricted residual life. Helicopters of this category are being replaced by 15 new inductions and the RFP is likely to be issued shortly. However, upgrade for medium-lift helicopter fleet (MI-17) is planned and the process has also commenced.

As Network Centric Operations will be central to future operational capability due to their impact on information flow and the decision making process, we have initiated a major programme in this regard. Development and integration of cutting edge technology in this field is progressing at a fast pace and we under the ambit of C4ISR (Command, Control, Communication, Computer, Intelligence, Surveillance and Reconnaissance) have commenced major networking projects and the most significant being Integrated Air Command and Control System (IACCS). It is an indigenous project for automation of Air Defence Command and Control infrastructure at tactical, operational and strategic levels. During the first phase, prototypes were developed and evaluated in field conditions. In a few months, our system will be operational. Additionally, another project has already been initiated to integrate airborne platforms, ground sensors and Command and Control Centers so as to reduce the sensor-to-shooter time in time sensitive targeting scenario.

To enhance electronic surveillance capability, a large number of ground based radars are being inducted. Radars in different categories like Aerostat, Medium Power Radar (MPR), Low Level Light Weight Radar (LLLWR), Low Level Transportable Radar (LLTR), Surveillance Radar Equipment (SRE) Precision Approach Radar (PAR) will assist a great deal in airspace management.

We are also acquiring state-of-the-art communication equipment across the spectrums. These include SATCOM, HF and V/UHF sets with associated encryption equipment to provide secure and reliable communication amongst its Command, Control and Combat elements.

To enhance operational efficiency and execute missions round-the-clock in all weather conditions, we have planned to modernise all our airfields under a combined project named Modernisation of Airfield Infrastructure (MAFI). This will allow a great deal of flexibility for planning and executing operational missions and also enhance Flight Safety.

SP's: What is the status of the MMRCA acquisition programme? Is the programme on schedule? When can the first lot of aircraft be expected to enter squadron service in the IAF?

DCAS: The Technical Evaluation is in the final stages of being completed and the acquisition process is on schedule. We have plans to commence flight evaluation this summer with the process being completed by the year-end. ■

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The company is engaged in manufacture of P68C (six seater aircraft), Thorp T-211 (sport aircraft), Nishant (UAV), Hansa (trainer aircraft) and structures for the SARAS aircraft & Structural assemblies for VSSC program. It is the only company in private sector in India which manufacturers aircraft.

In additional to the above facilities the company has highly experienced, design and engineering personnel with more than three thousand man month experience. A large number of modifications on the various types of helicopters and fixed wing aircraft have been successfully developed and incorporated on the serial production of the helicopter, aircraft and UAV's for our prime customers. The company has the strength to undertake major design to build projects on a competitive basis.

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- Design ,fabrication and assembly of interiors with sound proofing for SEA KING helicoptor for Indian Navy.
- Manufacture and assembly of interiors for ALH, HAL being used by ONGC.
- Manufactured cabin parts for Indian airlines and Air India. ■

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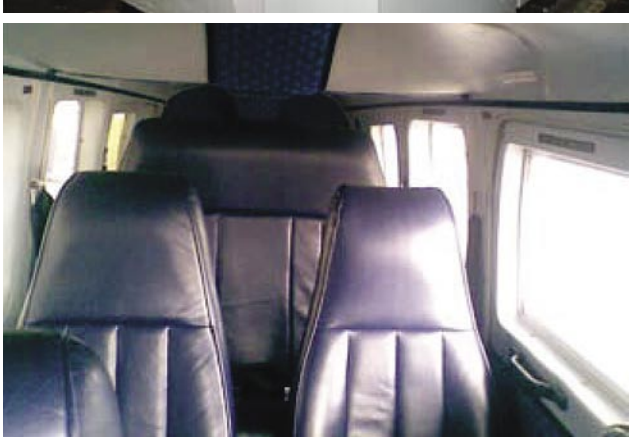

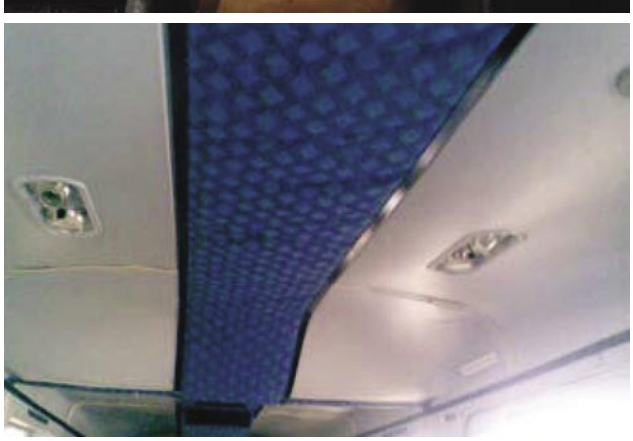

P68C Interior Fairings

Boeing IDS: F/A-18E/F Super Hornet

F/A-18E/F Super Hornet, equipped with advanced sensor technologies delivers unmatched total battlespace situational awareness. "When we designed the Super Hornet, we did it in two phases," said Bob Gower, Boeing Integrated Defense Systems Vice-President for F/A-18 and EA-18. "The first phase was an airframe and growth focus where we designed-in stealth. "We focused on what the Navy refers to as a 'balanced approach to survivability': stealth, our advanced electronic warning receivers, combat redundancy for major systems, such as two engines and two mission computers. "We also focused on our range and weapons bring-back capability," Gower explained.

In April 2005, the Block II version of the Super Hornet emerged. "Block II modernised all of the avionics and sensors on the aircraft. This reduced risk as we went through production stages—one of the key elements in the Super Hornet program's formula for success. The second phase of Block II enhancements upgraded the APG-73 radar—known as a mechanically scanning radar—into the APG-79 Active Electronically Scanned Array (AESA) radar, which lies at the heart of the Super Hornet's advanced capability. Upgraded sensors, which include the Advanced Targeting Forward Looking Infrared pod and SHAred Reconnaissance Pod, provides what Gibbons calls "unmatched total battlespace situational awareness".

"We can do simultaneous air-to-air and air-to-ground combat with the addition of the APG-79 radar," said Mike Gibbons, F/A-18E/F programme manager. "That hasn't historically been available. To date, it has been an either air-to-air or air-to-ground mode. Now, the Super Hornet is smashing through that paradigm. With the F/A-18E/F it's same-time air and ground missions—that's tough to match." Another hallmark of the day/night all-weather strike fighter is its versatility when connecting into the warfighting network—commonly known as net-centric operations. For example, when forward air controllers on the ground employ the Remotely Operated Video Enhanced Receiver (ROVER) system, the F/A-18E/F sends video to the ROVER and it confirms in a matter of seconds that the pilot is engaging the correct target through the real-time air-to-ground video captured with the Super Hornet's sensors.

The Super Hornet's Multifunctional Information Distribution System /Link 16, can instantaneously pass targeting information between aircraft by pushing a single button. It is a machine-to-machine interface," Gower said. "That used to take 27 keystrokes before the targeting data could be transferred and the weapon could be employed," he said. "Obviously, that goes a long way toward reducing pilot workload." The Super Hornet features 11 weapons stations—and the ability to carry up to 14 air-to-air weapons—which enable the Super Hornet to fight its way into target areas, launch weapons, and fight its way out. Gower said the Super Hornet's capability, availability and its versatility make it "the preeminent multi-role platform in the world today." He said the F/A-18E/F's unlimited angle of attack coupled with it ability to execute air-to-air, fighter escort, air-to-ground/close air support, maritime attack/tactical maritime operations, reconnaissance and tactical refueling missions, make it a true force multiplier. ■

BOEING AND INDIA

The Indian Navy recently announced the purchase of eight new Boeing maritime patrol aircraft, known by the designation of P-8I (I is for India).

The P-8I is a uniquely Indian derivative of the new P-8A Poseidon designed for the U.S. Navy, now being assembled at our plant in Renton, Washington. The maritime patrol aircraft is built upon Boeing's 737 platform whose dependability has already made it the world's best-selling commercial airliner. With its advanced electronics, speed and time-on-station, P-8I will be a daunting deterrent to seaborne territorial incursions. It provides the Indian Navy with all of the reach, speed, endurance and technology needed to protect 7,000 km of coastline, and to guard crucial international shipping lanes. These aircraft will remain robust for the next half century, building on the U.S. Navy's multi-billion investment in the P-8, and from continuous future technology upgrades. Boeing is capturing as much of these cost-savings as possible for the Indian Navy.

Far beyond the sale of these eight planes, the P-8I award is an historic milestone for our company, because this represents Boeing's first contribution to India's national defense.

Boeing is offering India the F/A-18E/F Super Hornet as India's newest multi-role combat fighter. As the most advanced see-all, do-all combat fighter in production today, the F/A-18E/F is battle-tested, capable of robustly defending the nation from the Himalayas to the Indian Ocean. The Super Hornet boasts the world's most advanced Active Electronically Scanned Array (AESA) radar which links its onboard avionics and weapons package into a formidable defender. And its "life cycle" or total ownership costs, are extremely attractive because this fighter won't see scheduled depot maintenance until it clocks a minimum 6,000 hours of flying time and even much longer. That is virtually the entire life of the Super Hornet's airframe. And the F/A-18E/F carries the full confidence of the US Navy, which will keep this fighter on US carrier decks well beyond 2030.

Some of the other Boeing defense products appealing to India are the renowned CH-46 Chinook helicopter for humanitarian and military needs, the AH-64D Apache, the C-17 Globemaster III for large strategic lift, and our network-centric technologies that tie all these platforms together into one seamless net-enabled force.

Finally, we want to emphasise that Boeing's strategic goal in India is not simply to sell planes or helicopters, but to become India's aerospace partner. It is an objective that foresees a long-term partnership to strengthen all aspects of India's aerospace capabilities in the twenty-first century. As the world's largest aerospace company, we believe Boeing is uniquely positioned to offer the depth and breadth of human talent, technical expertise and a variety of aerospace and defense resources required to help India strengthen its self-reliance and leadership in the fields of national security, civil aviation, defense, space technologies.

CAE: CDB aids mission rehearsal

CAE's common database, currently in use by the US Special Operations Command, can help significantly enhance training and mission rehearsal capabilities for the Indian defence forces

Most know simulation offers a range of compelling benefits for training, including significant cost advantages, saving wear and tear on weapon systems, and addressing environmental impacts. New technologies and capabilities, however, are helping move simulation beyond traditional training to mission preparation and rehearsal. CAE, one of the world leaders in simulation, has pioneered the development of something it calls the Common Database (CDB) and believes the time is now for India's defence and homeland security forces to look at the CDB.

The CDB is a single, standard database that defines a single synthetic representation of the world, and all simulation systems use the same database – the CDB. Originally developed for the United States Special Operations Command, the CDB is an open, non-proprietary database specification that allows the creation of a standardized, persistent, rapidly updatable synthetic environment. Because the CDB can be updated very quickly, it supports mission planning and mission rehearsal requirements.

CAE not only developed the CDB specification on behalf of the United States government, but has also implemented the CDB in two high-performance helicopter combat mission simulators for the 160th Special Operations Aviation Regiment.

"India has the opportunity to leapfrog more than ten years of struggle the U.S. and other nations have had with simulation database issues such as interoperability and correlation," said H J Kamath, President of CAE-Macmet, based in Bangalore.

Without getting into too much technical detail, a database that conforms to the CDB specification contains datasets that represent the features of the virtual world, also called the synthetic environment that you are trying to create. The implementation of a CDB significantly enhances interoperable training and mission rehearsal capabilities, while reducing development time, configuration control and associated database development costs. One of the main objectives of the CDB is to ensure unity and correlation between the various simulation subsystems, while improving database maintainability. A key benefit is the elimination of all source-level correlation errors. There are multiple benefits to using the CDB, but they all directly result in the capability to use simulation for mission preparation and rehearsal because the mission rehearsal timeline is greatly reduced.

"The CDB could provide the foundation for a national synthetic environment database in India," said Kamath. "Simulation technologies such as the CDB have proven to be effective combat multipliers and significant contributors to operational and mission readiness."

CAE is demonstrating a range of simulation technologies at its booth (Hall H, Booth #23) during Aero India, and will be highlighting the capabilities and benefits of the CDB. ■

EADS Defence & Security focus on ties in India

The Defence & Security Division (DS) of EADS is fully committed to support AERO INDIA 2009 in order to make it a successful air show and international defence exhibition. Therefore DS will highlight its products and capabilities to the Indian customers both on the EADS stand as well as on the Eurofighter stand. The German Air Force will deploy the Eurofighter Typhoon to AERO INDIA where they will demonstrate their flight performance to the visitors for the first time. Since India is currently expanding its aerospace and defence industry, DS will further enhance its industrial footprint in this growth market and is committed to create new partnerships. First steps will be the creation of EADS DS India Private Ltd. and the launch of new joint ventures in 2009.

Military Air Systems (MAS)

As an integrated Business Unit of DS, MAS concentrates its capabilities in the fields of combat aircraft, manned mission aircraft, unmanned aerial vehicles (UAVs) including research into and development of unmanned combat aerial vehicles (UCAVs). Further, the Business Unit is responsible for complex airborne systems including development, production and integration stages as well as training services and comprehensive system support during the entire in-service phase. Major programme is the Eurofighter Typhoon which is developed and manufactured by Alenia Finmeccanica (Italy), BAE Systems (UK) and EADS (Germany, Spain). Most impressive key feature of the Eurofighter Typhoon is its multi- and swing-role capability, which provides military commanders with enormous flexibility. On behalf of the Eurofighter consortium, EADS submitted the Eurofighter bid proposal for the Medium Multi Role Combat Aircraft (MMRCA) competition on 28 April 2008 and its offset offer on 4 August 2008. In the area of UAVs, MAS successfully demonstrated its light tactical UAV system Tracker to the Indian Army. This mini UAV is dedicated to surveillance and intelligence. It gathers, in day/night conditions, close range high resolution image with secured real-time processing.

Defence and Communications Systems (DCS)

The "Systems House" of EADS offers integrated solutions for network centric operations, flexible and interoperable services as well as outstanding communication capabilities based on the latest technology. The Business Unit ensures coherent delivery of end-to-end services for its military and security customers and is fully engaged in future tactical and infrastructural network projects for the Indian Army. As an example of our commitment to India, DCS acted as the design and integration authority to the Indian Army for its test bed system called Parikshak. This system is being used to help the Indian Army investigate the capabilities that could be delivered for the new Tactical Communications System (TCS) project. In addition on the 16 February 2008, DS and TATA announced the formation of a new partnership to bid for the TCS project.

In the global security market, DCS possesses the capabilities to provide integrated border and coastal surveillance as well as large event security solutions. It provides interoperable mission systems, solutions integrated in a command-decision-support system, command and control and combat management systems as well as simulation projects for India's Armed Forces. DS has been awarded with India's first major public safety TETRA network contract by the police of the state of Andhra Pradesh. The new network will cover the region of Cyberabad, the high tech hub that surrounds the city of Hyderabad. In the area of battle management solutions for army and joint forces, DS provides C3I systems for the strategic, operative and tactical level as well as military communication networks. This complete chain of command ranges from the highest level of command to the soldier in the field.

Defence Electronics (DE)

As the Electronics House of EADS Defence & Security, this Business Unit offers mission-critical key electronics to India. In cooperation with local industries, it is ensured that modular and interoperable solutions are available over a broad variety of platforms. Uniting electronic self-protection and sensor technologies for platforms deployed within armed forces and security forces worldwide, DE provides components and subsystems based on the latest radar technology such as the E-Captor radar for the Eurofighter Typhoon, electronic warfare technologies as well as mission management subsystems and electronics for air defence systems. ■

Eurofighter Typhoon Ready for India

Eurofighter Typhoon is ready for India. The Eurofighter consortium is fully committed to meet the future requirements of the Indian Air Force (IAF). As the Medium Multi-Role Combat Aircraft (MMRCA) competition progresses, EADS which is the lead company for the Eurofighter Typhoon campaign in India, has initiated intensive preparations for the forthcoming flight trials scheduled for summer 2009. Germany's Luftwaffe plans to deploy Eurofighter Typhoon, the most modern combat aircraft available on the world market, to Bangalore to demonstrate its flight performance during the flying displays at AERO INDIA 2009. Eurofighter Typhoon will be one of the major highlights at this international Air Show since it will be flying in India for the very first time.

While AERO INDIA and the MMRCA flight trials will be the key events this year, 2008 proved to be a challenging year for all six vendors in this competition. On 28 April, EADS submitted an attractive Eurofighter Typhoon bid proposal to the Indian authorities and invited India to become a partner of the Eurofighter programme. Bernhard Gerwert, CEO Military Air Systems, an integrated activity of EADS Defence & Security, said: "India is our partner of choice and we are interested in long-lasting political, industrial and military relations which will be based on a win-win-partnership with India." Four European nations, their four Air Forces and the leading European aerospace and defence companies such as Alenia Finmeccanica, BAE Systems and EADS in Germany and Spain fully support the campaign in India. All have one common goal in mind: Eurofighter Typhoon shall become a new and potent capability in the fleet of the Indian Air Force.

Moreover, since industrial cooperation with India is a key requirement in the MMRCA competition, a comprehensive and compliant offset offer was submitted on 4 August 2008. Germany, the United Kingdom, Spain and Italy are absolutely committed to support the Indian defence sector over the decades to come to bring new capabilities, skills and technologies to industry; from the Defence Public Sector Undertakings, to all elements of the defence private sector. The government-owned Hindustan Aeronautics Ltd (HAL) will play the leading role in all of this and EADS will liaise closely with HAL on how to integrate and involve the wide range of non state owned defence companies.

Since Eurofighter Typhoon's entry into service in 2004, its order book has increased to more than 700 aircraft from six nations including Austria and Saudi Arabia as first export customers. Countries such as Greece, Turkey, Switzerland, Japan, Croatia, Bulgaria and Romania are also showing strong interest. With more than 160 aircraft delivered so far, the Eurofighter Typhoon is rapidly gaining the respect of air forces throughout the world. Eurofighter Typhoon's agility and reliability combined with its state of the art multi-role capabilities provides military commanders with enormous flexibility.

Thanks to unique air-to-air and air-to-ground capabilities

and its exceptional engines, the EJ 200, Eurofighter Typhoon is a hugely capable weapons system. It combines advanced technology with world-class performance and its air-to-air refuelling capability extends weapons carriage, mission duration and range. Given Typhoon's outstanding cabilities, it is equipped to meet the IAF's fast-changing and significant operational and threat scenarios. Eurofighter Typhoon is ready for India!

The cockpit of the Eurofighter Typhoon is unique

Typhoon pilots benefit from one of the most advanced cockpit environments ever developed. Latest technologies have helped to simplify the task of flying and fighting in this modern swing-role combat aircraft. The most advanced fighter cockpits are dominated by large multi-function display screens with a Head-Up Display (HUD) and throttle controls and stick covered by control switches and buttons. However, there is much more to a fighter cockpit. The Human-Machine Interface (HMI) is of critical importance and Eurofighter Typhoon designers have paid unparalleled attention in developing it. The HMI combines the following elements:

HUD – the bigger the better

Until the Eurofighter Typhoon's advanced helmet-mounted display enters service with Tranche 2 aircraft the primary source of flight information is the massive, almost frameless, wide-angle HUD. This can present terrain-avoidance cues from TERPROM and infra-red imagery from the PIRATE (Passive Infra-Red Airborne Track Equipment), allowing 'head-up' operation even in poor weather. The HUD also displays basic flight information, target information and weapons aiming cues and weapons system status. The MIDS (Multifunctional Information Distribution System), radio, and fuel system displays are arranged under the HUD.

Active Matrix LC Displays make the difference

To try to give pilots what they need, the Eurofighter Typhoon's three Active Matrix Liquid Crystal Displays change automatically to present the most appropriate information in any phase of flight. For example, the displays switch from presenting system data to navigation information after take-off, and then to threat warnings if triggered by the DASS (Defensive Aids Sub-System). It may then change to weapons aiming displays on reaching the Initial Point, though the pilot can, of course, select other information using the 17 programmable soft touch buttons surrounding each display. In the moving map display mode, the map can be overlaid with target information and the full ground and air threat picture.

HMI for optimum awareness

With modern sensors it would be easy to overwhelm pilots with too much information. This potential problem was recognised at the very beginning of the design process and great efforts were made to present information in a clear, simple and intuitive way. The cockpit was optimised to provide the pilot with 'at a glance' awareness and appreciation of the vast amount of information the sensors and datalinks are bringing onboard. Because the HMI was very challenging, an 'active cockpit' rig was built to allow the ergonomics to be evaluated by front-line aircrew and test pilots long before the real aircraft was available. This enables the HMI and software development to proceed more rapidly. Former BAE Systems' Eurofighter Typhoon Project Pilot, Craig Penrice, said: "As a fighter pilot you cannot fail to' be impressed when you are introduced to Eurofighter's 'office'. My experience of demonstrating the aircraft at all the trade shows and airbases with our demonstrator, allows me to say that there is nobody who has walked away with the impression that we missed anything."

Voice Control plus HOTAS: the ease of flying

Eurofighter Typhoon incorporates Hands on Throttle and Stick (HOTAS) controls, allowing the pilot to control systems and sensors without taking his hands from the controls. This obviates the need to stretch in order to reach controls on the panel or side consoles. The aircraft has 12 programmable buttons on the control column and 12 more on the throttles. More unusually, it uses voice recognition technology which allows the pilot to undertake many routine tasks by using voice commands, controlling some 26 cockpit functions, such as changing a radio frequency, calling up a different display format, or even designating a specific target to be engaged, though not for safety-critical commands such as weapon launches or flight control inputs. Designated VTAS (Voice, Throttle and Stick), the system is based around a voice recognition. It is the first production Direct Voice Input (DVI) system in service.

A helmet to look over your shoulder

The Helmet Mounted Display (HMD) is one of the most sophisticated systems in the world. It provides flight reference data, and weapon-aiming symbology in the pilot's visor, giving him aircraft information without the need to look inside the cockpit, or through the HUD. The HMD therefore extends the 'head out' advantage offered by a HUD to wherever the pilot is looking, and not just in a fixed narrow slice of the forward hemisphere. It allows weapons and sensors to be slaved to 'look' wherever the pilot's head 'points', with sufficient accuracy for missiles to be locked onto an off-boresight or 'over-the-shoulder' target. The system even provides the pilot with cues of where to look to find targets. This is achieved by using a high speed optical helmet tracker to determine exactly where the pilot is looking, and projecting target designator boxes, generated by the weapons system, to show the target's position, significantly improving the pilot's overall situational awareness. ■

MILITARY

US Air Force to use prop planes as ISR platforms

To fulfill commanders' needs for intelligence, surveillance and reconnaissance, air force officials will begin using C-12 Huron turboprop planes as ISR platforms. The programme, Project Liberty, involves Airmen operating a fleet of 37 C-12 aircraft providing ISR full-motion video and signals intelligence for operations Iraqi Freedom and Enduring Freedom. The specialised crew of four will provide military leaders with real-time data and information to make key battlefield decisions. The project is part of the Secretary of Defense's ISR task force and derives from his direction to provide more ISR capabilities to US Central Command. There will be two deployed units and one stateside training unit. The modified C-12s—designated MC-12W—will be deployed to the CENTCOM area of operations during April 2009.

DoD releases Quadrennial Roles & Missions Review 2009

The US Department of Defense (DoD) has released the 2009 Quadrennial Roles and Missions Review (QRM) Report to Congress in accordance with the National Defense Authorization Act for Fiscal Year 2008. Although the department has completed similar reviews in the past, this was the first review conducted with the intention of establishing a framework for performing roles and missions analysis on a recurring basis every four years. The DoD's core mission areas are homeland defence and civilian support; deterrence operations; major combat operations; irregular warfare; military support to stabilisation, security, transition and reconstruction operations; and military contribution to cooperative security. In order to link DoD core mission areas with its capabilities development processes, the department identified nine core competencies to include force application; command and control; battlespace awareness; net centric; building partnerships; protection; logistics; force support; and corporate management and support. The 2009 QRM review also describes how the department reviewed the rapidly-evolving roles, missions, and capabilities associated with irregular warfare, cyberspace operations, unmanned aircraft systems, and intra-theater airlift.

Highlights of measures to protect US airspace

The US Air Force faces two challenges for sustaining its Air Sovereignty Alert (ASA) capabilities over the long term; firstly, replacing or extending the service life of aging fighter aircraft and secondly replacing ASA units with equipment and trained personnel when they deploy. For example, if aircraft are not replaced by 2020, 11 of the 18 current air sovereignty alert sites could be without aircraft. F-15s and F-16s are aging aircraft that cost more to maintain as they age. Of the 18 ASA sites, 12 are currently equipped with F-16s, which will reach the end of their useful service lives between fiscal years 2015 and 2020. One option is to replace the F-16s with either F-22s or F-35s, both of which the Air Force is acquiring. However, according to the current F-22 and F-35 fielding schedules, only 1 of the 12 units will receive the new aircraft before its fleet of F-16s reaches the end of its useful service life. Secretary of the Air Force has been directed to conduct a study on the feasibility and desirability of equipping certain ASA units with F-35s. Another option for the Air Force is to replace the F-16s with some of the more modern F-15 models. However, F-15s, like F-16s, are beginning to reach the end of their lives. Also, all F-15s, including those flown by five ASA units, were grounded for 3 months in late 2007 and early 2008 after an F-15 broke apart during a normal flying operation in November 2007. The air force found a structural problem and it is doubtful that enough F-15s will be available till there retirement date of 2025. In comments on a draft of this report, DoD indicated that extending the service life of its F-15 and F-16 aircraft is also an option; however, the air force has yet to determine the extent to which such actions are viable.

SAAB opens office in India

SAAB has opened an office in India (New Delhi) which was inaugurated by Anders Sjöberg, Deputy Head of Mission, Embassy of Sweden, and Mats Warstedt, Group Senior Vice President, Marketing, at SAAB. SAAB's commitment to India is to provide our cutting edge technologies across air, land and sea, indigenised and optimised for the local environment. Gripen, the most advanced fighter aircraft in its category, is also one of the contenders for the Indian Air Forces MMRCA program. "For SAAB, India is a key market where the company is making long term commitments. We are offering our high tech portfolio to the Indian Army, Air Force and Navy. We will be further enhancing our presence to ensure full support to our customers. SAAB is actively looking for long-term cooperation with Indian Government and Private Industries," said Jan Widerström, Vice President, SAAB International. SAAB has also recently received two serial production orders for the

QuickRoundUP

- The two Alenia Aeronautica C-27J tactical airlifters deployed in Afghanistan since September 2008 by the Italian Air Force have returned to their base after successful completion of their first major out-of-area deployment. Despite the very difficult terrain and weather conditions of the vast Afghan territory, the C-27J performed well. In their five months in Afghanistan the C-27Js provided some 200 hours of operational flying, carrying out some 50 sorties and transporting about 1,500 passengers and over 30,000 lbs of freight.

- Boeing has received a $75 million (Rs 364 crore) contract extension from the US Air Force to continue risk reduction and system definition for the TSAT. This additional award brings Boeing's total TSAT contract funding to $793 million (Rs 3,852 crore). TSAT will provide survivable, protected, high-capacity and Internet-like connectivity via satellite for airborne intelligence, surveillance, and reconnaissance; communications on the move; and protected strategic communications.

- Boeing has announced that it will assist in the development of the US Air Force F-16 Mission Training Centre (MTC) programme as part of a team led by L-3 Link Simulation & Training (L-3 Link). The Aeronautical Systems Center's Simulator Systems Group at Wright-Patterson Air Force Base, Ohio, awarded L-3 Link a $68.2 million (Rs 330 crore) contract for the programme in December 2008. This programme supports Boeing's growth strategy of capturing contracts for non-Boeing platforms.

- The Boeing Co., Integrated Defense Systems (Global Services and Support Division), St. Louis, Missouri, has been awarded a contract for operations and sustainment support for the fielded portions of the Ground-Based Midcourse Defense (GMD) System for calendar year (CY) 2009 with an option for CY 2010. The principal places of performance are the contractor's facility in Huntsville, Ala.; and Missile Defense Agency facilities at Schriever Air Force Base, Colorado, Vandenberg Air Force Base, Calif., and Fort Greely, Alaska.

Integrated Defensive Aids Suite (IDAS) for the Indian Advanced Light Helicopter Dhruv. The combined value of these orders from Hindustan Aeronautics Limited (HAL) is approximately $24 million (Rs 116 crore).

US focus on optimal future strategic airlift mix

US Government Accountability Office (GAO) was asked to identify the impact C-5 modernisation cost increases have had on the mix of aircraft; assess the current C-5 modernisation cost estimate; and identify C-17 production plans and issues related to production line shutdown. GAO found that the US Air Force has cut the number of C-5s it plans to fully modernise by more than half because of substantial cost increases in the C-5 Reliability Enhancement and Re-engining Programme (RERP), and plans to acquire more C-17s. Current plans are to provide avionics upgrades to all 111 C-5s, limit RERP to 52 C-5s, and acquire 205 C-17s. However, this mix may change again, based in part on the results of a new mobility capabilities study, the findings of which DOD plans to release in May 2009.

China exports arms to Africa

China has been increasingly exporting military hardware in lieu of oil, mineral resources and even fishing rights to African Nations. For example Zambia has used its copper and Kenya has been negotiating with China to trade fishing rights for arms. Among the most popular Chinese military exports to Africa are the J-7, K-8 and Y-12 aircraft, which are relatively inexpensive and easy to operate. China views those countries as potential customers for its new FC-1 fighters. Russia and other countries are keeping a close watch but find it difficult to compete with China due to its unique concept of arms trade.

Germany requests addition of secondary missile

MEADS International (MI) has received a request from the German government to integrate a European air defence missile into the Medium Extended Air Defence System (MEADS). The scope of work provides for incorporation of IRIS-T SL (surface launched) as a secondary missile, expanding the flexibility of MEADS fire units that will be delivered to Germany.

Based on a European air-to-air missile that uses an imaging infrared seeker, the IRIS-T SL fulfills specific German Air Force requirements within the MEADS programme. It will be the first time that one of the MEADS partner nations has chosen to adapt MEADS into a unique configuration. Compared to IRIS-T, IRIS-T SL is equipped with a larger solid-propellant rocket motor, a data link and a nose cone for drag reduction. Via a standardised plug-and-fight data interface, the IRIS-T SL system will be integrated into the MEADS network-based architecture to provide commanders with increased flexibility to dynamically select the optimum missile for a given target.

MEADS, under development by Germany, Italy and the United States, is designed to replace Patriot systems in the US and Germany and Nike Hercules systems in Italy.

Magic of Merlin helicopters

Merlin helicopter proved itself in Bosnia and continues to perform very well in Iraq. It is the latest addition to the RAF's helicopter family which is employed to pick up casualties, move troops and supplies to the frontline. The pilot has all-round visibility and Kevlar for protection. It has two 7.62 mm General Purpose Machine Guns as standard, with a five-gun fit available. Self-protection is even better with a whole host of defensive aids including missile and laser warning systems and infrared jammers.

Based on the military utility version of the Anglo-Italian EH101, the Merlins Mk3 and Mk3a can operate by day and night, in hot, high or freezing conditions. Powered by three Rolls-Royce/Turbomeca RTM322 engines, the aircraft can carry three or four crew members and 24 fully-equipped troops at a range of

EU NATIONS ENDEAVOUR TO OPEN EUROPEAN DEFENCE MARKET

EU governments are gradually coming around to the idea that they need to open up their defence markets, especially at a time when growing budgetary constraints clash with the increasing need for sophisticated military equipment. Governments have already agreed to the Code of Conduct on Defence Procurement introduced by the European Defence Agency (EDA) in July 2006, but the EDA cannot force governments to comply with the code. Also, the protectionist attitude of member states derives from the fact that they regard defence procurement as an area that overlaps with national sovereignty.

The European Commission is currently proposing new procurement and trade directives aimed at streamlining defence market legislation, and it is to be hoped that member states will respond positively to this initiative. The proposed directives would open up the defence market, improve European cooperation on armaments and lead to a more competitive European defence industry.

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- The Boeing Co., Ridley Park, Pa., has been awarded a contract for research with the primary objective of the programme to carry out Phase 1 of the DiscRotor Risk Reduction Study. The DiscRotor concept consists of a fixed-wing aircraft fitted with a retractable single rotor. The DiscRotor concept has substantial potential to provide a high-speed, high-altitude aircraft (400+knots true airspeed at 30,000 ft) that has the hover and low-speed characteristics of a helicopter.

- The Brazilian Air Force Command has announced that as set out in the schedule for the selection of a new multi-mission fighters for the Força Aérea Brasileira (FAB), it has received offers submitted by the three participating companies that have been short-listed, namely (in alphabetical order) Boeing (F-18E/F Super Hornet), Dassault (Rafale) and Saab (Gripen NG). This is as a response to Requests for Proposals issued during October 2008.

- An estimated $27.8 billion (Rs 1,35,038 crore) will be spent over the next 10 years on the development and production of major Electronic Warfare (EW) systems, according to Forecast International's "The Market for Electronic Warfare Systems." In total, some 46,060 EW units will be produced, including electronic countermeasures systems, radar warning receivers, and electronic support measure systems, among others.

- International Aero Engines (IAE) consortium has announced that Lufthansa is to power a new fleet of 20 firm Airbus A321s plus options with the V2500 SelectOne engine. The value of this business to IAE is up to $850 million (Rs 4,127 crore) if all options are exercised and deliveries are due to commence in 2009. Lufthansa has extensive experience of operating the V2500 and the airline celebrates 15 years of V2500 operation covering 33 aircraft.

- Lufthansa has selected International Aero Engines to power a new order for 20 firm Airbus A321's plus options with the V2500 SelectOne engine. The contract is valued at more than $283 million (Rs 1,374 crore) to Pratt & Whitney,

ANTONY KEEN ON SPEEDING UP PROCUREMENT PROCEDURES

With the armed forces going on a fast-track modernisation drive after 26/11 terror strikes, India's Defence Minister A.K. Antony said that unnecessary procedures, bottle-necks and red-tape should be cut down for hastening procurement procedures.

"We need to cut down on the unnecessary procedures, bottlenecks and red tapism in our procurement mechanism", Antony said while addressing the 'Jumbo' Majumdar Seminar on 'Dominance of Aerospace Power' in New Delhi. He said that to hasten the procurement procedures, the Government had come with the DPP and if required, further changes can also be made. "We have framed our defence procurement procedures. If changes in the present procedures are required to ensure speedy procurement, we will examine the", Antony said.

Without mentioning DRDO's frequent complaints against the services of making last minute changes in their specifications and requirements during trials of its equipment and systems, Antony said, "End-users (armed forces) must also ensure that the requirements and specifications are not changed frequently."

over 1,000 km and at a maximum speed of 167 knots. Alternatively, under-slung loads of up to 4.2 tonnes can be carried. RAF plans to move the Merlins to Afghanistan once they have completed their mission in Iraq.

Boeing submits A-10 sustainment/integration contract proposal to USAF

The Boeing Company has submitted a proposal to the US Air Force to participate as an associate prime contractor in the projected $1.6 billion (Rs 7,770 crore) A-10 Thunderbolt Life-Cycle Programme Support (TLPS) contract to support the sustainment of the A-10 Thunderbolt II weapon system and integration of current and future requirements. Boeing won the $2 billion (Rs 9,737 crore) A-10 Wing Replacement Programme contract in June 2007. The programme includes engineering services and the manufacture of up to 242 wing sets for the Air Force's A-10 fleet.

The programme is on schedule as Boeing develops the 3-D models that provide the engineering foundation for current wing sustainment needs, design improvements to prevent cracking, and production of the enhanced wing sets. The A-10, also known as the Warthog, was first introduced into the Air Force inventory in 1976.

'Manas Air Base closure won't disrupt Afghanistan operations'

Pentagon spokesman Bryan Whitman has stated that the US hopes to continue operations at Manas Air Base in Kyrgyzstan, but would use other means to support troops in Afghanistan if the Kyrgyz government goes through with plans to close it. Neither the State Department nor the Defense Department has received official word that Kyrgyzstan plans to discontinue its three-year arrangement with the US. But Kyrgyz President Kurmanbek Bakiyev reportedly announced plans to close the base after meeting Russian President Dmitry Medvedev in Moscow.

The US pays $17.4 million (Rs 85 crore) a year to use the air base, a major logistical and refueling hub supporting international troops in Afghanistan, Whitman said. The closure plan, if implemented, would affect about 15,000 people and 500 tonnes of cargo that transit through Manas each month.

AeroVironment awarded $41.7 million contract option for Raven UAS & support services

AeroVironment announced that the US Army has ordered additional RQ-11B Raven small UAS and associated services for its fiscal year 2009 requirements by the exercise of an option under an existing contract. Each Raven system typically consists of three aircraft, two ground control stations, and spares. The aggregate order value is $41.7 million (Rs 203 crore) and is fully funded. The award was released under the existing US Army joint small UAS program of record for AV's Raven system and will provide systems, spares and services for the Army and Marine Corps.

Boeing completes flights of two Wedgetail AEW&C Aircraft modified in Australia

The Boeing Company has conducted successful functional check flights of two 737-700 AEW&C aircraft modified in Australia for Project Wedgetail. During each of the 2.5-hour flights, the pilots performed a series of functional tests that verified the airworthiness of the aircraft's systems and structures. The flight followed major aircraft modifications performed by Boeing Defence Australia at Amberley, including the installation and checkout of an advanced Multi-role Electronically Scanned Array (MESA) antenna, ventral fins and mission system equipment. The Wedgetail programme includes six 737-700

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if all options are exercised. Pratt & Whitney, a United Technologies Corp. company, is a major participant in International Aero Engines (IAE) consortium.

• Northrop Grumman Corporation has delivered its 400th fuselage section for the F/A-18E/F Super Hornet, the US Navy's combat-proven multi-role strike fighter. The fuselage 'shipset', measuring nearly 30 feet long and 18 feet high, consists of the aircraft's centre and aft fuselage sections, twin vertical tails and all associated subsystems. As principal F/A-18E/F subcontractor to Boeing, Northrop Grumman is responsible for design and production of the entire centre and aft fuselage as well as subsystems integration and after-delivery product support.

• Patria Aviation has received an order from the Finnish Air Force for a cockpit upgrade of 11 BAES Hawk Mk 51 and Mk52 jet trainers. The total value of the order is over €10 million (Rs 62 crore). The upgraded trainers will be delivered during 2009 -2010. The Finnish Air Force has announced to upgrade also the 18 BAES Hawk Mk66 jet trainers purchased from Switzerland in summer 2007, which brings the number of modernised aircraft up to 30.

• Pratt & Whitney, in a joint venture with Seven Q Seven (SQS) of San Antonio, Texas, celebrated the roll-out of the re-engined Joint Surveillance Target Attack Radar System (Joint STARS) aircraft along with Northrop Grumman and the US Air Force. The JT8D-219 Joint STARS engine configuration offers a cost-effective, simplified installation approach. This fuel-efficient propulsion system affords the Joint STARS aircraft fuel burn improvement, which will increase the Joint STARS time on-station in its surveillance orbit.

• Rolls-Royce will share in an order by Lufthansa to power a new fleet of 20 Airbus A321s plus options with V2500 SelectOne engines from the International Aero Engine (IAE) consortium. The value to Rolls-Royce is approximately $272 million (Rs 1,320 crore) if all options are exercised. Deliveries are due to commence in 2009.

• Rolls-Royce has been awarded a contract by the UK Ministry of

AEW&C aircraft plus ground support segments for mission crew training, mission support and system maintenance. The modified AEW&C aircraft features Northrop Grumman's MESA antenna with integrated identification friend-or-foe capabilities; a flexible, open architecture for cost-effective future upgrades; an extensive communications suite; and aerial refueling capability.

Upgraded Early Warning Radar in Greenland achieves satellite tracking in record time

Raytheon Company's UEWR at Thule Air Base, Greenland, has achieved a significant milestone by successfully tracking its first satellite in an operational space surveillance mission configuration. The UEWRs add missile defence capabilities to the Raytheon-developed PAVE PAWS and Ballistic Missile Early Warning System radars, while continuing their missile warning and space surveillance missions for the US Air Force Space Command. The radar is a key sensor for the Missile Defence Agency's Ballistic Missile Defence System, providing target detection and tracking to protect the US and other nations from ballistic missile attacks.

CIVIL

Airbus signs JV contract to set up manufacturing centre for aircraft composite parts in Harbin, China

Airbus and a group of Chinese industrial partners have signed a contract to establish a JV Manufacturing Centre in Harbin, China to manufacture composite material parts and components for the Airbus A350 XWB programme and Airbus A320 Family aircraft. The contract was signed by Laurence Barron, President of Airbus China, and Pang Jian, Chairman of the Board of Directors of HAIG and HAI in Madrid, Spain in the presence of Chinese Premier Wen Jiabao and Spanish Prime Minister José Luis Rodríguez Zapatero. The Harbin Hafei Airbus Composite Manufacturing Centre Company Limited (the Manufacturing Centre) will be set up in 2009. The Manufacturing Centre will produce major components for the A350 XWB programme, as part of Airbus' target of manufacturing five per cent of the A350 XWB airframe in China. These components will be manufactured using the latest composite manufacturing technology based on Airbus standards and processes.

Airbus is committed to forging a long-term strategic partnership with China. The total value of industrial cooperation between Airbus and the Chinese aviation industry is expected to be near $200 million (Rs 970 crore) per year in 2010 and $450 million (Rs 2,185 crore) per year in 2015.

Arianespace to launch two satellites for Arabsat

Saudi-Arabia based operator Arabsat has selected Arianespace to launch the Arabsat 5C and Arabsat 6B satellites. The Arabsat 5C satellite is scheduled for a launch into geostationary transfer orbit (GTO) from the third quarter of 2011 and the launch of Arabsat 6B is scheduled from the second half of 2012. These two contracts are the 14th and 15th launch Service & Solutions contracts that Arianespace has signed in the Middle East. The Arabsat 5C and 6B satellites will be built by EADS Astrium and Thales Alenia Space.

Ulan-Ude Aviation Plant has delivered to Iran two civil Mi-171 helicopters

Within the framework of the contract signed in the end of 2007, Ulan-Ude Aviation Plant has delivered to Iran two civil Mi-171 helicopters. The helicopters will be operated by non-government organisation Red Crescent Society involved in conducting humanitarian missions. The society has its own aviation department and successful experience in operation of Russian helicopters. The helicopters will be used for civil missions, particularly, for carrying out search and rescue missions and transportation of people injured in natural calamities. ●

ARIANESPACE ORDERS 35 ARIANE 5 ECA LAUNCHERS FROM ASTRIUM

Jean-Yves Le Gall, Chairman and Chief Executive Officer of Arianespace, and Alain Charmeau, Chief Executive Officer of Astrium Space Transportation, have signed a contract for the production of 35 Ariane 5 ECA launchers (designated the "PB" batch). Worth more than €4 billion (Rs 24,950 crore), this contract follows the letter of intent signed at the last Paris Air Show in 2007, at a ceremony attended by French President Nicolas Sarkozy. The launchers in the PB batch will be used starting in the second half of 2010, after the 30 Ariane 5 launchers ordered in 2004 ("PA" batch). With this contract, Arianespace now has 49 Ariane 5 launchers under production.

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Defence to support the Pegasus engines which provide the Harrier fleet with its unique Short Take Off and Vertical Landing capability. The 10-year contract provides a guaranteed level of availability of Pegasus engines to power the aircraft operating in the UK's Joint Force Harrier, which is operated by both the Royal Air Force and the Royal Navy. Rolls-Royce is the world's number two defence aero engine company with 160 customers in 103 countries

• Sikorsky Aerospace Services has announced the signing of a $4 million (Rs 20 crore) contract with Presidential Airways to provide HUD systems. The distribution of these systems will be performed by Helicopter Support Inc., a Sikorsky Aerospace Services company. Sikorsky Aerospace Services is the aftermarket business of Sikorsky Aircraft Corp., a subsidiary of United Technologies Corp.

• During a test flight the Saab Gripen Demo aircraft proved its ability to "Supercruise", the ability to fly supersonic without the use of afterburner which results in fuel savings and an increase in range. This supercruise flight is part of the ongoing high speed supersonic testing that will include supersonic flights, with different load alternative.

• Maritime Helicopter Support Company, Woodbridge, Va., has been awarded a definite delivery, definite quantity Performance Based Logistics contract for support for Navy H-60 weapons repairable assemblies and shop replaceable assemblies covering various airframes and avionics systems in support of the H-60 series helicopters. The work is expected to be completed by January 2010.

• The US Air Force has awarded Northrop Grumman Corporation an indefinite-delivery, indefinite-quantity contract for operations and maintenance support of the RQ-4 Global Hawk unmanned reconnaissance aircraft. The sustainment contract calls for continued training and peacetime operations support for fiscal years 2009 and 2010. It will also provide operational assistance for two new forward operating locations in Guam and Italy.

F-16IN SUPER VIPER
THE ULTIMATE 4TH GENERATION FIGHTER

Lockheed Martin's F-16IN Super Viper is a unique new fighter sharing a heritage with the world's only fifth generation fighters. This ultimate fourth generation fighter has been tailored exclusively to meet or exceed all of India's Medium Multi Role Combat Aircraft (MMRCA) requirements. The F-16IN is the right choice for the Indian Air Force (IAF) and is ready for integration into India's infrastructure and operations now. Evolutionary technologies make the F-16IN the most advanced fourth generation fighter in the world today.

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