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[ inside ]








**The 10th edition of Aero India will be held on February 18-22, 2015, at Yelahanka Air Force Base, Bengaluru.**

# FIFTH-GEN FLAVOUR at Aero India


HAL-SUKHOI PROSPECTIVE MULTI-ROLE FIGHTER

BY **SP'S SPECIAL CORRESPONDENT**

At Aero India 2013, it's hard to miss the fifth generation flavour in the air. They may not be big jets on the flightline, not yet at least, but they finally have a shape and form. The HAL-Sukhoi prospective multi-role fighter (PMF), the modified version of the Sukhoi T-50/PAK FA which is already under test across four prototypes in Russia, is on display for the first time at the HAL pavilion and has attracted a great deal of interest. HAL sources confirm that enquiries have been pouring in about the aircraft, including from the vast number of small and medium Indian enterprises who will be looking for a piece of the lucrative development and manufacturing pie. To be sure, the HAL-Sukhoi jet will not be extravagantly different from the platform currently being flight-tested currently, but largely involve an Internet reconfiguration of systems, including sensors, avionics and survivability features. Officials with the Sukhoi Design Bureau visiting Aero India this year confirm that the scope of redesign is extremely slim given timelines. However, the project has received a show of support from the IAF from the word go, a highly welcome fact for a programme that is all set to be one of India's most costly. Air Chief Marshal N.A.K. Browne recently revealed that two prototypes of the PMF would be delivered for tests later this decade. However, it is perhaps testimony to the massive scope of work at play that full scale production of the platform won't begin before the early part of the next decade. In the meantime, there is a decade of development, testing and manufacturing to do, and HAL is going to be extremely busy. The fact that the state-owned company could be strapped for capacity and human resources towards developing a large part of its share of the work, the opportunities for the Indian private sector are enormous. It is also upto them to step up, take an interest in the future machine, and ensure that it is truly keeping with the spirit of an Indo-Russian partnership, rather than a Russian platform with a few Indian systems thrown in – which it could well turn out to be if ignored.

"The prospective multi-role fighter is a joint Indo-Russian effort to create an advanced fighter primarily for the Indian Air Force having advanced features such as stealth, ultra-manoeuverability, highly integrated avionics suite, enhanced situational awareness, internal carriage of weapons and network centric warfare capabilities," says HAL. The officially declared features describe it as a single-seat swing-role combat aircraft with a low-observable design capable of supersonic cruise flight regimes. The aircraft will be capable of high maneouverability both in subsonic and supersonic regimes. Sporting an active safety flight control system, the PMF is said to be designed for air superiority to engage targets in the air and for the strike role to engage targets on the ground and ocean surface. Electronic warfare support systems will enable it to operate in a dense hostile electronic environment comprising airborne and ground based radars and jammers. "High degree of agility to close air combat, both at medium altitudes as well as at low level," says official documentation freshly released on the platform at the show. High precision, multi-channel, long-range air-to-air missiles, air-to-ground, air-to-sea and air-to-radar weapons. This official description of the aircraft alone throws up huge development and participation opportunities for Indian companies.

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DEFENCE MINISTER A.K. ANTONY VIEWING THE RECENTLY ACQUIRED PILATUS PC-7 MKII TRAINER AIRCRAFT ALONG WITH AIR CHIEF MARSHAL N.A.K. BROWNE.

PRITAM BHAVNANI, PRESIDENT HONEYWELL AEROSPACE INDIA, WITH THE F125IN ENGINE BY HONEYWELL, DESIGNED TO EXTEND MISSION CAPABILITY OF THE IAF JAGUAR FLEET.

A top IAF officer attending Aero India as part of the IAF Chief's entourage says, "In an ideal situation, the PAK FA should only be a shell. HAL and Indian industry must fill the aircraft with fully Indian systems, preferably with an Indian primary AESA sensor, avionics, cockpit and all other on board features. If not, it adds to our inventory of just another foreign aircraft for which we will have to worry persistently about spares and support." India and Russia see the PMF as a new paradigm in their relations, but a large section of the IAF still worries about its continuation as a buyer of foreign aircraft, and how Aero India continues to be a reflection of that. And that's where the second newly revealed concept comes into play at the show – the newly configured advanced medium combat aircraft (AMCA).

Until now a concept jet, the AMCA effort has intensified, and the Aeronautical Development Agency (ADA) is making every indication at Aero India that the design phase of the fifth generation attempt could be in its final stages, or indeed complete. With several different configurations over the last few years, the AMCA is often called India's Raptor, though that may be a bit of stretch at this time. At the ADA stand this year, visitors will be treated to the first large model of an aircraft concept that has fructified into a formal project that has government sanction and generous funding. To be sure, the AMCA isn't just another aircraft programme. This week, it was described by Chief of the DRDO as a "fifth generation plus" aircraft programme. "The AMCA will feature typical fifth generation design features and technologies such as stealth features, supercruise, super-maneouverability, thrust vectoring, advanced avionics based on integrated modular architecture, new generation display systems with touch panels, pilots associate to reduce pilot workload, advanced sensors like an AESA radar and infra-red search and track. Its declared missions in the air-to-air space include point defence, area defence and escort. In the strike role, it will be built to conduct SEAD, DEAD and precision strike missions. •

# MMRCA, Special Ops, Attack Helicopters Priority: Air Chief Marshal NAK Browne

The Chief of Air Staff, Air Chief Marshal, N.A.K.Browne announced at Aero India that the IAF's priority for 2013-14 would be getting in place the medium multi-role combat aircraft (MMRCA) which Dassault Rafale has won. "It is the mother of all projects."

The IAF was in continuous discussion on formalising the deal and ensuring that India built the infrastructure for the programme. The 2013-14 priorities include closing some of the deals which are in the final stages including Special Ops transport aircraft C-17; 22 attack helicopters Apache; the Airbus A330 MRTT and 15 Everett helicopters. With the induction of Pilatus basic trainer, the IAF would be developing training facilities for the same.

In 2013, two to three C-17s would be inducted and the entire process would be complete by end of next year.

The government, he said, was fully aware of the urgent requirements of the IAF and the IAF was confident that the requirements would be met. In the next two plan periods (12th and 13th Five Year Plan), the IAF requires between 300 and 400 aircraft as many existing platforms, both fixed and rotary wing, were being phased out. The MIG 21s, the MIG 27s, 56 Avros and the Mi8 helicopters are being phased out which 95 of M17 were being upgraded.

Asked about indigenous capabilities, the Air Chief said that partnership is the only way to increase indigenous production as capital expenditure in these programmes was high. Presently, India has capability in Tier-II and III levels, 'but we need to move upto Tier-I level. Even HAL has limited presence in Tier-I." •

**— R. CHANDRAKANTH**

# HAL Aiming to Become a 10 Billion Dollar Company by 2020

Public sector 'Navratna' Hindustan Aeronautics Limited (HAL) has set itself an ambitious target of achieving $10 billion turnover by 2020, focusing on military, civil, MRO and UAV business at break-neck speed. The target for 2012-13 had been nearly Rs 15,000 crore with Rs 6,000 crore towards R&D.

Announcing this, the Chairman of HAL, R.K. Tyagi said that the company was aware of the urgent national requirements and had commenced restructuring to meet the challenges of growth. As India would be the third largest civil aviation market by 2020, HAL would focus on the national programme of civil aircraft and MRO business in collaboration with the private sector as the lead partner in the programme.

HAL will be preparing a blueprint of unmanned aerial vehicle (UAV) requirements in India and based on that would be making investments. The para-military forces need UAVs urgently to deal with internal security issues. A separate UAV group was being established.

On intermediate jet trainer, he said the development was on the right track. It was likely to get initial operational clearance by December this year. As for the basic trainer – HTT40, he clarified that the programme would be cheaper than import of basic trainers and that teams were working on the project. The sanction of Cabinet Committee of Security was awaited.

The HAL Chairman said the company was 'actively' discussing with Ministry of Defence on the MMRCA project and HAL would be leading in airframes, assembly and aircraft system integration. The place had been already identified and infrastructure needs were going on. There would be a separate division for engines and aerostructure development.

He said that HAL was striving to develop indigenous engines and GTRE had been strengthened. The aero engine market in India was about Rs 2,50,000 crore and that the company had serious plans on engine development.

Tyagi said that HAL Ozar airport near Nashik was to get civil certification soon and it would provide an alternate airport to the already congested Mumbai airport, thus leading to saving of fuel for airlines. To a question on Bangalore HAL airport, Tyagi said 'nowhere in the world an operational airport is closed when a new airport opens." However, he said the civil aviation ministry was seized of the matter and efforts were on to work out a via-media with Bangalore International Airport Limited. "By the next Aero India show we should have a workable solution." •

**— R. CHANDRAKANTH**

# Significant Potential in India: Raytheon

WILLIAM L. BLAIR

NICK KHANNA

Exciting, thrilling, busy and active--this is how William L. Blair, President, Raytheon Asia, describes his tenure as the Raytheon Head in India. Having taken over bigger responsibilities as the head of Raytheon in Asia, Blair says that the company has strong desire of delivering the best technology and solutions to India in cooperation with both public and private sector companies in India—Tata Power, L&T, Precision Electronics, BEL, HAL, ADA, etc. From radars to anti-submarine warfare, coastal surveillance solutions as well as weapon locating radars and ATM solutions for civil aviation, Raytheon, he said looks ahead to elevate its role in India. "There is significant growth potential in India." Nick Khanna, the New India head of Raytheon is now looking forward to take Raytheon's expansion plans in India ahead which was spearheaded with the opening of its new office in New Delhi in 2011. •

**— SUCHETA DAS MOHAPATRA**

# Sikorsky Looking at Full Assembly of Helicopters in India: Mick Maurer

Sikorsky, designers of advanced helicopters for civil and military use, which kickstarted its 90th anniversary celebrations from Aero India, Bengaluru, is looking at assembling entire helicopter in India and is working towards that goal. Presently, in collaboration with Tata Advanced Materials Limited, Sikorsky has been producing aerostructure cabins for S-92.

The President of Sikorsky, Mick Maurer said that full assembly would be 'opportunity-driven' and the helicopter class would be decided based on that. "The opportunities that are looking up are helicopters for the Indian Navy." While being a global company we want to be highly localised, he added.

The joint venture with Tatas, he said, had produced 17 S-92 cabins in 2012 and this year the number is going to be 37, to be scaled up further. "We have responded to the RFIs of the Indian Navy and the service quality requirements are yet to be announced."

On Boeing-Sikorsky partnership for the joint multi role helicopter for US requirements, Maurer said that it would be one of the biggest rotary wing programmes in the world with US defence requiring nearly 4,000 aircraft. The US Department of Defence intends to replace Blackhawk and Apache helicopters with one platform. The technology demonstrator would be a cost-sharing programme between Sikorsky, Boeing and the US DoD. •

**— R. CHANDRAKANTH**

# OIS Making Understanding Offsets Easier

Understanging offsets is not a cakewalk, and it seems the founders of Offset India Solutions (OIS) realised that fast and hence set up an organisation which could make things easier for both foreign and India original equipment maufactrers (OEM). The company is only four-year-old and yet is perhaps among the few Indian companies which have a bigger presence at the Aero India. Interacting with SP's ShowNews N.K. Sharma, CEO, OIS-AT, said that the response the company is getting from both Indian and global companies is quite positive. "Many companies are trying to understand the offset model from us."

"We concentrate on offsets but through our company OIS-AT we are also into manufacturing of technological products and project management services as well," said Sharma. Besides an office in New Delhi and a manufacturing hub at Noida, the company also has an office in London to better deliberations with European clients. "Our aim is that offsets which are part of acquisition procedures can be discharged completely." And to meet this purpose, OIS has a team of experts from the industry and officers, who have a good understanding of the requirements from the users perspectives and also experts who understand foreign OEM's well. •

**— SUCHETA DAS MOHAPATRA**

# Lockheed Martin Promotes C-130J for Varied Roles

Jack R. Crisler, Vice President, Business Development for Air Mobility, Special Operations and Maritime Programs Lockheed Martin Aeronautics Company is at Aero India 2013 endorsing the C-130J's proven capability across the world. On the second day of Aero India, Lockheed Martin organised a press conference speaking in detail about the success of the programme globally. Crisler said that the aircraft is affordable, flexible and is proven. After delivering six of the aircraft to the Indian Air Force (IAF) and getting ready to supply six more, the company is also seeing at opportunitues from the Indian Navy, Indian Coast Guard, etc. "India is a strategic partner in different fields ranging from the information and cyber sector to ASWs and helicopters."

With regard to offsets, Crisler said the governing factor is the Defence Procurement Procedure (DPP). DPP he said has several catergories in the offsets clause with emphasis on building capability i.e. setting up manufacturing capability in India. The 30 per cent offset for the C-130J he said will be satisfied by workers at Tata-Lockheed Martin Aerostructures Limited. The Indian programme included six stretched version aircraft (alrerady in operations with 77th Squadron of IAF), three years support, training of air crew, 30 per cent offsets. According to the company, the aircraft can be expanded for maritime surveillance anti-surface unit warfare role as well and at least 222 of the craft are in service wifh the US Government. •

**— SUCHETA DAS MOHAPATRA**

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*Internal Displacement Monitoring Centre figures.

# Unmanned: The Future of Air Wars

RUSTOM UAV

ARUSH XI

BY **SP'S SPECIAL CORRESPONDENT**

Extensive global experience shows that reconnaissance and observation helicopters need to be capable of fulfilling various roles – personnel transport, escort and armed missions, casualty evacuation and observation. Thus three key expectations from a successful helicopter in this segment are manoeuvrability, versatility and agility.

If even a fraction of work being done right now – both in terms of procurement as well as development – comes to timely fruition, India will be on course to deploying a robust and advanced arsenal of unmanned systems in all dimensions. The scope of work being done in unmanned air systems (UAS) is particularly ambitious. India currently has a large number of parallel development programmes, some in advanced stages, and some still in very preliminary concept phases. Without exception, they are each complex, game-changing technologies that will catapult the armed forces into the next generation of both defensive and offensive capabilities, deterrence and power projection. One thing seems certain – while India has so far been a buyer of unmanned air systems from abroad (its arsenal is dominated by Israel-built Heron, Searcher Mk.2 surveillance drones and Harop self-destructing UCAVs), the armed forces are no longer interested in being simply importers of equipment from foreign vendors (though there are several such opportunities too – a tri-service requirement for high altitude long endurance UAS, an Indian Air Force (IAF) requirement—albeit stalled—for UCAVs and the Indian Navy's search for shipborne unmanned helicopters and medium altitude long range (MALE) maritime UAS). The sentiment has compelled a change of tact, and the future mantra is undoubtedly co-development, joint manufacturing, joint marketing, joint ownership. Any company simply looking to sell a few UAS to the Indian Government now with no strings attached is perhaps looking at things from a 1980s perspective when India had no choice but to buy these systems from abroad. In the event, the opportunities that currently exist for cooperation in the unmanned space are plentiful and potentially long-term. The fact that many of these programmes are still on the drawing board offers experienced technology houses abroad the opportunities to pitch in, share technologies and help speed Indian programmes along, providing a win-win situation for all concerned, not least the armed forces which require systems quickly and on cost.

Take, for instance, the least known of India's unmanned programmes: the recently revealed Indian Unmanned Strike Air Vehicle (IUSAV). The flying wing pilotless strike aircraft project is more complex, ambitious, and potentially expensive than anything India currently has on the table (or off – the IUSAV is still a classified programme, though the Defence Research and Development Organisation (DRDO) and the Ministry of Defence (MoD) now acknowledge its existence since the programme is almost certain to require frequent budgetary and technology support). Very little is known or revealed about the IUSAV, though public domain reports suggest that it will be a futuristic aircraft similar in shape to the multi-nation European Neuron platform that made its first flight three months ago. The Aeronautical Development Establishment (ADE), the nodal DRDO laboratory conceptualising the IUSAV, is currently working on a timeframe of 2020 by which time it hopes to have the platform operational and proven. Seven years may seem like a healthy amount of time, but for a system as complex as an unmanned strike aircraft, the hurdles are large and plentiful. The IUSAV will incorporate largely ab initio technologies including its flying wing design, flying wing controls, radar absorbent paint, serpentine intake architecture, encrypted datalinks, not to mention modified turbofan engines, sensors and smart weapons. It is known that Dassault Aviation, Saab and BAE Systems have all offered technologies and assistance to the Indian establishment in the development of the IUSAV. Discussions are on at various levels on how the IUSAV can quickly be brough to the prototype and then testing stages. It is also learnt that the beleaguered Kaveri jet engine programme will spin off a modified version to power the IUSAV and that studies in this regard have already been initiated.

The other is the less advanced, though no less ambitious, Rustom-H – a hunter-killer drone concept on the lines of the US-built Predator. The Rustom-H mock-up was displayed for the first time at Aero India 2009, and made a comeback at Aero India 2011, but it remains on ground. Timelines in the programme show that the Rustom-H should take to the air in early 2014, and there are no indications that this won't happen. It has also been revealed that the ADE is producing 10 such systems at a cost of about $350 million already. A large amount of ab initio development in the Rustom-H programme will in fact flow directly into the exponentially more advanced IUSAV project, including data-links, sensors and weapons (in 2011, it was revealed that the DRDO was developing an extended range version of the HELINA anti-armour missile specifically for the Rustom-H and other airborne platforms). So far, the only progress in the Rustom programme has been the Rustom-1 that continues to be tested as a tactical surveillance drone. At this stage, it is not clear what engines will power the twin-engined Rustom-H. The platform's official mission requirements include reconnaissance and surveillance, damage assessment, laser designation, strike, long endurance at high altitude, SAR/MPR missions, EO/LREO missions, waypoint navigation, etc.

The only indigenous unmanned air system currently near service with the Indian military is the Nishant – after confirmatory trials, the surveillance UAV is ready for operations with the Indian Army, and will be inducted shortly. Highlighting other achievements in unmanned systems in the indigenous space, the Ministry of Defence notes, "Orders for Lakshya II pilotless target aircraft capable of flying in sea skimming mode and tree top heights are expected from the services after successful demonstration to them (flying at sea skimming height of about 15 metres at DRDO's test range near Balasore, Lakshya-II the advanced version of DRDO's pilotless target aircraft today demonstrated its full capability in January last year). Similarly, UAV Rustom-I, a forerunner to MALE UAV Rustom-2, had series of successful trials. Indigenously designed and developed RUSTOM-1 underwent series of successful test flights. This UAV has the potential to be used for military missions like reconnaissance, surveillance, target acquisition, target designation, communications relay, battle damage assessment and signal intelligence. A mini UAV - NETRA, especially suited for low intensity conflict operations was inducted by the Central Reserve Police Force (CRPF). NETRA has four high speed propellers allowing it to take off and land vertically. Similarly a fixed wing mini UAV for low intensity conflict was demonstrated to security forces at various locations for surveillance within the range of 10 kms. It is also useful in reconnaissance over hills."

At Aero India 2011, the National Aerospace Laboratory (NAL) revealed the SlyBird micro-air vehicle (MAV). In September last year, India's National Programme on Micro Air Vehicle (NPMICAV), a Department of Science and DRDO joint effort, announced a countrywide competition MICAV2013 organised by NAL and Aeronautical Development Establishment (ADE) where national labs, companies and industry, and students would build micro-air vehicles and demonstrate their capabilities. According to NAL, the competition seeks to "bring out

*Continued on page 8...*

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# Pratt & Whitney Delivers First 10 Engines to Boeing for India's C-17 Aircraft


Pratt & Whitney, a unit of United Technologies Corporation, has delivered the first 10 F117 engines to Boeing to power a fleet of C-17 Globemaster III transport aircraft for the Indian Air Force. India's Ministry of Defence signed a letter of offer and acceptance with the US Government in 2011 to acquire 10 C-17s. The first of these C-17 aircraft is now going through a US Air Force flight test programme at Edwards Air Force Base in Palmdale, California. The Indian Air Force is scheduled to take delivery of its first five C-17s this year and five in 2014.

"Pratt & Whitney is delighted to be delivering the first batch of engines that will power the Indian Air Force's C-17 fleet and we're pleased to have them join the growing international fleet that flies this premium airlifter," said Bev Deachin, Vice President, Military Programs and Customer Support, Pratt & Whitney.

The C-17 Globemaster III—the world's premier heavy airlifter – is powered by four F117 engines, each rated at 40,440 pounds of thrust. The C-17 transport, exclusively powered by Pratt & Whitney engines, is capable of taking off from a 7,600-foot airfield, carrying a payload of 1,60,600 pounds, and completing a flight of 2,400 nautical miles without refueling. The F117-PW-100 first entered service in 1993 and is a derivative of Pratt & Whitney's PW2040 commercial engine. With nearly 10 million hours of proven military service and 50 million hours in commercial use, the F117/PW2040 has consistently proven itself as a world-class dependable engine. Through Pratt & Whitney's ongoing investment in product improvements, the engine continuously surpasses established goals of time on wing and support turnaround time.

Boeing has delivered 250 C-17s featuring F117 engines worldwide, including 32 to international customers. The US Air Force – including active duty National Guard and Reserve units – has taken delivery of 218 C-17s. Other customers include the United Kingdom's Royal Air Force, the Qatar Emiri Air Force, the Royal Canadian Air Force, the Royal Australian Air Force, the 12-member Strategic Airlift Capability initiative of NATO and Partnership for Peace nations, and the United Arab Emirates Air Force and Air Defence.

Pratt & Whitney is a world leader in the design, manufacture and service of aircraft engines, space propulsion systems and industrial gas turbines. United Technologies, based in Hartford, Connecticut, is a diversified company providing high technology products and services to the global aerospace and building industries.

This press release contains forward-looking statements concerning anticipated business opportunities. Actual results may differ materially from those projected as a result of certain risks and uncertainties, including but not limited to changes in the Globemaster III funding related to the C-17 aircraft and F117 engines, changes in government procurement priorities and practices or in the number of aircraft to be built; challenges in the design, development, production and support of technologies; as well as other risks and uncertainties, including but not limited to those detailed from time to time in United Technologies Corporation's Securities and Exchange Commission filings. •

## Unmanned: The Future... *continued from page 6*

the capability of vehicles and technologies being developed in the country for performing a defined mission using multiple MICAVs (fixed-wing, rotary-wing, flapping-wing and combinations) and unmanned ground vehicles (UGVs)." It goes on to add that the objective of NPMICAV is to indigenously develop MIC technologies at sub-system as well as system level. "These vehicles are meant to address a large number of civilian and military applications including search and rescue, disaster management, traffic monitoring and management, remote sensing, terrain mapping, etc." The focus and thrust areas for the competing MAVs will be communication, precise navigation, sensor capabilities, video transmission, multi-vehicle coordination, cooperative flying and vision based manual flying through windows. The requirement for such systems is large – across the military, paramilitary and police services across the country.

Companies like Lockheed Martin have tapped the unmanned space at the grassroots. It provides engineering and funding support to the Delhi Tech University in building the Arush X1 prototype surveillance UAV (which flew for the first time in December 2011), with plans now to expand the platform's capabilities. Other companies like EADS, Saab, BAE Systems, even MiG, are looking to forge partnerships with Indian firms, academia and institutions to build future unmanned platforms for a variety of missions. The Indian private sector has emerged in a big and promising way when it comes to innovations in the unmanned space. Companies have shown alacrity in investing their own money in R&D to produce systems that could, with help and support from industry and the military/government, go on to become robust military systems in operation with the armed forces. Private firms are constantly on the lookout for tie-ups with experienced foreign technology houses for systems across the board – entire UAS to engines, optics, electronics, avionics, communications, sensors etc. There is cooperation between government agencies and the private sector too. In May last year, private firm Kadet Defence Systems revealed that it has entered into an agreement with NAL to produce an optionally unmanned version of the Hansa basic trainer/aerobatics aircraft. Several other such opportunities could potentially exist.

Companies seeking to do business in the UAS space should know that the door is wide open, but only long-term engagements that accrue benefits to the Indian military-industrial complex. The days of a buyer-seller relationship are over. But a healthy market remains, and remains oriented towards furustic systems development. •


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BY **T.C. CHAN, VICE PRESIDENT AND MANAGING DIRECTOR, ASIA PACIFIC REGION, ROCKWELL COLLINS**

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- Access to global airspace by providing full compliance with reduced separation and operating minimums in all phases of flight enabled by advanced communication, navigation and surveillance systems
- Enhanced all-weather operations via synthetic vision system (SVS) and enhanced vision systems (EVS) for mission specific scenarios.
- Modular avionics incorporating a comprehensive runway situational awareness system, integrated terrain avoidance warning system (TAWS) with high resolution terrain maps, optional synthetic vision, and integration of an enhanced vision-capable head-up display system
- Industry leading display size and quality featuring large format 15.1-inch landscape SXGA active matrix liquid crystal display (AMLCD) displays with trackball cursor control
- Expertise in production and ruggedization of displays with a composite production rate of over 13,000 LCD units per year for commercial aircraft, helicopters, military fighters, tankers and cargo platforms
- Reduced flight crew workload through capabilities such as integrated flight information system (IFIS), graphical flight planning, and full flight regime auto throttle.

Since 2001, Rockwell Collins has been a pioneer in researching and developing Synthetic Vision – a visually based system designed to increase safety and terrain awareness during approach and departure operations. Today this technology is featured in our Pro Line Fusion avionics systems which recently debuted in the business aviation market. However, Rockwell Collins is now preparing to bring synthetic vision into the military market on both fixed and rotary wing platforms.

**UAV SYSTEM OF SYSTEMS**

Rockwell Collins believes that UAVs are "systems" and not stand-alone vehicles, and that these systems include controls, propulsion systems, communications, ground control systems, life cycle support maintenance teams, and more. We offer nose to tail systems for UAVs and are active on over 25 air vehicle platforms around the world.

Rockwell Collins' Athena flight control and navigation systems for UAVs are miniaturized, light-weight, highly reliable integrated control, INS, GPS and Air Data, Attitude, Heading and Reference systems. Available in low-cost redundant configurations, these systems enable autonomous operations and are proven with over one million flight hours in combat theaters. Used on both manned and unmanned aircraft, these systems are moving towards obtaining commercial certification.

In addition to control and navigation systems, we offer a wide range of communications, command, control and intelligence solutions, as well as payloads and engine controls for UAVs. By doing business with Rockwell Collins, customers can also gain insight and access to sense and avoid and damage tolerance technologies to enable UAVs to fly safely alongside manned aircraft in shared airspace. •

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# Gulfstream G280 Sets 15 New City-pair Speed Records


Gulfstream Aerospace Corporation's new best-in-class G280 aircraft recently set 15 new city-pair speed records as part of the company's reliability demonstration programme. The 250-hour internal testing programme, among the most extensive voluntary reliability programmes ever implemented by Gulfstream, served to enhance fleet reliability, enrich pilot training and improve customer readiness.

"The Gulfstream reliability demonstration programme incorporates pilot check rides, maintenance on auxiliary power units, engine run qualifications, technical operations, publications validations and basic servicing and handling at typical fixed-base operators," said Mark Burns, President, Product Support. "This is just one more way we are going above and beyond for our customers, ensuring they have the most reliable and high-performing aircraft."

Of the 15 new city-pair speed records set as part of the programme, the most notable were a flight from Aspen, Colorodo, to Fort Lauderdale, Florida, and one from Honolulu to Savannah. The super mid-sized aircraft has established 22 speed records since setting its first in May.

"Two of these new speed records are particularly significant because they demonstrate the G280's capability to reach the East Coast from Aspen and to travel an exceptional distance," said Scott Neal, Senior Vice President, Sales and Marketing, Gulfstream. "The G280 continues to prove its tremendous reliability, range, speed and performance for our customers."

The G280 flew from Aspen-Pitken County Airport to Fort Lauderdale-Hollywood International Airport in 3 hours and 21 minutes. It flew 1,640 nautical miles (3,038 km) at an average cruise speed of Mach 0.84. On board were demo pilots Santiago Koritschoner, Brian Erickson and Stephanie Ruyle.

The G280 flew from Honolulu to Savannah in 8 hours and 19 minutes, a total of 4,124 nautical miles (7,638 km) at an average speed of Mach 0.80. On board were Brian Dickerson, Senior Production Test Pilot; Scott Evans, Engineering Test Pilot; and Scott Blouin, Avionics and Electrical Technician.

The city-pair speed records have been certified by the National Aeronautic Association, the official record keeper for US aviation, and forwarded to the Federation Aeronautique Internationale in Switzerland for approval as world records.

The G280 is certified to fly 3,600 nm (6,667 km) with four passengers at Mach 0.80 with the National Business Aviation Association (NBAA) IFR reserves, some 200 nautical miles farther than the company announced at the programme's launch in 2008. In addition to more range, the aircraft's balanced field length has been reduced from 4,960 feet (1,512 m) to 4,750 feet (1,448 m). This field length is an improvement of more than 1,300 feet compared to the G200, the aircraft the G280 replaces. The aircraft entered into service on November 14, 2012. •

# nEUROn Height of Stealth Technology

The nEUROn, Europe's unmanned combat air vehicle (UCAV) stealth technology demonstrator, successfully completed its maiden flight from the Dassault Aviation company's flight test base in Istres recently in collaboration with the flight test personnel of the French defence procurement agency (DGA).

The nEUROn was launched in 2005 by the customer, DGA, and involves France, Italy, Sweden, Spain, Greece and Switzerland. It defines a future for the aeronautic excellence of Europe.

With Dassault Aviation as prime contractor, the programme was designed to pool the skills and know-how of Alenia Aermacchi (Italy), Saab (Sweden), EADS-CASA (Spain), HAI (Greece), RUAG (Switzerland) and Thales (France).

With a length of 10 metres, a wingspan of 12.5 metres and an empty weight of 5 tonnes, the aircraft is powered by a Rolls-Royce Turbomeca Adour engine.

The nEUROn will continue to undergo testing in France until 2014, at which time it will be sent to Vidsel in Sweden for a series of operational trials. It will then go to the Perdadesfogu range (Italy) for further tests, in particular firing and stealth measurements. •

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# C4I Systems–Suggestions During Development

BY **RADHEY SHYAM**

**C4I – THE SYSTEM**

Good intelligence gathering and analysis, coupled with efficient command and control structures, are at the heart of all successful military operations. Without the ability to quickly gather and analyse information about the enemy's movements, composition, intentions and capabilities, any operation becomes incredibly risky.

While C2 basically concentrates on radio systems and equipment for effective communication to receive and respond to orders, C4I (command, control, communications, computers & intelligence) system includes a wide range of sensors, navigation equipment, communication links and control of weapon systems.

**C4I – INDIAN SCENARIO**

The Indian defence services had been contemplating for an apex level C4I system which is interoperable across three services. There has been an effort towards setting up of National Command Post, which will have a command and control system at the apex level for control of strategic forces.

Presently each service is in the process of developing its own C4I systems. DRDO is developing BSS, ACCCS, CIDSS, ADC&RS and EWS as part of Tac C3I system for Indian Army. Indian Navy is implementing platform-centric Combat Management Systems (CMS) on its major frigate and destroyer ships. Towards network-centricity efforts within Indian Air Force, the Integrated Air Command and Control Systems (IACCS) has been connected over AFNET, a fibre optic-based Air Force Network. The system operating at three echelons (tactical, operational and strategic levels), is also envisaged to provide connectivity to maritime operation centres (MOC) and civil radar network.

**C4I –TYPICAL ARCHITECTURE**

The C4I system is characterised as a central point at which information from associated sensors and communication systems arrive, a point of control of weapons and a point of sharing own data, tactical situation and intelligence. It is a tactical centre which is equipped to collect, present, manage, evaluate and disseminate information for the use by command centres on the Network.

System essentially includes set of computers with associated applications, sensors (radars, sonars, and EW systems and navigation systems, etc), tactical data links and weapon interfaces.

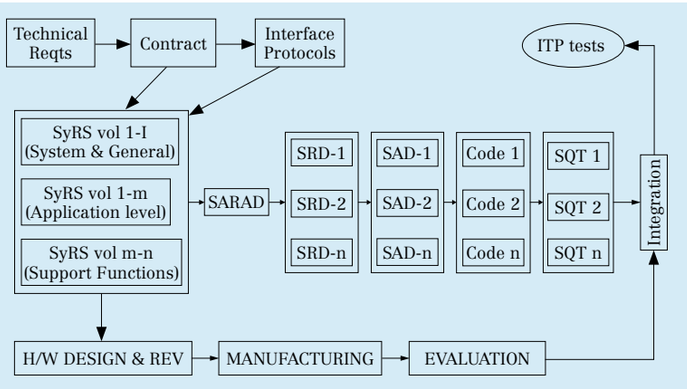
**KEY DEVELOPMENT PHASES**

**Design Phase**

To start with, system requirement specifications (SyRS) are finalised in close interaction with the user. Based on SyRS, system architecture SARAD is finalised to allocate each activity to an element of hardware or software. Total number of independent S/W modules are also finalised here. SyRS & SARAD lead to Software Requirements Description (SRD) for each S/W module followed by Software Architecture Description (SAD) documents and then on to the actual coding of software module. Every requirement in these design documents has an upward traceability with requirements in SyRS.

After coding, each software module undergoes software qualification testing (SQT) with predefined test cases to verify that it meets its specified requirements.

In addition, to ensure an error-free development, the complete set of design documents may be offered to an Independent agency for independent validation and verification (IV&V). This agency checks and verifies the documents for their completeness, compliance to applicable standards (normally IEEE 12207) & backward traceability of requirements.




TYPICAL C4I SYSTEM DEVELOPMENT CYCLE

**Integration Testing**

After combining different hardware and software elements in a progressive manner, the Integration testing is conducted to ensure that design specifications are met. After integration testing as per Integrated Test Procedure (ITP), the system simulators are used to verify and derisk the system performance before final commissioning.

**CHALLENGES IN C4I DEVELOPMENT**

C4I system in defence application is a complex system of systems. Buyer gets involved as he has the domain specific as well as tactical knowledge of the system. Also buyer/user may not like to share the sensitive information and get the tactical & algorithmic intensive part of software developed through its own design wings.

On the other hand, C4I developer's sub-vendors may be involved in development of non-critical and non-confidential elements due to large volume of the system. The development follows a partnership approach and many challenges are thrown up which have to be overcome as they present themselves. Some of these are:

| | |
|---|---|
| **i. Compressed Time frames**<br>The C4I requirements are normally finalised after requirements of all or major input/output systems have been finalised. | Development time can be shortened if buyer involves prospective C4I developers during preliminary preparation of requirements. This keeps developers well informed & improves their planning process. |
| **ii. Lack of domain Knowledge**<br>The domain knowledge on tactical and algorithm intensive applications is held with buyer or suppliers of associated sensor/weapon systems. | Buyer may share necessary, unclassified domain information with developer. This helps developer in grasp of system requirements clearly and results in less rework during development phase. |
| **iii. Requirement Changes during design cycle**<br>Changes in specifications/make of associated Input/output systems during development phase of C4I. | Object Oriented methodology in software development may be used wherein the changes in any interfacing system is mostly confined to related software module & major part of software largely remains unchanged. |
| **iv. Man power Attrition**<br>Development team members parting off before completion of project. | This issue can be addressed by attaching additional manpower on critical activities (to be clearly defined) so that their skills remain updated to take over when a member of team leaves.<br>It is also necessary that the design is documented for each module as it is developed and regularly updated as a discipline, at every stage with strict Configuration Control. |
| **v. System integration**<br>During system integration, isolation of an error and assigning it to a particular software module is a major task. | The integration team may be constituted with members from different development groups and user reps so as to arrive at a quick and consensus diagnosis of the problem. |
| **vi. Platform availability for system validation**<br>Many a times the platform with all interfacing external systems is not available for C4I integration/performance validation. | This situation may be due to platform's operational requirements and can be overcome by proper planning through interaction with user. In addition, simulators developed beforehand can be used to validate large part of C4I performance. |

**CONCLUSION**

The trend so far has been towards platform-centric systems. But requirements are changing to bring in net-centric operations with higher degree of automation, artificial intelligence and secure communication etc. C4I systems will be expanding to newer areas and may cover other sectors like homeland security, etc. With many C4I programmes on the horizon, it may be beneficial if industry is also brought into this activity and works in conjunction with DRDO/DPSU/Services. Industry may support and augment the development effort by setting up labs for prototyping critical modules and validating them in simulated environment, thus cutting short the development cycle and meeting the expectations of end users. •

*Radhey Shyam, an alumnus of IIT-Roorkee, has long experience in Product – Assurance & R&D mainly in IFF & Naval CMS Systems at BEL– Ghaziabad. He retired as GM, R&D, from there. Currently he is GM, R&D, OIS Advance Technology.*

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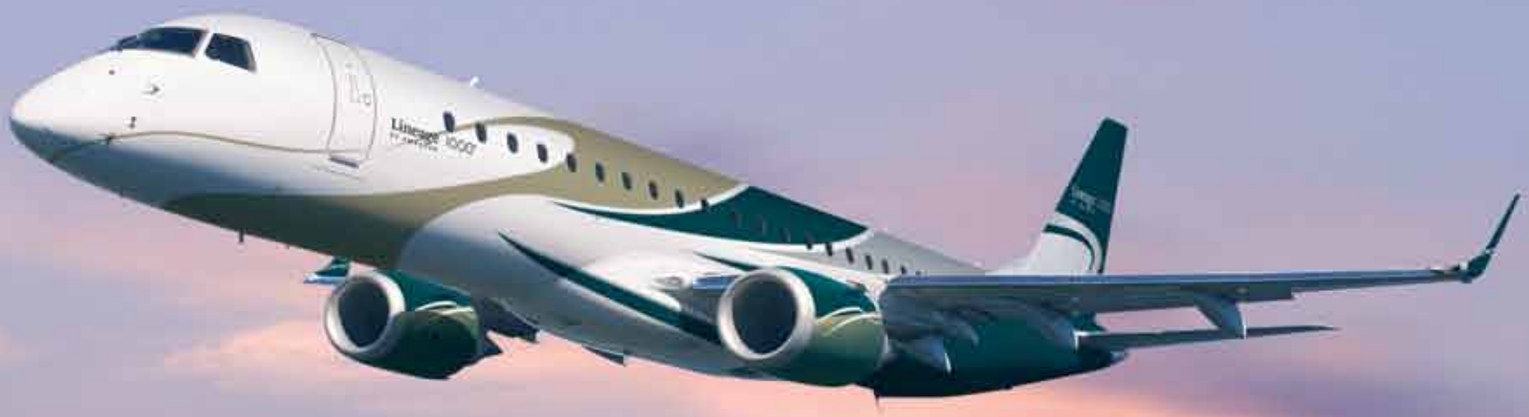



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# A330 MRTT, New-Gen Tanker

The A330 MRTT is the only new-generation multi-role tanker transport aircraft flying, and fully certified today, after having demonstrated its capability during an extensive flight test campaign. Following a first delivery in early June, it is due to begin operations with the Royal Australian Air Force (RAAF) in early Fall. The A330 MRTT uniquely offers military strategic air transport as well as air-to-air refuelling capabilities.

The A330 MRTT is the most capable tanker/transporter currently available. It is the only aircraft able to perform simultaneously three different types of missions: Aerial refuelling (tanker role), passenger and/or freight transport, and/or medical evacuation (MEDEVAC). Also, its tank capacity is sufficient to supply the required fuel quantities without the need for any additional reservoirs, nor major structural modifications and it is able to carry more passengers and more freight than any of its competitors

Air-to-air refuelling (AAR) is today a fundamental element of military air operations without which none of the recent major aerial campaigns could have been undertaken. It is needed to deploy forces to the required part of the world, maintain continual combat patrols or strikes, and enhance the endurance and range of helicopters. New generation tankers also need to serve as transports to increase their flexibility and maximise value to taxpayers. Airbus Military is the world leader in AAR as producer of the only certified and in-service new generation multi-role tanker transport—the A330 MRTT—and the A 400M tanker configuration—the most advanced tactical tanker on the market.

Strategic missions involve flights over long ranges, often intercontinental, and frequently conducted between an aircraft's home base and a relatively well-equipped destination. Aircraft in this role need to have the range for the job, the flexibility to perform different missions carrying military cargo or personnel, and be equipped with specialist military communications and self-defence systems.

The Airbus Military A330 MRTT, with a range of up to 6,500 nautical miles (12,000 km) and A400M with a typical range of 3,450 nautical miles (6,380 km) are the most advanced strategic transports available today. The versatility of the A400M also makes it an ideal tactical transport. •

# India To Be Offered US Navy's Future Unmanned UAS?

BY **SP'S SPECIAL CORRESPONDENT**

Northrop Grumman will for the first time highlight the MQ-4C Triton long endurance unmanned air system at Aero India 2013. The under-development system is being created under the Broad Area Maritime Surveillance (BAMS) programme that Northrop Grumman won in 2008.

The system was officially unveiled in June last year. In a statement, Northrop Grumman has said, "Triton is a maritime version of the combat-proven Global Hawk unmanned aircraft system. Developed for the US Navy, Triton can fly missions for 24 hours at altitudes more than 14 kilometres, allowing the system to cover vast areas of ocean and coastal regions.

The Navy developed its future concept for maritime patrol using Triton in conjunction with the P-8 Poseidon, a manned surveillance platform that has also been purchased by the Indian Navy. Sources say the company plans to take forward discussions on the Triton based on the proposition that the Indian Navy's choice of the Boeing P-8 makes the Triton a logical choice for the Indian Navy, since it is being developed for operations alongside the US Navy's fleet of Boeing P-8A Poseidon jets.

According to Northrop Grumman literature on the MQ-4C Triton, it "provides the U.S. Navy with an advanced autonomous air vehicle and state-of-the-art, service-oriented architecture mission control system. Incorporating Navy requirements into a family of air vehicles that are in production and combat proven provides a cost-effective system with the greatest capability at the lowest risk."

Key features of the Triton are said to include persistent maritime ISR at a mission radius of 2,000 nm; 24 hours/7 days per week with 80 per cent Effective Time on Station (ETOS), land-based air vehicle and sensor command and control, afloat Level II payload sensor data via line-of-sight, dual redundant flight controls and surfaces, 51,000-hour airframe life, due regard radar for safe separation, anti/de-ice, bird strike, and lightning protection, communications bandwidth management, commercial off-the-shelf open architecture, mission control system, net-ready interoperability solution.

The other "marinised" unmanned air systems at Aero India vying for the Indian Navy's attention are the Elbit Systems Hermes 900 MP and the Boeing Insitu Scan Eagle. •

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# Bell Helicopter: Nation Shield H-1

AH-1Z


UH-1Y

The H-1 Programme, comprised of the AH-1Z and the UH-1Y, is delivering fully integrated, high-performance, state-of-the-art aircraft. Speed, range and payload have been increased while supportability demands, training timeliness and total ownership costs have been reduced.

Separately, the AH-1Z and the UH-1Y are the most capable attack and utility helicopters flying today. When combined, they represent the most effective and efficient means of accomplishing a wide array of missions, anywhere in the world.

Simply referred to as the "Yankee" and "Zulu" by the pilots who fly them and the mechanics who maintain them, these aircraft have earned a reputation as some of the most combat-effective and survivable aircraft on the modern battlefield. With a focus on maximising performance while reducing supportability demands and total ownership costs, these aircraft provide improved speed, manoeuvrability, range, firepower and payload while leveraging 85 per cent "commonality" of maintenance-significant replaceable components.

Both of these aircraft are "marinised" to prevent corrosion and ease operations in high-moisture environments. However, the benefits of marinisation are not limited to maritime operations, as corrosion resistant treatments, blade fold, enhanced rotor brakes and minimised elctro-magnetic environmental efforts benefit maintenance and reliability in all-weather environments.

The Zulu and Yankee integrated avionics system (IAS) interfaces the helicopter's glass cockpits and provides the capability for them to communicate, navigate, process and present data, manage crew station systems, detect and counter threats, acquire and track targets, employ guided and unguided munitions, and provide various sensor input data with other aircraft systems and equipment. The IAS also improves the aircrew's situational awareness and weapons accuracy by providing critical mission data on four multi-function displays.

The layout and functionality of crewmember stations is identical, with the exception of the rotor brake and access to some circuit breakers, minimising training and allowing the aircraft to be flown and fought from either crew station.

Crew members fly with the Optimised TopOwl (OTO) helmet. OTO is the combat-proven Helmet Mounted Sight and Display on both the AH-1Z and UH-1Y. OTO significantly reduces pilot workload and affords more attention to the situational environment by presenting: a conformal display that superimposes flight symbology onto the natural landscape, integrates aiming and acquisition symbology allowing weapon system employment without taking "eye off" the target and supplements hover symbology to aid the pilot in reduced visibility approach and landing conditions.

The AH-1Z and UH-1Y were designed with survivability in mind, knowing the two aircraft would regularly be tasked with conducting close air support (CAS), armed reconnaissance, forward air control, escort and insert/extract missions. These aircraft are outfitted with a robust, combat-tested suite of threat detection and countermeasure equipment and engineered with multiple crew safety features. •

# Fourth Prototype of NewGen AW169's Maiden Flight

AgustaWestland has announced that the fourth prototype of the new-generation 4.5-tonne class light intermediate AW169 helicopter has successfully completed its maiden flight at AgustaWestland's Vergiate plant in Italy. During its flight, the aircraft performed as expected with an assessment of the helicopter's general handling and basic systems being made. The event is a major milestone for the AW169 programme as the last of the four prototypes has now entered the flight test programme.

The AW169 programme is on schedule to achieve civil certification in 2014. The first three AW169 prototypes, which performed their maiden flights in May 2012, July 2012 and November 2012, have completed more than 150 flight hours till date. The fourth prototype, built in just 71 days, is fully representative of the production configuration.

The AW169 is part of AgustaWestland's family of new generation helicopters that includes the AW139 and AW189 models. These helicopters all possess the same high performance flight characteristics and safety features while sharing the same common cockpit concept and design philosophy. This approach will deliver real cost savings in areas such as training, maintenance and support for operators having two or three of the models in their fleets. Launched in July 2010, the AW169 has rapidly found market success, logging orders for more than 70 units as far as from customers in North and South America, Asia, Middle East, Europe and Australasia for a wide range of missions including air ambulance, law enforcement, corporate transport, utility and offshore transport.


A versatile, new-generation twin-engine helicopter, the AW169 has been designed in response to the growing market demand for an aircraft that delivers high performance, meets all the latest safety standards and has multi-role capabilities. It is the first all-new helicopter design in its class in decades and the only one that will meet all the latest safety requirements. The AW169 incorporates several new technology features to provide the highest levels of safety and operational benefits for its customers. New generation technologies are incorporated in the rotor system, engines, avionics, transmission and electric power generation and distribution systems. Latest technologies include an APU mode capability and touch screen cockpit devices. The AW169 is set to be the most advanced and cost-effective helicopter in its class for EMS, SAR, law enforcement, passenger and offshore transport and utility missions. •

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# Nose-to-tail Maintenance Plans for Embraer Phenoms

Embraer Executive Jets has expanded its customer service and support solutions by launching the new Embraer Executive Care (EEC) engine add-on option that will offer a nose-to-tail maintenance solution for Phenom jets, complementing the EEC and the Eagle Service Plan (ESP) programmes.

The new EEC engine add-on option helps Phenom 100 and Phenom 300 operators to streamline and simplify invoice and payment processes, addressing one of the customers' main concerns.

"The EEC engine add-on comes as we celebrate the eleventh anniversary of Embraer Executive Care maintenance programme which now has almost 300 aircraft enrolled in the programme," said Edson Carlos Mallaco, Vice President, Customer Support and Services, Embraer Executive Jets. "It is the latest in our commitment to give our customers peace of mind."

The new option covers scheduled line maintenance, which is currently not available in the engine maintenance plans. This optional plan covers labour, shipping charges as well as expendable and consumable parts such as filters and o-rings associated with these tasks. It also includes one desalination wash per engine per year during a scheduled aircraft maintenance visit. •

# Bombardier Receives Orders for 481 Aircraft in 2012

Bombardier Aerospace has delivered 233 aircraft during the 2012 calendar year, compared to 245 aircraft deliveries in the previous fiscal year, the 11-month period ended December 31, 2011.

The company also received orders for 481 aircraft, net of cancellations, compared to 249 orders, net of cancellations, for the previous fiscal year. Bombardier's successful order intake was supported by a number of volume orders for both business and commercial aircraft, including those placed by Delta Air Lines Inc., NetJets Inc., Nordic Aviation Capital and PT. Garuda Indonesia (Persero) Tbk, VistaJet and WestJet, and the delivery total is in line with the 235 aircraft delivery guidance for business and commercial aircraft that was provided in March 2012.

"2012 was a year of focus on execution, and our employees demonstrated their resilience and commitment by rallying through a challenging economic environment to meet our delivery targets," said Guy C. Hachey, President and Chief Operating Officer, Bombardier Aerospace.

"A number of our existing customers reaffirmed their confidence in Bombardier aircraft in 2012 with fleet growth and fleet replenishment orders, and we proudly welcomed new customers from emerging and traditional markets. We are the market leaders in business aircraft, and the restructuring of our commercial aircraft sales organisation is yielding results. Overall, we are seeing positive momentum across our entire product portfolio," added Hachey.

**AIRCRAFT DELIVERIES AND ORDERS**

In calendar year 2012, Bombardier delivered 179 business jets, compared to 163 for the previous 11-month fiscal year ended December 31, 2011. During this same period, the company received 343 net orders for business jets, compared to 191 for the previous fiscal year.

In calendar year 2012, Bombardier delivered 50 commercial aircraft, compared to 78 for the previous 11-month fiscal year ended December 31, 2011. During this same period, the company received 138 net orders for commercial aircraft, compared to 54 for the previous fiscal year. •

# HAL Receives IOC for ALH "Rudra"

Hindustan Aeronautics Ltd (HAL) had achieved the initial operational clearance (IOC) for advanced light helicopter – Mk-IV Army Version of "Rudra". Dr. K. Tamilmani, CEO, Centre for Military Airworthiness and Certification (CEMILAC) presented the certificate to HAL recently. "The occasion gives us the confidence and it is a proud moment for the country and boosts our indigenous activities, said Dr. R.K. Tyagi, Chairman, HAL.

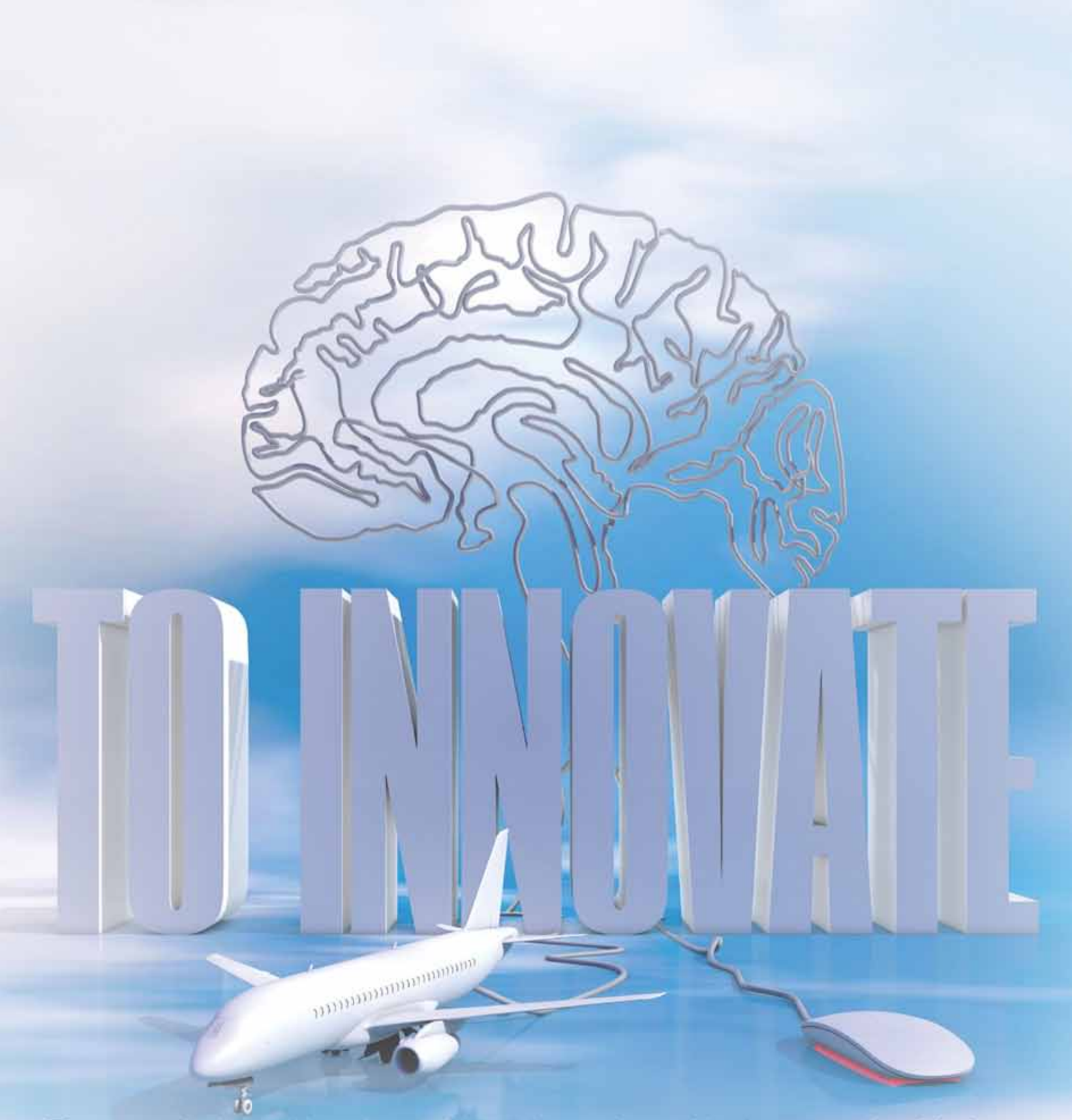
The occasion marks the entry of HAL into the elite group of a few industries in the world which design, develop, manufacture and certify a helicopter as weapons system to international standards. Tamilmani pointed out that potential for helicopter remains forever in India and the country has the ability to meet technical challenges on this front.

P. Soundara Rajan, HAL's Managing Directer Helicopter Division, pointed out that integration of multiple weapons systems simultaneously on the helicopter is a complex assignment. "In this particular case it involved four major groups of systems and weapons, involving eight countries: Israel, France, Belgium, South Africa, Germany, Italy, United States and India. Nearly 23 km of cables had to be laid and hundreds of hours of flight and ground tests were carried out," he said. •

# Embraer Delivers A-29 Super Tucano to Angola

Embraer Defense and Security recently delivered the first three light attack and advanced training A-29 Super Tucano turboprops to the National Air Force of Angola, at a ceremony held in its facility in Gavião Peixoto, São Paulo, Brazil, as part of an total order for six aircraft. Upon this delivery Angola becomes the third operator of the Super Tucano in the African continent. The airplane will be used for border surveillance missions.

"The selection of the Super Tucano by the National Air Force of Angola demonstrates the great potential of this aircraft in Africa," said Luiz Carlos Aguiar, President of Embraer Defense and Security. "It is a robust, versatile and very efficient combat-proven aircraft with low operating costs and has generated great interest among other African nations."•

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# The RAFALE Omnirole Fighter: Pushing Forward on New Air-to-Air Capabilities

SUCCESSFUL TESTS OF THE BEYOND VISUAL-RANGE AIR-TO-AIR MISSILE (BVRAAM) METEOR

October 2012, the RAFALE omnirole fighter reached two major milestones: the first delivery of a production aircraft equipped with the first production RBE2 AESA radar, and the initial successful testing of the new-generation, very long-range, METEOR air-to-air missile.

Pushing forward on new air-to-air capabilities, the Rafale B301, operating from Cazaux DGA Flight Test Centre in south-western France, completed on October 4 then on October 10, two successful tests of the beyond visual-range air-to-air missile (BVRAAM) Meteor.

On December 22, 2010, the French defence procurement agency DGA ordered 200 Meteor missiles. A week after, the contract for integration of the Meteor missile to the Rafale system was awarded to the industry.

This advanced, ramjet-powered missile, made by MBDA, is intended for air defence missions. It will intercept targets at very long range, and it will be a perfect complement to the MICA missile, which is currently used at shorter ranges for air-to-air interception, dogfight and self-defence.

On October 2, 2012, the first production Rafale F3 (the single-seater C137), equipped with the first production Thales RBE2 AESA 1 radar, was delivered to the French DGA, paving the way for the introduction into operational service of the first European combat aircraft fully exploiting the cutting edge AESA radar technology.

Extended range capabilities offered to the Rafale by the RBE2 AESA radar (among a number of other key operational benefits) allow the full use of the latest generation of long-range air-to-air missiles such as the Meteor.

The Rafale is already an extremely effective new-generation, combat proven (in Afghanistan and Libya war zones), omnirole tactical fighter, but development is continuing apace to exploit more and more of the aircraft's tremendous capabilities, and to seamlessly add new ones. As a result, Rafale looks set to become even better in the near future. •

# Finmeccanica: Order for 12 Eurofighter from Oman

Finmeccanica, partner in the Eurofighter programme through Alenia Aermacchi, welcomes with great satisfaction the new order of 12 Eurofighter signed by Oman which thus becomes the seventh customer, at global level, for the European aircraft.

Giuseppe Orsi, Chairman and CEO of Finmeccanica, said: "The Oman order further confirms the strategic value of our investments in the Eurofighter programme and, more in general, highlights the growing importance of European programmes in the aerospace and defence sector. Finmeccanica companies are playing a key role, both in technological and industrial terms, in the engineering, the development, the manufacturing and the support to the platform and to the avionic systems. The Eurofighter is an excellent example of how collaboration within Europe can contribute to the maintenance and development of state-of-the-art capabilities for industries, and guarantee the best returns on governments' investments within the four partner countries to contribute to the growth of a strategic industry sector."

The Eurofighter is a fundamental programme for the Italian aeronautical industry and for Finmeccanica's companies in particular, which have a 36 per cent overall participation in the programme, taking into account the activities carried out also at international level in the development and production of the aircraft.

Alenia Aermacchi is the Italian leader in the programme and is responsible for the construction of the left wing, the design and construction of the rear fuselage with BAE Systems, the integration of weapon, navigation and the propulsion system. It is also responsible for the final assembly of all aircraft for the Italian Air Force as well as for those destined to "export" clients.

Giuseppe Giordo, CEO of Alenia Aermacchi, commented: "With seven customers, 719 aircraft under contract, 571 under production contract and more than 340 already delivered, the Eurofighter confirms itself as the largest and more advanced new generation fighter programme in the world. This new order is great news for our plants of Turin, Foggia, Nola and Venegono, all involved in the production of Eurofighter components. Alenia Aermacchi, with its share of 19 per cent, covers a key role in the programme and any new order for the European fighter significantly and positively impacts our activities.

"Furthermore, the Oman order will also positively impact some other campaigns we are currently pursuing in the Middle East and whose possible successful conclusion would allow to keep the production of the European fighter also after 2017, when the end of production is now scheduled."

The newly formed Selex ES company, merging the European businesses of Finmeccanica's Electronics Defence and Security sector, has a significant stake in the avionics and sensors of the aircraft. Selex ES leads three consortiums: Euroradar, which designs and develops the Captor radar and develops the new electronically scanned version Captor E; EuroDASS, for the design and development of the Praetorian Defensive Aids Suite for the protection and survivability of the aircraft; Eurofirst, for the infrared search and track system Pirate.

"The positive financial and industrial impact of this contract is significant for Selex ES," says the CEO, Fabrizio Giulianini, "because through its subsidiaries in Italy and in the UK Selex ES is responsible for over 60 per cent of the avionic systems on board the Eurofighter."

In Italy, the programme employs an average of around 7,200 highly qualified and professional staff a year directly (internally and externally). A further 4,800 people a year work on operations indirectly linked to the programme. It should be noted that these direct and indirect activities generate as much employment again in services. •

# GE Aviation Showcases Advanced Technologies in Aircraft Engines and Systems

GE Aviation is showcasing its advanced technologies in aircraft engines and systems, for the military that provide the necessary power and reliability for any application from fighters, helicopters and transports to the next-generation of unmanned aircraft.

"GE Aviation develops and manufactures the most innovative and powerful jet engines and systems for commercial and military aircraft. With an installed base of over 25,000 military engines, our advanced technologies are known around the world for the excellence that they bring. We have been participating at Aero India regularly showcasing our technologies and this year we would be featuring engines and systems for military applications such as F404, F414, CT7, T700, CF-6 & CFM 56 engines," said Nalin Jain, CEO, GE Aviation, South Asia.

The technologies being displayed include:

Engines by GE Aviation:

• The F404 engine powers frontline fighters for armed forces around the world. The performance and reliability of F404 engines have set the standard for modern fighter engines.The engine family powers multiple aircraft performing a broad spectrum of missions from low-level attack to high-altitude interceptors. The combat-proven F404 has accumulated more than 12 million engine flight hours serving the US Navy, Marines and Air Force, as well as the military forces of various countries. The F404 provides 11,000-18,000 lbs of thrust and is the standard for modern fighter aircraft offering performance, simplicity and multi-mission capability.

• The F414-GE-400 is the US Navy's newest and most advanced technology fighter engine in production. This afterburning turbofan incorporates advanced technology based on the proven design of GE's F404 to provide the Boeing F/A-18E/F Super Hornet with a durable, reliable and easy to maintain engine.The F414-GE-400 turbofan builds upon the excellent reliability, operability and readiness of the F404 engine.The F414G provides 22,000 lbs of thrust andadvanced technology features such as a full authority digital electronic control (FADEC) improve operational characteristics of the engine while the latest materials and cooling techniques allow for higher temperatures and pressures without sacrificing component life.

• Ruggedness, safety and the ability to operate reliably under adverse environmental conditions while requiring minimal maintenance are the trademark values of the CT7and T700 engine family. The CT7 and T700 military engines represent a quantum leap in reliability and maintainability over other engines in their class. The CT7 and T700 engine family is the most widely used in its class—powering over 20 types of rotary and fixed-wing aircraft for close to 125+ customers in 50+ countries.

• GE's CF6 large turbofan engines (military designation F103 and F138) power 16 military and VIP applications every day. Military CF6 applications include the E-4B, KC-10 tanker, A300, A310 tanker, airborne laser, Air Force one, C-5M Super Galaxy, XC-2 Transport, AWACS, and KC-30 multi-role tanker transport. The (CF6-50) F103 has already powered the KC-10 through two-and-a-half decades of recognised mission accomplishment, fuelling it with one of the best dispatch reliability rates and lowest support costs of any major weapon system in the Air Mobility Command. The CF6-50 provides 46,000-54,000 lbs of thrust.The CF6-80E is the newest and highest thrust model of the CF6 family and is capable of generating up to 72,000 lbs of thrust. It currently powers the KC-30 multi-role tanker transport, a modification of the A330 commercial aircraft.

• CFM combines the resources, engineering expertise and services of two major aircraft engine manufacturers: Snecma of France and GE Aviation in the USA. CFM's goal is to maintain the trust of airlines and airframers by providing superior engines, world-class customer support, and the outstanding and dedicated services that contribute to the operational and the financial success. The engines produced are technologically sophisticated market leaders in every category in which they compete. Nearly 23,000 engines have been delivered to more than 500 customers around the world.

GE Aviation systems portfolio has a presence in India on platforms including the Hawk Mk 132, SEPECAT Jaguar (Shamsher), P-8I, C-130J and HJT-36 Sitara. PBN Solutions provided by GE's PBN Services business could be a critical enabler for India as it gears up its navigation infrastructure to raise air travel.

GE Aviation and the Hindustan Aeronautics Limited (HAL) have signed a 30-year contract that covers licence to carry out repairs and overhaul of various avionics, instruments and hydraulic products for the Hawk Mk132 aircraft, an advanced jet trainer operated by the Indian Air Force.

GE has also entered into a Manufacturing License Technical Assistance Agreement with HAL in 1986 for the LM2500 marine gas turbine to support the propulsion requirements at local shipyards, and has supported HAL in the establishment of a dedicated test cell for the assembly, inspection and testing for LM2500s in Bengaluru. •

# Israel Aerospace Industries Expands its 'Ehud' Family of Air Combat Systems

Israel Aerospace Industries (IAI) has expanded its 'Ehud' Autonomous Air Combat Manoeuvring Instrumentation (AACMI) family to support Eastern fighter aircraft in addition to its Western fighter aircraft related advanced capabilities.

IAI's Ehud is a unique real-time air combat, training, debriefing and safety system for fighter aircraft pilots. The system allows conducting high level live training with the ability to fire simulated armaments and receive real time hit/miss assessments as well as high level post-exercise debriefing. The fighters can train jointly with ships, helicopters and air defence platforms, since IAI provides dedicated embedded training systems for each of these platforms.

IAI has now developed an AACMI pod in an R73 (air-to-air missile) enclosure, making its 'Ehud' the only AACMI pod in the market which can fit any R73 compatible aircraft.

The Ehud family can be found in an AIM-9L, Hellfire and R-73 enclosures, as well as in a verity of onboard LRU boxes and racks which fit ships, utility helicopters and air defence platforms. Ehud could be fitted to additional enclosures upon demand. •

# Proven Products and Technologies from Telephonics

Telephonics Corporation, a world leader in fully integrated, advanced sensor and communication systems technology serving aerospace, defence and commercial markets is displaying a wide array of radar, IFF, intercommunication, border surveillance and air traffic management solutions. Some of their products on display here at Aero India are:

**APS-143C(V)3**
The APS-143C(V)3 is the world's premiere maritime surveillance radar serving on fixed-wing, rotary-wing, and aerostat applications worldwide. This radar offers long-range detection, tracking, imaging, and identification of small targets in the most severe maritime environments.

**UPX-44 INDENTIFICATION FRIEND OR FOE (IFF) INTERROGATOR**
Telephonics' IFF Interrogator systems provide operators with timely and accurate displays of both civil and military air traffic. Our interrogators are the only system to achieve All-Mode IFF Interrogator certification worldwide and offer multi-channel ADS-B capability.

**RDR-1600**
The RDR-1600 is a state-of-the-art search, rescue, and weather avoidance radar and is fully compatible with integrated flight decks and the latest glass-cockpit configurations.

**AIR TRAFFIC CONTROL/AIR TRAFFIC MANAGEMENT (ATC/ATM)**
For over 40 years, Telephonics Corporation has been providing the expertise and advanced systems required for safe, efficient Air Traffic Control and Air Traffic Management Operations. From the planning stages to turn-key installation, Telephonics can assist in providing technical support and system solutions to ensure smooth, secure, and effectual air traffic flow at airports and control centers around the world.

**MOBILE SURVEILLANCE CAPABILITY (MSC)**
The MSC is a fully integrated, rapidly deployable surveillance system that is effective in all terrains and environments. MSC can act as a standalone system, providing detailed information of a selected region or networked together to cover larger surveillance areas.

**RDR-1700A**
The RDR-1700A is a search, surveillance, and weather avoidance radar system, with secondary roles that include terrain mapping and beacon navigation. The lightweight RDR-1700A is designed for integration with glass-cockpit-configured aircraft and offers various display modes.

**RDR-1700B**
The RDR-1700B is a maritime surveillance and imaging radar delivering automated situational awareness at sea, in the littorals, and overland. The system is ideal for manned or unmanned rotary and fixed-wing aircraft.

**SECURE DIGITAL INTERCOMMUNICATION (SDI) SYSTEM**
The SDI is a flight deck and mission intercommunication solution. The system allows crew members the flexibility to control and distribute digital audio and data in accordance with a predetermined connectivity matrix and mission communication plans. •

# L-3 Aviation to Meet Indian Needs

L-3 Aviation Products (AP) has announced that it is establishing a presence in India to provide technical support for its customers, engineering oversight for programmes and expanded business development coverage in that area. The establishment of a local presence aims to advance L-3's long-term business growth in the emerging Indian aerospace sector, as well as the region.

"For L-3 to deliver best-value solutions, service and support to our Indian customers, we need to expand our presence in that area," said Denise Millard, Vice President of international business development for L-3 AP. "Our Indian customers demand the highest quality, top-level service and ease of access to local support. Through this initiative, we are continuing to broaden our reach in meeting the growing needs of aerospace customers in the region."

Having already implemented a variety of technical support, engineering, design and manufacturing activities in India through local partnerships, L-3 AP is poised to increase the level and value of its local content. L-3 plans to add more capability and collaborate on the manufacture, delivery and support of products in India for domestic and international aviation markets, while developing the basis for a long-term support and services center in the region. •

# Embraer Executive Jets Signs MoU with Indamer for Maintenance

Embraer Executive Jets has signed a memorandum of understanding (MoU) with Indamer Pty Ltd to provide maintenance support for the midsize Legacy 500 aircraft, ahead of the jets' expected entry into service in 2014.

"The MoU we are announcing illustrates our commitment to our customers' peace of mind by providing the best possible customer support infrastructure for current and future operations of Embraer Executive jets aircraft in the country," said Andre Luis Vieira de Sousa, Director Customer Support and Services, Asia Pacific – Embraer Executive Jets.

Indamer is one of an initial 17 service centres worldwide to enter into MoUs with Embraer Executive Jets for Legacy 500 product support. Indamer will provide line and base maintenance, including the entry-level Phenom 100, super-midsize Legacy 6000, long-range Legacy 650 and ultra-large Lineage 1000.

Jose Eduardo Costas, the Vice President, Marketign and Sales – Asia Pacific of Embraer Executive Jets gave a perspective of the business jet markets worldwide, stating that 2013 will also be a challenging year. •

— R. CHANDRAKANTH

# Beechcraft King Air 350i Leading Turboprop Market in India

Hawker Beechcraft Corporation (HBC) is showcasing its best-selling business aircraft family – the Beechcraft King Air 350i. The Beechcraft King Air series has long led the turboprop market segment in India. According to JETNET industry data, 82 percent of the new turboprop business aircraft delivered into India from 2002-2011, were King Air products, while 83 percent of the total fleet of registered business turboprops registered in the country are King Air aircraft.

"The reliability, durability and versatility of King Air turboprops make them ideal for operating in the diverse environments of this region," said Todd Hattaway, HBC director of sales, India. "In addition, we continue to see a growing demand for our aircraft used in special mission applications throughout the country." More than 20 King Air turboprops are currently registered to state or federal government organizations in India – the majority providing VIP transportation for both interstate and cross country travel.

The worldwide fleet of more than 7,000 King Air turboprops has amassed in excess of 45 million flight hours while operating in 115 countries around the world. King Air products serve a variety of missions such as traditional transport of personnel and high-value cargo, electronic and imagery surveillance, air ambulance, airways calibration, photographic mapping, training and weather modification. •

— R. CHANDRAKANTH

# Russians with a Positive Impulsion

Despite recent defence deals going to the US and Europe, Indo-Russian relationship seems to be still going strong. At a press conference organised on the first day of the air show, Viktor Komardin, Head of the joint delegation of the Russian Technologies State Corporation and Deputy Director General, Rosoboronexport, said that we will offer newer technology to India, both in defence and aviation sector. "We have and we will continue participating in the Indian programmes." The delegation said that they are looking ahead to both civil and Navy helicopter deals in India and they are of the opinion that their technology is of optimal use.

The Rosoboronexport delegation is at the show presenting the latest export models of Russian aviation and air defence equipment. At the show, Russian Helicopters is demonstrating its new light multi-purpose helicopter Ka-226T. The delegation emphasised on the civil upgraded medium-range helicopter Mi-171A2 based on the successful solutions of the popular Mi-8/17 series. The holding is participating in IAF surveillance and reconnaissance deal. Together with Rosoboronexport, Russian helicopters is also presenting the attack helicopter Mi-28NE. Likewise, United Engine Corporation is highlighting on a number of advanced aircraft engines like the RD-33MK turbofan engine to power the MiG-29 fighters; VK-2500 turboshaft engine for helicopters; PD-14, a next generation turbofan engine; the AL-551 turbofan engine, developed to power the IAF HAL HJT-36 jet trainer aircraft. The others who are also at the show are Urals Optical and Mechanical Plant, Concern Avionika, Fazotron-NIIR corporation and Russian Technologies State Corporation (Rostec). •

— SUCHETA DAS MOHAPATRA

# Rafael's Strong Missile Defence Systems

MAJ GEN (RETD) ILAN BIRAN, CHAIRMAN, RAFAEL

Israeli defence company Rafael is showcasing integrated air and missile defence systems and is hopeful of the Indian armed forces looking at their capabilities. The highlight of the show includes Iron Dome, a combat proven active defence system against short range artillery rockets; David's Sling (Stunner), a multi-mission, multi-platform interceptor; Spyder SR/MR (short range/ medium range); Python-5, full sphere air-to-air missile and air defence; Derby – beyond visual range air-to-air missile and air defence missile; and MIC4AD – modular, integrated C4I air and missile defence sytem.

The Israeli company has displayed these and a lot of interest has been generated within the armed forces for the systems and the company is all ready to fulfil India's defence requirements.

The Iron Dome, a spokesperson of Rafael said, was a dual system which addressed short range rockets, artillery shells and mortars and was also an air-defence option. "We are ready to cooperate with India on any of the programmes." The Spyder short range had 20 km reach and the medium range had 50 km interceptor range and they were all based on the same operation concepts. •

**— R. CHANDRAKANTH**

# New Raytheon Torpedo Wing Kit Can Support India's P8-I Aircraft

As the Indian Navy incorporates the sophisticated P8-I Poseidon multi-mission maritime aircraft into its air fleet, Raytheon Missile Systems has developed a extended range wing kit for its torpedoes that can further enhance the warfighters' capabilities.

Raytheon's Fish Hawk is a smart wing kit for MK54 Lightweight Torpedo (LWT) that is deployed by the P8-I. Fish Hawk enables warfighters to launch torpedoes at multiple targets from high altitude at stand-off range. It is ideal for maritime patrols flying at a high altitude to avoid sub surface-to-air detection or firing, and eliminating the need to descend to lower altitude to launch a torpedo. It is also compatible with other platforms and torpedoes.

Built for the US Navy's High Altitude Anti-submarine Warfare Weapon Capability (HAAWC) programme, Fish Hawk uses an optimum global positioning system and inertial navigation system guided flight profile for precision targeting. Once Fish Hawk descends to the target location, the wing kit releases the torpedo to seek out, engage and destroy the detected threat submarines.

With an innovative, streamlined design, Fish Hawk features a low-profile pivot wing that allows for a controlled high-speed decent from high altitude, to ensure optimum water entry and survival.

"Raytheon's Fish Hawk will significantly improve P8-I survivability, in addition to providing enhanced rapid engagement and on-station time," said Mark Borup, business development senior manager at Raytheon Missile Systems. "It provides an affordable solution for the Indian Navy that takes advantage of combat-proven technology. Fish Hawk continues to be a perfectly suited solution to extend the reach and capability of India's new P8-I fleet and keep its warfighters out of harms' way," Borup said. •

# Northrop Grumman Focusing on E-2D Hawkeye

Northrop Grumman which has responded to a 2010 request for information (RFI) in 2010 is hopeful that its E-2D Hawkeye would win as and when the Indian Navy will be going in for carrier-based multimode long-range identification friend or foe (IFF). Speaking to *SP's ShowNews*, Tom C. Trudell, Manager, International Business Development, Northrop Grumman, said the company was having discussions with the Indian Navy with the US Navy in the loop. "E-2D Hawkeye is well suited for India's requirements. India has made an RFI for aircraft." The US and French were already using them.

He said there were many unique features of the E-2D Hawkeye including providing 360 degree automatic, simultaneous air and sea surface radar detection, automatic radar correlation, and long-range passive detection and classification of electronic emitters. The Hawkeye's extensive suite of radios and data links with its integrated, automated sensor systems, make it a network-centric warfare enabler for joint battle management command and control. The result is Knowledge 360 – the ability to see in all directions and act accordingly.

He said Hawkeye's multi-mission flexibility makes it the preferred choice for many nations to meet a variety of needs from early warning and missile defence to border security and disaster recovery. •

**— R. CHANDRAKANTH**

# Rockwell Collins Signs Teaming Agreement with Tata Power SED

Rockwell Collins and Tata Power Strategic Engineering Division (Tata Power SED) have announced a teaming agreement as part of their pursuit of the Indian Air Force software defined radio programme. "Together, our companies provide the expertise to deliver the best-value software defined radio (SDR) solution for the Indian Air Force while offering an unmatched opportunity for technology transfer," said Ram Prasad, managing director of Rockwell Collins India. "This announcement formalizes what has been a long-standing and positive working relationship with Tata Power SED and will provide the Indian Air Force with advanced air and ground connectivity to meet their requirements. This relationship is very strategic in nature and would provide Indian defense with not only a local, within country, long-term support and maintenance provider, but also access to state-of-the-art technology."

Rahul Chaudhry, CEO of Tata Power SED remarked, "Tata Power SED has a four-decade long defense research and development experience and has now emerged as one of the largest private sector defense prime contractors. Our teaming agreement with Rockwell Collins for the Air Force's software defined radio programme allows us to harness our core competencies in the hi-tech arena of SDR for which Rockwell Collins is an acknowledged world leader with proven solutions. With this collaboration, we bring to India a proven hi-tech communication technology with indigenous security, platform and system engineering as a trustworthy solution."

Under the terms of the agreement, Tata Power SED is the prime contractor and Rockwell Collins will provide technology for the team's software defined radio offering. If selected, the team of Tata and Rockwell Collins plan to perform the majority of the programme effort in India, providing faster delivery times, as well as more responsive in-country service and support for the customer.

For the Indian Air Force programme, Rockwell Collins is providing industry leading software defined radio technology designed to provide the best value in features, technology and growth capabilities. This technology features a digital radio architecture that allows easy reprogramming with different wave forms and operating modes through the use of digital signal processing technology. •

# Safety is Our Priority: Boeing

Boeing is leaving no stone unturned to prove that its 787 Dreamliner is the best and that safety of passeners and crew is of high priority for the company. Stating that the company's aim is now to get the aiplanes back in the air, Boeing stated at Aero India that the company is committeed to the investigations being carried by NTSB and FAA.

Addressing a press conference on the second day of the air show, Dinesh Keskar, Vice President, Sales, Boeing Commercial Airplanes, once again reiterated that Boeing sees the Indian commercial aviation market improving. He said that though traffic is dropping due to reduced capacity, yileds are improving and fuel prices are stabilising in the market. And over the next 20 years, the company projects that India will need 1,450 new airplanes worth 175 billion.

Keskar said that single-aisle airplanes such as the Next-Generation 737 and new 737 MAX continue to be in high demand with airlines in India, making up the bulk of new deliveries in the next 20 years. He said the 737 MAX has the maximum efficiency, maximum reliability and maximum passenger appeal. "The newest family of airplanes, 737MAX, 737 MAX 8 and 737 Max 9 will build on the next generation 737s popularity and reliability while delivering customers unsurpassed fuel efficiency in the single-aisle market.

Similarly on the maintenance repair and overhaul (MRO) facility at Nagpur, Keskar said that 90 per cent of the work is complete and by the second quarter of this year, it will be ready. " There will be two hangers 100m/100m which can accommodate three wide body aircraft or six smaller craft." •

**— SUCHETA DAS MOHAPATRA**

# To Strengthen Indian Footprint: Eurocopter

Our helicopters know the Indian skies, know every corner of India," said Eurocopter President and CEO, Lutz Bertling, at Aero India 2013.

Eurocopter which has begun its defence campaign with a number of platforms will set up production capabilities in India to meet Indian defence requirements. The Indian Army and Air Force require 197 reconnaissance and surveillance helicopters and Eurocopter is offering AS550 C3 Fennec in a re-tendered process. Eurocopter had won the competition but the first tender was cancelled.

"We have the best tool for the IAF," he said and added that it was now for the Indian Government to decide on the programme. Nevertheless Eurocopter is ready to set up assembly line in India, considering the industrial competence and the economic benefits it offers. •

**— R. CHANDRAKANTH**


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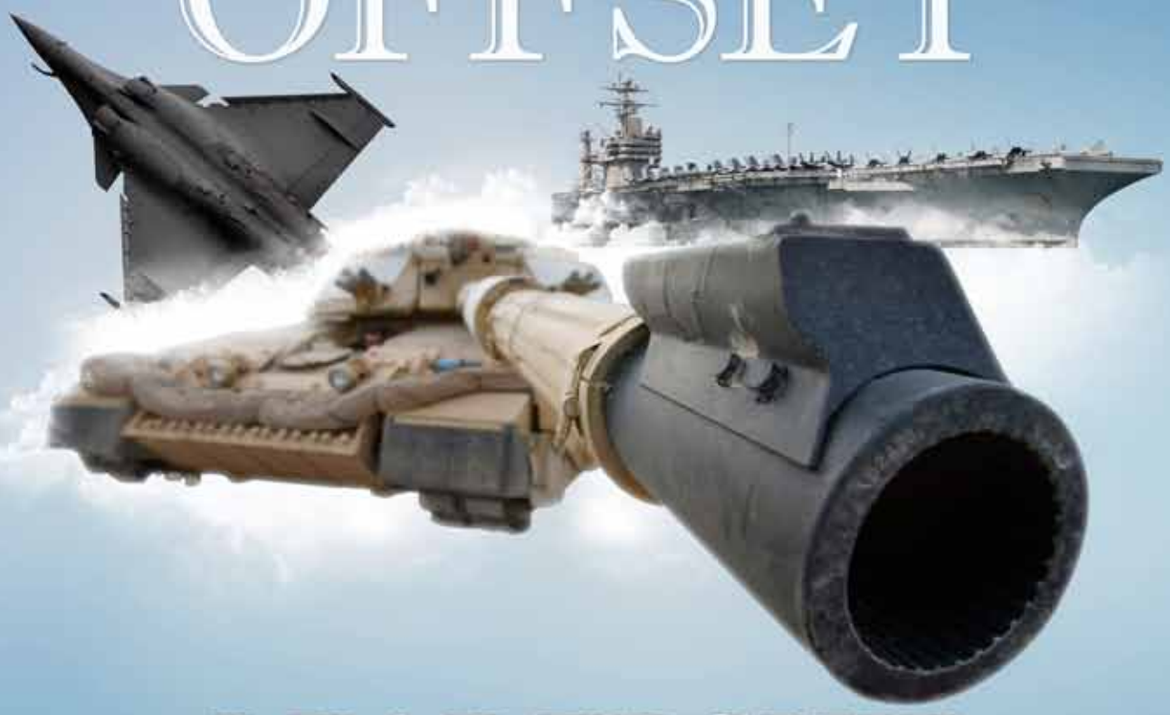
# DEFENCE OFFSET



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