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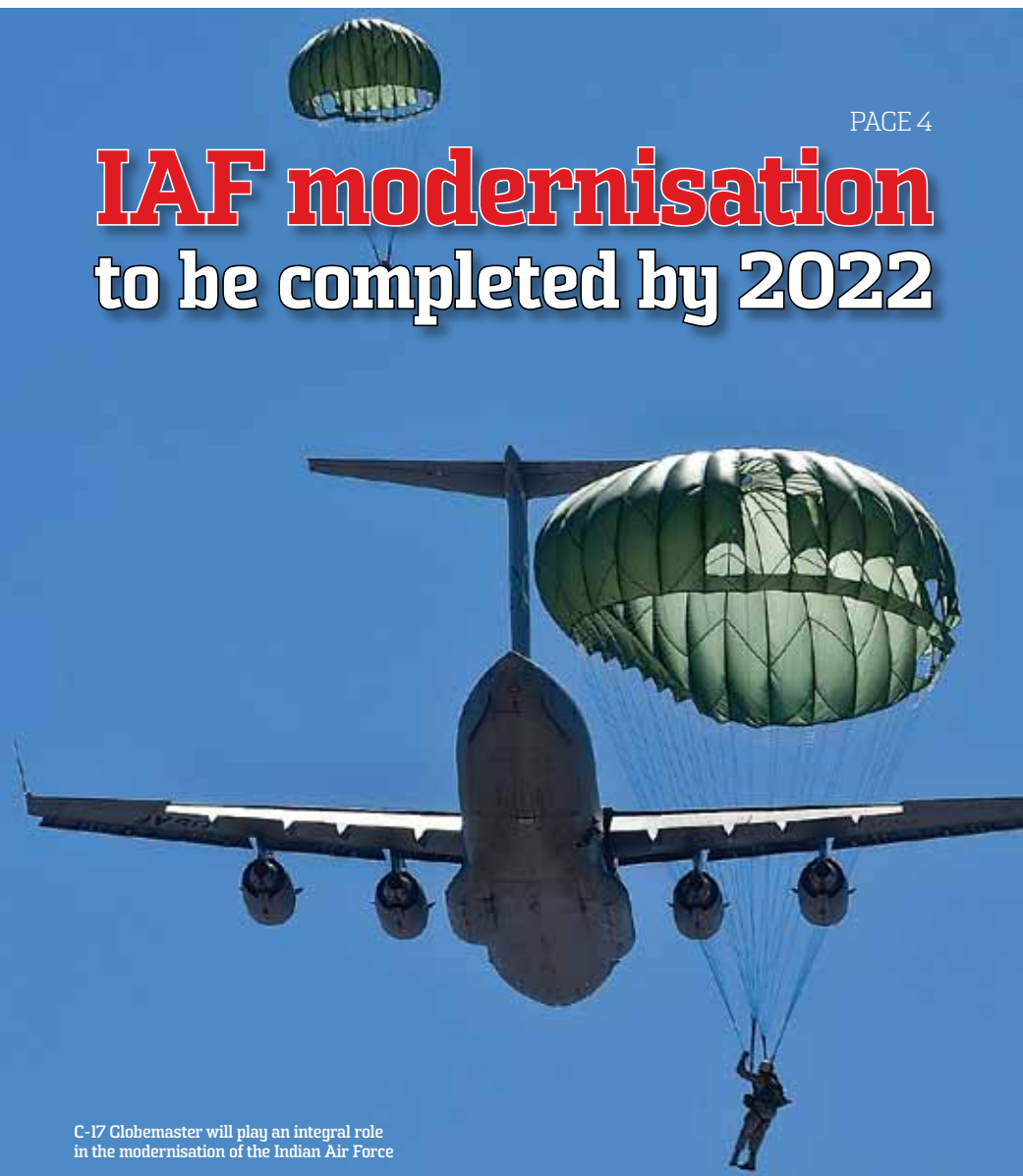
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ONLY FORTNIGHTLY ON

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IAF modernisation to be completed by 2022



C-17 Globemaster will play an integral role in the modernisation of the Indian Air Force



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Superiority: The New Benchmark



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Modernisation of armed forces, it's a long haul

A massive military as ours, with varied responsibilities, needs to be modernised post-haste. As the defence industry is in a transitory phase, moving from totally controlled production by the defence public sector industries to almost a free-market enterprise, the challenges of modernisation are many. It is going to be a long haul.

Confirming this is the IAF Chief Air Chief Marshal N.A.K. Browne who has stated that the current state of IAF modernisation would be complete by 2022. The contracts which were signed during the 11th Five Year Plan, amounting to ₹1,12,000 crore, would be executed by 2017, accounting for almost 70 per cent of the modernisation plan. Similarly, the new Army Chief, Chief of Army Staff, General Bikram Singh has committed to fast-track modernisation process. In the near future, we are going to see major acquisitions in all the tri-services, the biggest being the MMRCa deal which has gone to Rafale. Considering the dynamic technology environment, modernisation is going to be a continuous process.

In this issue, Lt General (Retd) Naresh Chand has written a comprehensive article

on underwater weapons systems across the world, including India's programmes. India has sought from the US 32 MK-54 lightweight torpedoes and allied equipment for P-81 maritime aircraft which the Indian Navy is procuring. Meanwhile, the Defence Research and Development Organisation (DRDO) is developing a light weight torpedo called TAL and a heavy weight torpedo called Varunastra.

The modernisation process, which includes indigenisation, transfer of technology etc, has been well understood by the OEMs and other stakeholders. Lockheed Martin, like many other OEMs, has made its intent clear that it is here for the long-term, as the market is going to unfold surely but steadily. What is needed is a major impetus to the research and development efforts which is dismal, euphemistically speaking. Our academic institutions have not been platforms for accelerated R&D, unlike the US where the academia-industry linkages are strong. In the technology section, we have featured how the US Army Research Laboratory has revolutionised and increased transmission power in the Apache helicopter without increasing the transmission's

size or weight. It introduced the split-torque face gear technology, on the Apache Block III helicopter, which gives helicopters more power without becoming heavier or bigger.

There are so many technological developments as witnessed at Eurosatory where the number of new products and innovation launches exceeded 350. In the concluding part of Eurosatory reportage, there is coverage of some new product launches which India may be interested in.

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Publisher & Editor-in-Chief

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Pilatus PC-7 Mk.2

Current IAF modernisation to be completed by 2022

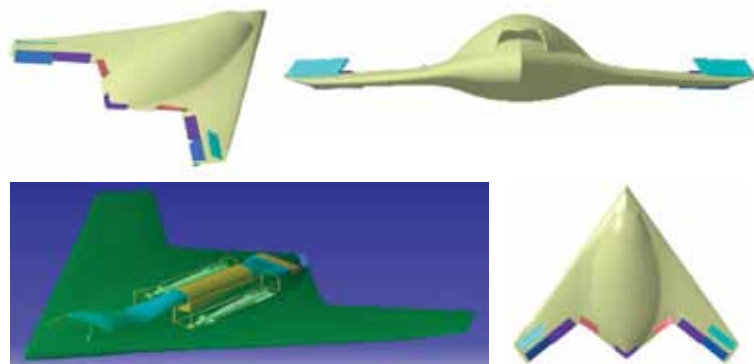
Signalling a push to modernisation of air power asserts and shoring up of dwindling squadron strength, IAF Chief Air Chief Marshal N.A.K. Browne said on June 30 that the current spate of IAF modernisation would be complete by 2022. "All the contracts which are signed during the 11th Plan are about ₹1.12 lakh crore and they will be executed till 2017. At least 65 to 70 per cent of modernisation will be accomplished by 2017, and the rest by 2022. So 12th and 13th Five-Year Plans are very crucial for IAF" said the IAF Chief. The massive capital commitment includes the monumental medium multirole combat aircraft (MMRCA), likely to be contracted to Dassault Aviation by the end of this year for 126 Rafale jets, primary trainer aircraft, Boeing C-17 Globemaster-III heavy lift transports, many more medium transports and several miscellaneous special mission aircraft and helicopters. In addition, the IAF will be investing in backbone network-centric architecture to consolidate AFNET, and begin investments in space-based assets as well. The IAF, as is well known, has also been pitching for a dedicated military satellite. The major thrust of procurement will be to shore up combat strength, and slowly pull squadron numbers up from 34 to 42—the ideal figure sanctioned to the IAF. **SP**

Rashtriya Rifles jawan with TETRA handset



Indian Army scouts for TETRA handheld radio sets

In an effort to ramp up tactical communication, the Indian Army is looking to rapidly procure TETRA handheld radios to meet its demands for mobile voice and data communications in a field environment. These Army has stipulated that any new handheld radios it considers will be required to function along with existing TETRA infrastructure already in place with the service. Apart from the mandatory function of voice and data communication, the Army has stipulated that it would be interested in supplementary functions on the TETRA handsets, which include priority pre-emption, ambience listening, talking party identification, calling line identity presentation, connected line indication, call forwarding unconditional/busy/no reply/not reachable, barring of incoming/outgoing calls, emergency call, automatic transmission of geographical location (using a GPS receiver) and call control features. The Army has sought an early response from vendors interested in contributing to a test schedule. **SP**



IUSAV revealed

It is finally clear what India's hush-hush stealth unmanned combat aerial vehicle (UCAV) will look like, with images emerging from the project's design and definition stage finally providing a definite picture. The Indian unmanned strike air vehicle (IUSAV), under preliminary definition and development by the Aeronautical Development Agency (ADA) in Bangalore under the stewardship of aeronautical scientist and project director Dr Biju Uthup, is intended as a stealthy autonomous bomber aircraft, incorporating flying wing aerodynamics, low observable features, long endurance capabilities, and the ability to deploy precision-guided weapons over enemy territory. Several different laboratories are currently engaged in various sub-systems that will go into the IUSAV, which the DRDO intends to begin flight testing by 2015-16, an ambitious target by current standards. The project has an initial investment of ₹100 crore, but with additional sanctions, the amount could go up to a total of \$1.5-billion overall. At this stage, the primary user of the intended platform, the Indian Air Force, has insisted that the secret project be a fully Indian effort. However, it is understood that the DRDO has held discussions at various levels with Saab, EADS, Dassault and BAE Systems for possible technological partnerships on the IUSAV. Earlier this year, Defence Minister A.K. Antony informed Parliament that efforts were on to modify the Kaveri jet engine for possible use on the IUSAV. **SP**



Government clears procurement effort of QR-SAMs for eight Army air defence

The Ministry of Defence's (MoD) Defence Acquisition Council (DAC) has cleared a ₹12,000-crore acquisition of quick-reaction surface-to-air missiles for the Army. The missiles

DRDO's stealth fighter

With so much attention paid to India's LCA Tejas and the Indo-Russian fifth generation fighter aircraft (FGFA – but officially designated Prospective Multirole Fighter or PMF) programme, it is important to remember that the DRDO is also designing and developing India's own next generation medium fighter, the AMCA, a stealthy twin-engined strike fighter that is intended to be an Indian take on the F-22 Raptor. The computer design images, from the Advanced Projects & Technologies (AP&T) directorate of India's Aeronautical Development Agency (ADA) provide valuable impressions on the stealth design elements that are known to be going into India's Advanced Medium Combat Aircraft (AMCA). Serpentine air intakes (with minimum flow distortion and robust pressure recovery) and internal weapons bays, depicted in the images above, are some of the most critical nose-on low observability design elements going into the programme.

As part of the multidisciplinary design optimisation (MDO) currently on for the AMCA – a wind tunnel model of which was first publicly displayed at AeroIndia 2009 – that design-based stealth features will include further optimised airframe shaping, edge matching, body conforming antennae and a low IR signature through nozzle design, engine bay cooling and work on reduced exhaust temperature. Radar absorbent materials and paints, special coatings for polycarbonate canopy and precision manufacturing will all be part of the effort to make the AMCA India's first stealth airplane. With aerodynamic design optimisation near complete, the AMCA's broad specifications are final. The aircraft will have a weight of 16-18 tonnes [16-18 tonnes with 2-tonnes of internal weapons and 4-tonnes of internal fuel with a combat ceiling of 15-km, maximum speed of 1.8-Mach at 11-km. The AMCA will be powered by 2 x 90KN engines with vectored nozzles – likely to be the new GTRE-Snecma engine under development. **SP**

LCA Tejas completes bombing trials

The LCA Tejas has made another big step towards operational clearance, completing a two-day routine of weapons trials at the desert field firing range in Pokhran, Rajasthan. The trials involved three Tejas platforms (LSPs 2, 3 and 5) deploying a series of weapons, including laser-guided 1,000-lbs bombs and unguided bombs. The tests were a continuation of weapons deployment trials that took place at Pokhran in September last year.

The aircraft has so far proven weapons delivery using its secondary sensor, a laser designator pod, but not from its primary multimode radar. The Tejas is scheduled to undergo sea trials shortly, at which point



certain missile tests could be expected. While the Tejas has already conducted a few tests of the R-73 close combat missile, it is yet to prove itself with any beyond visual range weapons, specifically the Rafael Derby and the Vympel R-77. **SP**

Indian Army will replace the now obsolete Russian Kvadrat surface-to-air missiles

will arm eight air defence regiments of the Army. Competitors from US, Israel, France and Russia are expected to compete for the massive order that could take more than a year to finalise.

Former Army Chief General V.K. Singh, in his letter to the Prime Minister, had highlighted the obsolete state of Indian Army's air defence arsenal. The decision today is a big boost for air defence cover of the country. The missiles are to replace the Army's obsolete Russian Kvadrat surface-to-air missile batteries. The IAF is awaiting the supply of Rafael SpyDer QR-SAM systems—a product that will compete for the Army competition as well. The huge order will include mostly licence production by Bharat Dynamics Ltd. **SP**

LCH sea trials

India's light combat helicopter (LCH) is off to a successful start to sea trials. The second prototype of the programme is now three days into a complex list of test-points to be completed over 10 days on the East Coast just outside Chennai. The LCH prototype is being filmed and recorded by an IAF Mi-8 from Yelahanka Air Force Station. The pilots and test team are currently extremely pleased with the helicopter's handling and manoeuvrability at sea level, since for the last three years, both prototypes have been confined to altitudes of 3,000 m and above at Bangalore.

Sources involved with the trials said, "The helicopter is maturing well and promises to be a very good platform once ready. We are putting it through the necessary paces as required by the IAF and by us to bring the platform up to maturity." The LCH, yet to be given a formal name like the Tejas or Sitara, will, later this year, be put through cold and hot weather trials, following which its first crucial weapons trials will begin. The helicopter is expected to deploy rocket pods, the HELINA air-launched anti-armour missile and the



MBDA Mistral air-to-air missile initially, but could be configured for other munitions as well. **SP**

(Clockwise from top left) LCH overflies the Bharat Benz factory enroute to the East Coast; LCH over the East Coast, a view from the cockpit; LCH hovering in Tambaram near Chennai

Government to declare winner in mid-air refueller competition

EADS/Airbus will be waiting with baited breath for an impending decision on the winner of the Indian Air Force's mid-air refueller competition. The tender, a second iteration after the first was aborted in 2009, is a delicate one for EADS. It's Airbus A330 multi-role tanker transport (MRTT), which emerged the winner in the last competition, lost out when the tender was scrapped citing the cost of the system. Airbus has fielded the same aircraft for the current competition, facing off against the Russian Ilyushin-78M, six of which are already operational with the IAF at its Agra airbase. The Finance Ministry's objections on cost in 2009 are not expected to hold up the same way this time around, considering the dynamics of cost of ownership and life-cycle expenses worked into procurement processes. Russia's pitch has of course been type commonality not just with the existing flight refuelling aircraft, but also with its A-50 PHALCON jets and existing heavy transports, all of which are Ilyushin-76 platforms. **SP**

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Airbus A330MRTT at Leh during trials in November 2011

Skew of launches at Paris

The number of launches of products and solutions at Eurosatory 2012 was a healthy one, setting aside the gloomy economic scenario. Companies vied with each other to highlight their new offerings, catering to the global marketplace. Here are some of the launches and other highlighted products and solutions which SP's M.A.I. team got to witness. R. Chandrakanth from Paris reports.

Nexter Systems range of artillery firepower

Nexter showcased a range of artillery firepower. They included CAESAR; TRAJAN; 105 LGI, etc. The famous CAESAR self-propelled wheeled vehicle equipped with 155mm/52 calibre guns provides fire support to a range of up to 55 km with impressive precision. A similar success can be expected for the TRAJAN towed version in its reply to the Indian "Towed Gun System" (TGS) call for bids for its first baptism of fire. The 105 LG1, a 105mm light gun, supplies precise and efficient fire support while remaining easy to use and highly mobile.

CAESAR has excellent tactical and strategic mobility. Configured at 15.9 tonnes for air transport, it can easily be deployed in a C 130, A 400M or IL 76 aircraft. Its autonomy of more than 600 kilometres and its road speed of over 80 km/h make it agile and reactive. CAESAR is fitted with a 155mm/ 52 calibre gun and it can fire any 155mm NATO standard munition (39 or 52 calibre) and particularly Nexter Munitions.

It can also fire BONUS type munitions, or VLAP munitions extending its range up to 55 km. Its five-man crew can make the CAESAR system ready for action in less than one minute and take it out of action equally quickly, thus avoiding counter-battery fir-



ing. Each CAESAR carries 18 complete rounds onboard.

CAESAR has been integrated on two different chassis, Renault Trucks Defense's SHERPA 6x6 for which the last revision was

Nexter's development of an armoured cab, and SOFRAME's 6x6 chassis (Mercedes-Unimog base). This mobility originating from a commercial range helps to control its global cost of ownership. **SP**



TRAJAN, the 21st century towed artillery

TRAJAN is the result of a combination of two types of proven systems, the 155mm/39 calibre TRF1 (Iraq in 1991) towed artillery and the 155mm/52 calibre CAESAR truck-mounted artillery (in Afghanistan since 2009), and was developed to provide fire support for all types of motorised, mechanised or armoured units and to perform frontier defence missions.

TRAJAN integrates the fire power of CAESAR' into a modern and very efficient towed artillery unit for all firing missions including direct support firing, in-depth

action firing. TRAJAN has very high precision due to the integration of a muzzle radar, an inertial control unit and a ballistic computer.

It was developed based on the 155 TR-G2 and has been made to satisfy the specifications in the Indian "Towed Gun System" (TGS) call for bids in partnership with Larsen & Toubro, a large Indian industrial group. This action illustrates Nexter's ability to transfer its know-how and control technology transfers.

The Indian MoD got it right, TRAJAN was officially invited to assessment tests in India this winter after the technical assessment committee had approved its conformity with requirements. **SP**

Qioptiq launches Saker at Eurosatory

Qioptiq's new fused weapon sight (FWS) Saker was officially launched at Eurosatory 2012. Nominated by serving and former military personnel in two categories at the Soldier Technology Conference in London held on May 22 and having won the award for the "Best Situational Awareness Device", Saker provides the dismounted close combat user with an 'enhanced detect, recognise and identify' capability. It combines image intensifier and uncooled thermal imaging sensors into a single sight unit. Designed with a low-power architecture and featuring a removable battery pack, Saker can be used as a stand-alone sight or as an in line/clip-on sight, providing flexibility and forward compatibility.

Saker is a clip-on in-line (COIL) fused weapon sight utilising and combining the latest image intensification and uncooled thermal imaging capability in one compact, lightweight package and delivering a flexible architecture to allow the user maximise the benefits of both technologies. This structure coupled with a



number of other innovations taken from on-going technology development processes and the use of lightweight materials (exploited as alternatives to aluminium and plastics as an alternative to glass) assist with overall size and weight reduction. Saker is targeted at Special Forces users and urban environments in particular by providing a lightweight low light/zero light solution that will assist in target detection and recognition at ranges well in excess of most modern assault rifles. Saker is compatible with a range of optical sights and attaches via a quick release bracket, providing 24 hour capability with the ability to continue operating even during the harshest visibility conditions. **SP**

PHOTOGRAPHS: BAE Systems, Qioptiq



BAE Systems new mine protected vehicle – RG35

BAE Systems displayed the RG35, its latest mine protected vehicle, which meets battlefield requirements by being adaptable for future technologies and fulfilling a variety of roles.

"The new RG35 vehicle is a direct response to lessons learned from operations in Iraq and Afghanistan – soldiers need an effective level of protection without sacrificing mobility, payload and firepower," said Chris Chambers, Vice President and General Manager of BAE Systems Tactical Wheeled Vehicles. "We have responded to the needs of soldiers and are now able to tailor the vehicle's capability to specific requirements because of the design's adaptability."

The vehicle is available in 4x4 and 6x6 configurations. The RG35 4x4 is a mine protected, multi-mission tactical wheeled vehi-

cle that can easily be modified in a number of ways to transport cargo, conduct routine patrols or be outfitted for surveillance missions. The 6x6 version combines tactical mobility with a high level of survivability and high volume under armour, offering a new class cross-over combat vehicle.

"The RG35 family of vehicles is a modern and dependable tactical wheeled vehicle family truly built for multiple mission types. No matter where or what the mission, getting troops home safely is what drives us when developing our vehicles," said Johan Steyn, Managing Director of BAE Systems' Land Systems South Africa.

The RG35 can be equipped with light and medium turrets, or with indirect fire weapons. The RG35 4x4 variant has the light weight self-defence remotely operated weapon (SD-ROW), which enables forces to engage hostile targets without exposing operators to harm during day and night. **SP**

Russia to produce French new generation thermal imagers

During Eurosatory, Rosoboronexport and French Thales Optronics concluded a licence agreement for the manufacture of Catherine XP new generation thermal imagers at the Vologda optical-mechanical plant. The two companies also signed a contract for repairs in Russia of thermal imagers made by Thales Optronics.

The contractual documents were signed on the French side by Serge Adrian, President of Thales Optronics and on the Russian side by Igor Sevastyanov, Deputy Director General of Rosoboronexport. The signing

ceremony was attended by Dmitri Rogozin, Deputy Chairman of the Government of the Russian Federation and Dmitri Shugayev, Deputy Director General of the Russian Technologies State Corporation.

Russia brought to Eurosatory the modernised T-90s MBT, BMPT tank support combat vehicle, Kornet-EM anti-tank missile system based on the Tigr armoured car, and Ural 6X6 hardened truck.

"We have been participating in the Eurosatory exhibitions since 1996, but this year's show has been special. Russia has never brought such a number of full-scale new items. They are from the latest developments that clearly demonstrate a huge potential of the Russian defence industry," said Igor Sevastyanov. **SP**



Navistar's Special Operations Tactical Vehicle makes international debut

Navistar Defense showcased its Special Operations Tactical Vehicle for the first time outside of the United

States at Eurosatory. The vehicle was developed to be an overt tactical vehicle that can be transportable in a CH-47 helicopter.

The Special Operations Tactical Vehicle chassis, suspension, powertrain and armoured occupant safety cell were engineered specifically to carry large payloads across rough landscapes and the scalable armour packages meet multiple threat levels. The vehicle can be integrated with a full government furnished command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) suite.

"We always strive to leverage our existing platforms to provide affordable and integrated solutions for our Allied Armed Forces," said Archie Massicotte, president, Navistar Defense. "The Special Operations Tactical Vehicle adds to our portfolio and provides high vehicle mobility to aid the mission needs of special operators."

The company also displayed the Saratoga and the MXT Armoured Personnel Carrier for special operations. The company launched the Saratoga in October 2011 to meet a gap in the light tactical vehicle market and the MXT is a proven platform currently in operation in Afghanistan. **SP**

Elbit Systems launches Elsat 2100

Elbit Systems launched Elsat 2100, a new satellite-on-the-move (SOTM) terminal. It is an 80 cm diameter low profile rugged bi-directional military satellite communications (MILSATCOM) vehicular SOTM antenna with outstanding characteristics.

Based on a new generation planar antenna technology developed for high performance and efficiency of low profile SOTM antennas, the Elsat 2100 delivers a six-fold performance improvement over the Elsat 2000, enabling 50 mbps downlink and 10 mbps uplink speeds.

The system features an advanced triple tracking mechanism based on a combination of Gyro, GPS and RSSI (receive signal strength indication), with a 110 degrees elevation capability for superior SOTM tracking and relocking.

The system features a Tx-Gain of 33.4 dbi, and Rx-Gain of 33 dbi, and a G/T of 12 dB/k (including Radom loss), with an ideal radiation pattern of -14 dbw/4 kHz. It also delivers outstanding SOTM performance as well as superior efficiency resulting in substantial bandwidth cost efficiency.

Designed for demanding tactical vehic-

ular military SATCOM on-the-move applications, the system is designed for Ku and extended Ku band operations.

XACT-NV32 - new night vision micro monocular

Elbit Systems also launched a new night vision micro monocular, XACT-NV32. This highly advanced, compact and lightweight (180 grams) micro monocular features a ruggedised body (fully complying with environmental MILSTD810), along with a unique optical and mechanical design, which includes an advanced I2 tube, as well as an auto shut-off technology. Head, helmet or weapon-mounted, the monocular's unique design prevents shifting of line of sight and flexibility of use due to a flip-up head/helmet adapter. When used in dual configuration as a binocular, the system provides a lightweight solution for depth perception in driving, complex terrain navigation etc. XACT-NV32 provides high image quality even in complete dark scenarios and features automatic and manual gain control for better visibility under any light condition. **SP**

General Dynamics European Land Systems presents the new EAGLE 6x6

General Dynamics European Land Systems presented for the first time the newest member of the EAGLE family of vehicles, the EAGLE 6x6 light tactical vehicle.

To meet the growing demand for higher levels of survivability, mobility and capacity in more-affordable light tactical vehicles, General Dynamics European Land Systems combined the proven DURO 6x6 chassis, driveline and suspension with the EAGLE 4x4 hull to create the EAGLE 6x6 light tactical vehicle.

The uniquely designed axle and mechanical roll-stabiliser system provides superior driving safety at high speeds and superior traction for negotiating difficult off-road conditions. The General Dynamics-designed transfer case, differentials and wheel ends ensure constant drive to all wheels under all conditions. The optional rear-axle steering further increases the tactical mobility of the EAGLE 6x6.

The EAGLE 4x4 and the EAGLE 6x6 provide a true family of vehicles with the flexibility to accommodate two to 11 soldiers in roles including reconnaissance, command and control, APC, ambulance, NBC detection, mortar carrier, recovery and logistics transport over the 8.5 tonnes to 15 tonnes gross vehicle weight range. The new EAGLE 6x6 offers payloads of up to 6,000 kg and protected volumes of up to 16 cubic metres. **SP**



Rafael's advanced land defence systems

The Israeli pavilion seemed to garner all the attention as they were loud and clear on what they were offering to the world market. Rafael, IAI and Elbit, the three big Israeli players, made strong statements on the latest products and solutions they had come up with. Rafael showcased advanced land defence systems – complete air and missile defence systems; communication and exploitation systems; and survivability solutions.

The Marketing Communications Manager Ravit Rudoy said the response at

Eurosatory was encouraging and there were many Indian delegations which visited the stall, interested in MIC4AD (modular, integrated C4I air and missile defence system); Trophy family (active protection system for heavy, medium and light vehicles); Mini Spike (man portable, multi-purpose miniature electro-optical guided missile system) and Samson family (remote controlled weapon stations). **SP**

PHOTOGRAPHUS: Eurosatory 2012, Rafael



Samson RCW



Beretta flexes its military and law enforcement prowess

Beretta Holding at Eurosatory presented Beretta Defense Technologies, the alliance of the four market leading companies owned by Beretta Holding and such as Beretta, Benelli, Sako and Steiner. Thanks to this alliance the four companies will combine technical prowess to form a unique source contact, supplying the operational needs of military and law enforcement personnel worldwide.

Thanks to an eminent expertise in military and law enforcement fields, Beretta Defense Technologies provides modern soldiers and law enforcement officers with the vital and specific tools required to complete the tasks assigned to them by providing a unique combination of services, weaponry and equipment.

Ugo Gussalli Beretta, President of Beretta Holding, said: "We are very proud to present this new project. Now, through the development of Beretta Defense Technologies we play not only as a single product supplier but as a complete solution



provider. As a matter of fact, we are able to be a one stop reference point, comprising of skilled experts in their fields, in order to match operational needs with state-of-the-art technology and armaments available, leading to a long-term partnership with our partners. Thanks to our skills, our integrated expertise and a continuous technological improvement we have shown to be able to give the best tailor-made and versatile solutions to different requirements". **SP**

Navantia's integrated surveillance and reconnaissance system

The Spanish company which is strong in offerings for navies has some products and solutions for land, through Navantia Faba, which is a state-of-the-art centre specialised in the integration of high-tech complex systems. Navantia Faba has acquired the know-how as a combat system integrator with many types of ships, patrol vessels, air-defence frigates, submarines, aircraft carrier etc.

It is offering now land surveillance and reconnaissance system called SERT showcased at Eurosatory.

Giving details of the system, Jose Alfonso Cardona Peral, Programme Manager, said that the company, which had a rich knowledge-base, had come up with this offshoot in land systems. "We are offering this to the Spanish Army as well as marketing it in Latin America where Spanish is the language and easy for us to work with. But, we are now looking at other markets too, including India."

The SERT, he said, comprised electro-optical (EO) battlefield surveillance and target location system; integrated defence

(self-protection) system; navigation and night driving aiding system and battle-field management system. The integrated system, he claimed, gave the soldier solid information which could be used decisively.

The electro-optical battlefield surveillance and target location system allows day and night battlefield surveillance and target detection. It is based on an EO system with latest generation passive (IR, visible) and active (laser) sensors. It has both on-vehicle and dismounted versions.

The integrated defence system provides the vehicle with a self-protection system integrated with all other vehicle systems, avoiding the crew exposure to the vehicle outside. Modular allows the installation of small calibre guns: 7.62mm and 12.70mm.

The navigation and night driving aiding system is designed to provide all-weather vehicle operation. It is based on a high resolution uncooled thermal imager integrated with all other in-vehicle systems for safe driving in complete darkness.

The battlefield management system provides mission specific tools (artillery, cavalry, intelligence) and is completely integrated with all other SERT systems as well as with the unit command, control and communication system, avoiding unnecessary duplicities and providing safe redundancies. **SP**

Underwater weapon systems

The modern torpedo is a powerful weapon which can destroy targets at 40 kms with a speed of 50 knots and a destruction potential equivalent to 400-600 kg of TNT.

[By Lt General (Retd) Naresh Chand]

Underwater weapons are designed to attack submarines or surface vessels. They can be of three types i.e. guided weapons, non-guided weapons and rocket and mortar weapons. Guided weapon is a torpedo, which is very powerful and most commonly used thus the focus here will be on the mighty torpedo. Non-guided weapons are mines and depth charges. Rockets and mortar weapons, such as anti-submarine grenades and anti-submarine rockets have the advantage of rapid response time since they travel to the target through air and also have the advantage of being less susceptible to decoys etc. A hybrid of this category is the rocket launched torpedo, which is carried to the proximity of the target via a rocket.

Torpedo

The modern torpedo is a powerful weapon which can destroy targets at 40 kms with a speed of 50 knots and are of two types, the heavyweight, launched from submarines, and the lightweight which is launched from ships, dropped from aircraft (both fixed wing and helicopters) or delivered by a rocket. They can be straight-running, wire-guided and fire and forget. A modern torpedo could have a speed of 50 knots, range of 40 km, should have a combined acoustic and wake homing with an acquisition range of about 5 km and a destruction potential equivalent to 400-600 kg of TNT. The normal size is 6.5 metres in length with a standard diameter of 533mm or 650mm but will depend on the size of the launch tube. Salient sub-systems are:

Propulsion. Torpedo propulsion is of two types i.e. electrical propulsion powered by batteries and thermal engine powered by combustible fuel.

Propulsion motors. With the advent of Permanent Magnetic Motors, greater power to weight ratio has been achieved and brushless motors allow a continuously variable speed control. Faster torpedoes need more powerful motors.

Homing Head

Homing. The terminal guidance of the torpedo is provided by the homing system, which comprises of homing head and the



Mk 48 CBASS Mod 7
heavyweight torpedo



MU90 lightweight torpedo

signal-processing unit. Homing can be acoustic or wake. Homing head of most modern torpedoes have acoustic sensors which can be passive or active. In the passive mode the sensor receives the noise created by the target, whereas in the active mode the torpedo transmits acoustic energy and it receives the echoes reflected from the target. In wake homing a torpedo detects and homes on to bubbles that are created in

the wake of the target and is effective only against surface ships.

Guidance. Torpedoes can be controlled by a submarine by means of a wire which provides a two-way communication between the submarine and torpedo. The wire used in modern torpedoes has a length of about 50-60 km, high data handling capacity and is made of fibre optic cable.

Warhead design. The desired explosive



BlackShark
heavyweight torpedo

power of a heavy weight torpedo is of the order of about 400 kg of TNT and HE required for this purpose is about 250-300 kg. The use of shaped charge delivers the same punch with reduced weight of HE. Some modern torpedoes have an explosive weight of just 45 kg thus giving it high range and speed of the order of 65 kms and 60 knots respectively. A single modern heavy weight torpedo is sufficient to sink a ship of any size by exploding a few metres beneath the target hull almost at its centre. Some examples are:

US

Raytheon's Mk-48 is a huge 19 feet torpedo with advanced homing, wire guidance capabilities and 300 kg warhead. Its original manufacturer is Hughes Aircraft which was later on acquired by Raytheon. It is designed to kill both fast, deep-diving nuclear submarines and high performance surface ships, and is carried by US Navy and Royal Australian Navy submarines. The Mk 48 Advance Capability (ADCAP) has improved target acquisition range,

reduced vulnerability to enemy counter-measures, reduced shipboard constraints and enhanced effectiveness against surface ships. These torpedoes can operate with or without wire guidance, and can use active and/or passive homing, conducting multiple re-attacks if they miss the target. The Common Broadband Advanced Sonar System (CBASS) kit is for the Mk48 which gives the retrofitted torpedoes the ability to transmit and receive over a wide frequency band. In 2011, however, Lockheed Martin stepped into the picture with a key contract win for CBASS kits.

Raytheon's Mk54. Light weight torpedo. It is a light weight torpedo designed for operating both in deep waters and littoral environment. Mk54 can be deployed on surface ships, helicopters or fixed wing aircraft to track, classify and attack underwater targets. It is integrated onboard the MH-60R maritime helicopter and is its primary weapon for ASW capability. Recently it has been successfully launched by the US Navy from the P-8A Poseidon aircraft, which Indian Navy is also acquiring.

Europe

Whitehead Alenia Sistemi Subacquei(WASS)-Italy

BlackShark. This is a heavyweight torpedo developed for Scorpene submarines. It features an electric-propulsion system, 50 knots top speed, a range of 50 km, active/passive acoustic homing head, multi-target capability and an counter-countermeasures

Undersea warfare market

The undersea warfare market structure is changing. The high-cost sector of the market is expanding as new unmanned vehicles, torpedoes and fire control systems are developed to replace older-generation equipment. Meanwhile, production of low-cost items like sonobuoys is declining as the need to chase submarine contracts fades.


The Pentagon's budget request for unmanned maritime systems (including unmanned surface) research, development, testing, procurement, operations and maintenance is approximately \$641 million for the 2011 to 2015 period.

With the end of the Cold War and diminished threat levels, the US Department of Defense (DoD) reduced its torpedo inventory requirements. Based on current threat projections, the department does not expect to require full production again for approximately 25 years when replacement torpedoes will be

needed. Torpedo production capability is waning accordingly, and each of the prime manufacturers currently has excess torpedo production capacity.

Worldwide Torpedo Production

Torpedoes are purchased by almost all navies to support their military needs. In 1994, the value of worldwide torpedo production totalled \$655 million, and it increased by almost 70 per cent in 2002. The increasing number of countries with diesel electric submarines and littoral warfare surface craft is increasing torpedo demand. Additionally, the need to upgrade older, primarily deepwater, torpedoes to improve their performance in shallow water increases demand in this market.

Current worldwide torpedo producers of both heavyweight and lightweight torpedoes include the United States, the United Kingdom, France, Germany, Italy, Sweden, the former Soviet Union, Japan, and China. 



SeaHake torpedo

US Undersea Warfare programme hit by funds

The US National Defense Industrial Association (NDIA) in its 2011 report on the Undersea Warfare (USW) Industrial base has said the USW programmes in the US were affected by 'financial constraints' among other reasons.

The report submitted by NDIA President and CEO, Lt General (Retd) Lawrence P. Farrell Jr., said that "the current assessment of the USW industrial base is consistent with previous NDIA UWD biennial reports, i.e., we continue over a decade long struggle to sustain an industry critical mass in the face of Navy budget challenges. Since the Budget Control Act of 2011 brings new uncertainty to every facet of how the government will invest and spend its resources, and nothing is off the table, we cannot predict, yet expect USW funding to be negatively impacted.

"This assessment drives our recommendations as we enter the next decade in a fiscally constrained environment: a) Sustain the force structure procurements, e.g., LCS, DDG-51, P-8, MH-60R/S, and SSN production to preserve the vital critical mass for major platforms and

b) ensure funding of the Ohio SSBN replacement programme as a vital element of national security and the nuclear shipbuilding capability."

The November 2011 NDIA assessment indicated the trends:

Force structure investments and production of key USW platforms has slowed the atrophy in major capital facilities, e.g., the Littoral Combat Ship (LCS), DDG-51 Destroyer, P-8 Poseidon aircraft, MH-60R Seahawk helicopter, and Virginia class submarine, and Ohio SSBN replacement programmes are as significant to the USW industrial base as they are to force structure.

Investments in modernisation of existing platforms, weapons, and sensors is at a minimally sustaining level which strains the ability for industry to predict favourable or stable returns.

Industry consolidation is a natural outcome of constrained or declining resources; this trend is expected to continue having a negative impact on both the physical and intellectual capital, i.e., little or no bench strength.

Few, if any, businesses can survive with a US USW only focus; this dilutes both critical mass and targeted investments. As a consequence, the number of senior industry executives who spent their careers in USW is also declining. **SP**

system. It is in service with the French, Italian and the Chilean Navy. An improved version called F21 is being developed by WASS along with DCNS and is likely to be in service by 2015.

Flash Black. This was unveiled during the Defexpo 2012 held at Delhi. As per the WASS, Flash Black is the world's first next generation lightweight torpedo. The torpedo which is yet to be developed has finished the design stage and will take 26 months from the start of the development. WASS is planning to talk to the DRDO for possible collaboration. The design of the Flash Black is highly versatile with the capability to be launched from multiple platforms (underwater and AUV,

UUV and USV), against any target and in any environment, including littoral waters and extremely shallow bottom depths and in the presence of the most sophisticated countermeasures.

Atlas Elektronik - Germany

SeaHake DM2 A4. The SeaHake DM2 A4 is currently used by 18 navies on over 150 submarines. At a test-firing in March 2012, the heavyweight torpedo SeaHake® mod4 ER (Extended Range) has achieved a range of over 140 kilometres. SeaHake® mod4 is the latest advancement of the DM 2 A4 heavyweight torpedo, which is in service with the German Navy as well as the navies of Turkey, Pakistan and Spain.

EUROTORP

EUROTORP is a consortium established in 1993 with the purpose of creating a world's leadership in the field of light weight torpedo to include DCNS, WASS and Thales. Their MU90/IMPACT advanced lightweight torpedo (LWT) is claimed to be a leader of the third generation of LWTs. Its data is classified but it is understood that its linear variable speed is between 29-50 knots and has a range of 10 kms at maximum speed.

Thales

Thales has designed, developed and produced acoustic heads for the Eurotorp MU90 as part of the EURUTORP consortium due to its expertise in underwater acoustic and non-acoustic sensors.

Indian perspective

It is understood that India had made a request to the US Government last year to buy 32 MK-54 all-up-round lightweight torpedoes and allied equipment for P-8I maritime aircraft which the Indian Navy is procuring. The same torpedo is being integrated on the US Navy's P8 systems. Boeing will be the lead integrator M-54 is Raytheon's design. Lockheed Martin offers the GPS guided, High Altitude Anti-Submarine Warfare Concept System (HAAWC/Longshot) which enables launch of weapons from high altitudes and long stand-off distances. India may like to acquire this system depending upon its operational requirement.

DRDO. DRDO is developing a light weight torpedo called TAL and a heavy weight torpedo called Varunastra. **SP**



PHOTOGRAPH: WASS

BAE Systems awarded Norwegian armoured vehicle contract

BAE Systems will upgrade and build CV90 armoured combat vehicles for the Norwegian Army under a contract worth approximately £500 million (\$750 million) awarded by the Norwegian Government.

The company will upgrade Norway's existing 103-vehicle CV9030 fleet, delivered from the mid-1990s, and build new vehicle chassis to deliver 144 CV90s in different configurations, including a variant equipped with a sensor suite for improved surveillance capability.

"We have had a long and excellent experience with CV90, and have built up considerable expertise about the system, which we have chosen to further develop together with our supplier in Sweden," said Petter Jansen, Managing Director at the Norwegian Defence Logistics Organisation. "This is one of the largest army investments and an important part of the Norwegian Army modernisation plan."

The project will deliver 74 infantry fighting, 21 reconnaissance, 15 command, 16 engineering, 16 multi-role and two driver training vehicles. The multi-role vehicles can fulfill different functions, including mortar carrier and logistics roles.

"Today's order illustrates the trust there is in Norway for the CV90



family of vehicles," said Tommy Gustafsson-Rask, President of BAE Systems Hagglunds. "We continue to invest in the CV90 system and develop the vehicle to keep it at the forefront of technology and in particular, to incorporate improvements in protection and digitisation so that it remains the world's most advanced vehicle of its kind." **SP**

Thales wins French radio deal



or tactical and theatre digital communications), valued at 1.06 billion euros.

This programme aims to equip French forces with a new generation of radios to replace existing equipment, notably the PR4G family, with next-generation equipment providing increased performance in terms of speed, security and interoperability.

CONTACT is a very high-technology programme with a strong export potential that will be able to capitalise on the success of the PR4G radios in many countries. Its development and production will call on the skills of more than 2,000 people in France.

The first stage of the programme calls for equipping two combined arms amphibious brigades, as well as the naval vessels that will deploy and support them. In total, this will require 2,400 vehicle radios and 2,000 portable radios. Delivery of the first production equipment will take place from 2018.

The second phase of the programme will focus on equipping combat, intelligence and transport aircraft, giving them a new extended capability to communicate with ground forces. The third phase will completely cover air force requirements, and also ensure the equipment of ships for their communication needs within naval task forces.

Contact uses software-defined radio technology and builds, especially as far as interoperability is concerned, on the work of the European ESSOR programme (European Secure Software Defined Radio). **SP**

Israeli armoured brigade equipped with advanced defence system

The entire Iron Trails Brigade, a tank brigade within the Israeli Defence Force's Armoured Corps, was recently equipped with the Trophy active defence system. The new defence system identifies and eliminates anti-tank missiles before they can reach the tanks on which it is installed.

In the past month, the Iron Trails Brigade, which boasts a number of advanced Merkava Mark IV tanks, completed a significant exercise in conjunction with engineering forces. This drill involved cooperating with other units and focused on the advanced platforms used by the unit.

"The Iron Trails Brigade's exercises are difficult, reflecting our belief that we must push the commanders to the limit of their abilities and those of the platforms," said Colonel Einav Shalev, commander of the unit. **SP**



France's defence procurement agency, the Direction Générale de l'Armement (DGA) has given Thales the first stage of the programme CONTACT (Communications Numériques TACTiques et de Theatre,



Textron gets 71 more mobile strike force vehicles for Afghanistan National Army

Textron Marine & Land Systems (TM&LS) recently announced that it received a third option award from the US Army Contracting Command, Warren, Michigan, for 71 mobile strike force vehicles (MSFV) for the Afghanistan National Army (ANA). These vehicles were added to the current contract and have a not-to-exceed value of \$79,182,680.

Work will be performed at Textron Marine & Land Systems' facilities in the New Orleans area, with vehicle deliveries scheduled through October 2013. Three variants are being produced: MSFV with enclosed turret; MSFV with objective gunner protection kit; and an MSFV ambulance.

MSFV began arriving into Afghanistan in February. Soon after, comprehensive operator new equipment training of a first ANA battalion, called a Kandak, commenced. The first Kandak has completed this phase of training and has begun mounted and dismounted tactics training with NATO forces. With the training and sign over of vehicles to the ANA, the programme has achieved initial operational capability (IOC) on schedule.

"In less than two years our dedicated employees, together with the US Army's Product Manager Armored Security Vehicles, have developed, tested, built and started fielding an essential capability for the Afghanistan National Army's security mission," explained Tom Walmsley, TM&LS Senior Vice President and General Manager. "This level of cooperation has enabled our team to quickly and efficiently produce more than 200 MSFVs to date, field the first ANA Kandak, and prepare the next Kandak to train on its fleet of vehicles."

Derived from the combat-proven M1117 Armored Security Vehicle (ASV), all MSFVs are configured with enhanced survivability (ES) capability, which improves blast protection to mine-resistant, ambush-protected (MRAP) levels. The ES-equipped vehicles continue to possess the ASV's original, all-important V-shaped hull design, in addition to innovative protection design features that enable them to meet MRAP blast protection standards.

TM&LS has delivered nearly 3,900 M1117 ASVs and related configurations to the US Army and other military forces including Afghanistan, Iraq, Colombia and Bulgaria. **SP**



FREMM frigate Aquitaine launches first torpedo

Teams from DCNS, the French Navy and defence procurement agency DGA have recently completed a new test campaign aboard first-of-class FREMM multi-mission frigate Aquitaine, the last and most important being the first ever torpedo launch test from a FREMM frigate. After demonstrating FREMM frigate Aquitaine compatibility with a 10-tonne Caïman helicopter (the French version of the Eurocopter/EADS NH90) in March, DCNS specialists spent several weeks putting the vessel combat system, which includes the torpedo launch control system, through its paces.

After validating the torpedo tube configuration and performing dry-run tests, the DCNS team conducted the torpedo launch test on June 22. Using an exercise torpedo equipped with sensors and data loggers instead of a warhead, the launch was performed under otherwise operational conditions. The results validated the torpedo tube configuration compliance with the relevant specifications. Shipboard observation by DCNS specialists and the data gathered by the torpedo onboard sensors confirmed all key parameters including exit speed, angle of impact with the water, and torpedo behaviour and trajectory.

First-of-class FREMM multi-mission frigate Aquitaine is designed to face all types of threats. It is equipped with four launch tubes and will carry up to 19 MU90 torpedoes. FREMM multi-mission frigates can respond to all types of threats with unparalleled flexibility and availability. The first export sale, to the Royal Moroccan Navy, demonstrates that they also meet the needs and expectations of international client navies. **SP**



New Foxhound displayed in UK

The British Army's new Foxhound vehicle has been unveiled for the first time since its arrival in Afghanistan. Hundreds of people involved in equipment and

support for the UK's Land Forces have flocked to the Defence Vehicle Dynamics (DVD) Exhibition at Millbrook in Bedfordshire.

The MoD has committed £270 million for 300 Foxhound vehicles with General Dynamics Land Systems - Force Protection Europe, which will sustain around 750 UK jobs.

Foxhound's V-shaped hull helps it withstand explosions and provides unprecedented levels of blast protection for its size and weight. It is light and agile and designed to move freely around the narrow alleyways, tracks, bridges and culverts of Afghanistan.

The second tranche of this British-designed-and-built vehicle is part of a £5.5 billion investment in the Army's core armoured vehicle programme over the next 10 years. A total of £160 billion will be spent on equipment and equipment support over the next decade. **SP**

Eurocopter's revolutionary X3 helicopter begins US tour

Eurocopter has commenced the US tour of its X3 high-speed hybrid helicopter, which will demonstrate the unique operational capabilities of this advanced transportation system during a month of visits to military facilities and hub locations for civil helicopter operators.

The tour was initiated with a debut X3 flight presentation at the Grand Prairie, Texas headquarters of Eurocopter's US subsidiary – American Eurocopter.

“We have a very ambitious innovation strategy leading to the first flight of a new helicopter, a new version or a new technology demonstrator every year. Innovation is not just a buzzword, it's a way of life at Eurocopter,” explained President & CEO Lutz Bertling. “With the ingenious design and unparalleled technology of our X3 demonstrator, we are well positioned to bring this type of helicopter to the market in the next 10 years.” **SP**



Kaman confirms negotiations with New Zealand on Seasprite helicopters

Kaman Corporation confirmed that the US Department of State has granted authorisation that would permit the company to negotiate a possible sale of SH-2G(I) Super Seasprite Helicopters to New Zealand. The potential sale would include 11 SH-2G(I) helicopters, a full motion flight simulator, training aids, spares inventory, publications and the introduction into service and through life support of the aircraft.

The Kaman SH-2G(I) Super Seasprite is the latest version of the multi-mission maritime helicopter and would potentially replace the country's existing fleet of SH-2G's. These helicopters would significantly enhance New Zealand's vertical lift capabilities with exceptional performance and low operating costs. Kaman continues to support the Ministry's objective of extending the naval helicopter capability through 2025. **SP**

Elbit Systems to upgrade Korea's C-130 transport aircraft

Elbit Systems announced that it was awarded a contract valued at \$62 million to upgrade the Korean Air Force C-130 transport aircraft. Under the contract, the C-130 aircraft will be installed with various types of advanced electronic systems. In addition, Elbit Systems will convert the existing analog cockpit to a “Glass-Cockpit” using Elbit Systems' cutting edge digital flight displays.

The project, to be performed over four years, will be executed in cooperation with Korea Aerospace Industries Ltd. (KAI), which is the leading local aircraft manufacturer in Korea.

Yoram Shmueli, Co-General Manager of Elbit Systems' Aerospace Division, commented: “We are very proud of this award. It marks an additional milestone in the projects Elbit Systems has performed for the Korean Air Force in collaboration with Korea Aerospace Industries. This new contract is expected to further enhance capabilities of the Korean Air Force.” **SP**



Boeing delivers 100th modified Chinook to US Army



Boeing recently delivered the 100th modified Chinook to the US Army.

“The Boeing Millville team is proud to have delivered 100 modified Chinooks to the Army on time, using efficient, cost-saving processes,” said Peri Widener, Boeing Vice President of Rotorcraft Support. “The modification work on new F-model Chinooks gives soldiers in the field the most advanced equipment possible without taking aircraft out of service at the unit or in theatre.” **SP**

Northrop Grumman to supply airborne fire control radars to Thailand, Iraq and Oman for F-16s



Northrop Grumman Corporation has received an \$87.8 million foreign military sales (FMS) contract to provide the APG-68(V)9 airborne fire control radar to Thailand, Iraq and Oman for use on F-16 fighter aircraft.

The company will deliver six radar systems to the Royal Thai Air Force, 22 radar systems to the Iraqi Air Force and 15 radar systems to the Royal Air Force of Oman, for a total of 43 systems. Deliveries are expected to be completed by March 2015. The FMS contract is managed by the Aeronautical Systems Center, Wright-Patterson Air Force Base, Ohio.

"Selection of the APG-68(V)9 Fire Control Radar by Thailand, Oman and Iraq reaffirms its value and baseline position for all new F-16 production and F-16 avionics upgrades," said Tim Winter, Northrop Grumman's Vice President for Global Sys-

tems Solutions. "The APG-68(V)9 radar's operational performance, affordable acquisition cost, low sustainment cost and immediate availability has led 12 nations to procure almost 750 systems so far." **SP**

Dutch plan to sell F-16s

Romania is interested in buying 15 surplus F-16's from the Dutch Air Force. A number of other countries have also shown interest in Dutch military vehicles and ordnance.

The Defence Ministry confirmed reports that it is looking to sell equipment in order to raise funds. It is not clear how much money Netherlands will be able to raise with the sale of the fighter jets. **SP**

Boeing delivers UAE sixth C-17

Boeing delivered the sixth United Arab Emirates (UAE) C-17 Globemaster III to the UAE Air Force and Air Defence earlier this month at the company's final assembly facility in Long Beach.

The delivery completes an agreement announced on January 6, 2010, for six advanced airlifters to modernise the UAE's transport capabilities. Boeing delivered four C-17s to the UAE in 2011 and a fifth aircraft in May.

"After every delivery, UAE C-17s fly into action, conducting humanitarian airlift and disaster-response missions and life-saving aeromedical evacuation," said Bob Ciesla, Boeing Vice President, Airlift, and C-17 programme manager. "We're proud to deliver another C-17 that strengthens the UAE Air Force and Air Defence's range and ability to perform critical airlift missions around the globe." **SP**

First operational evaluation firing of ASMPA missile

The French Air Force has carried out the first operational evaluation of its new ASMPA supersonic nuclear stand-off missile placed on the centreline pylon of a Rafale fighter. France's strategic air force command successfully carried out the first operational evaluation launch of the integrated weapon system comprising a C-135 tanker, a Rafale strike aircraft, and the ASMPA nuclear stand-off missile according to a scenario representative of a real mission.

The crew of the fighter, belonging to the 1/91 "Gascogne" squadron, took off from Saint-Dizier air base. During five hours, the mission brought together all the important phases of flight: high altitude cruise, low altitude penetration, terrain following, in-flight refuelling from tanker aircraft...The C-135 tanker, belonging to the 2/91 "Bretagne" in-flight refueling squadron, provided the range extension needed for a strategic mission. After five hours of flight, the crew launched the ASMPA, which was not fitted with a nuclear warhead. **SP**



Embraer delivers final A-29 Super Tucano and F-5M aircraft to FAB

Embraer successfully performed the first flight of the A-1M prototype at its manufacturing plant in Gavião Peixoto, in out-state São Paulo, during a ceremony attended by the Aeronautics Commander, Air Force General Juniti Saito, and officers from the Brazilian Air Force (FAB) high command.

The aircraft's flight test campaign will soon begin. The A-1M programme provides for refurbishing and upgrading 43 FAB AMX subsonic fighters. Ten aircraft are already at the company's facilities and the first deliveries are planned for 2013.



The event also marked the delivery of the 99th, and last, A-29 Super Tucano light attack turboprop to the FAB, as well as the last two upgraded F-5M fighters from the first group. Via the

AL-X programme, the FAB became the launch customer for the Super Tucano, in December 2003. The aircraft is currently used for advanced pilot training and carries out important functions in the Amazon Surveillance System (SIVAM). The A-29 Super Tucano has been chosen by ten customers in Africa, the Americas and Asia-Pacific.

The F-5M programme covers the refurbishing and upgrading of 46 supersonic fighters. Each aircraft received new navigation systems, weaponry, computers, and multi-modal radar. **SP**

Northrop Grumman unveils US Navy's first MQ-4C BAMS unmanned aircraft

Northrop Grumman Corporation unveiled the first US Navy MQ-4C Triton broad area maritime surveillance unmanned aircraft system (BAMS UAS) recently.

"Northrop Grumman is proud to provide our US Navy customer with the MQ-4C Triton unmanned aircraft, a key element of the BAMS UAS programme, representing the future of naval aviation and a strategic element of the US Navy," said Duke Dufresne, Northrop Grumman Aerospace Systems sector Vice President and General Manager for Unmanned Systems. "The BAMS UAS programme will revolutionise persistent maritime intelligence, surveillance and reconnaissance. We are honoured to serve the US Navy and our nation's allies in the quest to build and maintain a strong and cooperative global maritime domain."

The Northrop Grumman BAMS UAS is a versatile maritime intelligence, surveillance and reconnaissance system to support a



variety of missions while operating independently or in direct collaboration with fleet assets. When operational, BAMS will play a key role in providing commanders with a persistent, reliable picture of surface threats, covering vast areas of open ocean and littoral regions as the unmanned segment of the Navy's Maritime Patrol Reconnaissance Force. **SP**

Surrogate UAV prepares for maiden flight in UK airspace



A Jetstream aircraft known as "The Flying Test Bed," which can fly as if it were a UAV (uninhabited air vehicle), is undergoing a series of flight trials in preparation for the first maiden flight of a surrogate UAV in UK shared airspace later this year.

The aircraft will fly using instrument flight rules under air traffic control. In preparation, trials taking place this month include the world's first use of autonomous, vision-based weather-avoidance routing and the first UK surrogate flight of a fully functional visual sense-and-avoid system which includes collision avoidance tests using a second aircraft. This trial will begin to demonstrate to regulators such as the Civil Air Authority and air traffic control service providers, the progress made towards achieving the safe use of UAVs in UK airspace.

The new technology is part of a suite of innovations being brought together for the

first time as a UK industry-led programme known as ASTRAEA (Autonomous Systems Technology Related Airborne Evaluation & Assessment); a UK industry-led consortium focusing on the technologies, systems, facilities, procedures and regulations that will allow autonomous vehicles to operate safely and routinely in civil airspace over the United Kingdom. **SP**

US Navy, Northrop Grumman complete X-47B flight testing

The first major phase of flight testing the X-47B unmanned combat air system (UCAS) demonstrator aircraft came to a successful conclusion on May 15 when Northrop Grumman Corporation and the US Navy wrapped up testing at Edwards Air Force Base, California.

The airworthiness test phase, which comprised 23 flights by two air vehicles, proved that the X-47B will perform properly at all speeds, weights and altitudes associated with the Navy's programme. The flights included tests of several aircraft manoeuvres required

in the carrier environment, helping to reduce risks associated with operating a tailless, unmanned aircraft from a Navy aircraft carrier.

The first X-47B was moved to Patuxent River in December 2011. It is currently undergoing electromagnetic interference testing, which is designed to demonstrate that the X-47B is compatible with the electromagnetic signal environment of an aircraft carrier.

In 2013, the UCAS-D programme plans to demonstrate the ability of the tailless, autonomous, low-observable relevant X-47B demonstrator to operate safely from a navy aircraft carrier, including launch, recovery, bolter and wave-off performance. Demonstration of autonomous aerial refueling by the X-47B is planned for 2014. The programme will also mature and demonstrate technologies required for future carrier-capable unmanned air system programmes. **SP**

First full company of Gray Eagle deployed

General Atomics Aeronautical Systems, announced the recent deployment of the first full company of Gray Eagle UAS, F/227.

"Gray Eagle will provide F/227 with 24/7 RSTA [reconnaissance, surveillance, and target acquisition], precision attack and communications relay capabilities," said Frank W. Pace, President, Aircraft Systems Group, GA-ASI. "This system fielding does not rely on a legacy Ground Control Station [GCS], showing our total commitment to the One System GCS/ Universal GCS combined with the Tactical Controlled Data Link [TCDL] architecture." **SP**





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Rebooting insurgencies

No matter government admissions, Maoists have affected 180 districts in 16 states (35 per cent population in 40 per cent area) and are establishing urban bases. Fudging below poverty line figures through unsustainable benchmarks can hardly help.

PHOTOGRAPH: Jugal R Purohit / thoughts.wordpress.com

With experience of insurgencies in Jammu & Kashmir, Northeast and the Maoist over past decades, it should be clear that the reasons for armed dissent are multifarious. Lacking/absent/corrupt governance, suppressed political aspirations, denied democratic/constitutional rights, justice denial, poverty, lack of development, religious radicalism and cross-border proxies are all part of the conundrum. What is the state of our insurgencies and what are we doing about it? Poverty alleviation is not the sole factor in dealing with insurgencies but it is a vital catalyst.

India's stand at Rio+20 to accord precedence to poverty alleviation over greening environment is laudable but do we look inwards? The poor in India has little time to bother about S&P warning of losing investment grade ratings, Fitch lowering our GDP estimates to 6.5 per cent with Indian bonds running risks of falling to junk status and Dr Manmohan Singh blaming Eurozone crisis simultaneous to RBI Governor pointing indigenous fault lines. What gravely affects him is the Planning Commission report of only 17 paise reaching ground of every rupee spent—something even Rajiv Gandhi declared as Prime Minister. Maintaining this rate of 17 per cent over a decade coupled with maintaining 134th position in the world in HDI (Human Development Index) over last decade are unparalleled proofs of mis-governance. At this rate, of the whopping ₹1,85,000 crore purportedly spent on poverty alleviation schemes during fiscal year 2011-12, only ₹31,450 crore reached ground level. Balance ₹1,50,550 crore went into what the Planning Commission terms as “administration”. View this matrix over last few years and talk to the man on the street. He bluntly tells you “*gorment in tarikon se agle election ke lie paise ikatha kar rahi hai*” (using these measures, government collects funds for next election) for which country in the world milks 83 per cent poverty alleviation funds before reaching the poor? Same is his comment about the unprecedented

hike in fuel prices while every neighbouring country provides it cheaper. Common man talks about the political game of buying votes and coercing support through CBI inquiries that cease or prolong unendingly once support is garnered. Dr Manmohan Singh may show concern about industrial output but if you talked to small scale industrialists two years back they told you they were shutting shop because cheap Chinese goods have flooded our markets. Yet we do little about correcting the imbalance in Sino-Indian bilateral trade 60:40 in China's favour.

Incidentally, Japan does not import rice to safeguard indigenous produce. HDI standings apart, the state of basic provisions and amenities in say Maoist

areas is deplorable – drinking water, electricity, roads, health, education you name it. Look at the area Bhadrakali encounter of last year. The so-called NH 220 is no more than a dirt track in places. River Amravati is crossed in a makeshift ferry that barely takes four persons and a scooter per trip.

The recent document Nonalignment 2.0 states, “The fundamental source of India's power in the world is going to be the power of its example. If India can maintain high growth rates, leverage that growth to enhance the capabilities of all its citizens, and maintain robust democratic traditions and institutions,

there are few limits to India's global role and influence.” We don't seem to be focusing on any of those “ifs”. Security forces can at best lower violence levels. Balance has to come through good governance. No matter government admissions, Maoists have affected 180 districts in 16 states (35 per cent population in 40 per cent area) and are establishing urban bases. Fudging below poverty line figures through unsustainable benchmarks can hardly help. Ignoring the population (centre of gravity in any insurgency) amounts to rebooting insurgencies. **SP**

The views expressed herein are the personal views of the author.



Mangled remains of a CRPF bullet-proof vehicle that was blasted by the Maoists in Bijapur, Chhattisgarh

Lockheed Martin has a new office

As a part of the ongoing process of resources' optimisation, Lockheed Martin has moved its India office to The Grand Plaza Hotel at Vasant Kunj. Henceforth, the new office address will read as:

Lockheed Martin India Pvt Ltd
The Grand Plaza, The Grand Hotel
Nelson Mandela Road, Vasant Kunj, Phase - II
New Delhi 110070

It will be important to have a quick look at the company's agenda for the country. As per Roger Rose, Chief Executive, Lockheed Martin, India not only has some important projects ongoing in hand but also has long-term plans for the country which quite interestingly include some highly diversified areas.

The company is apparently quite positive about its successful C-130J programme for the Indian Air Force which it claims has been "under budget" and delivered well "ahead of time".

While the supply of a total of six initial aircraft has been concluded, the US Government has offered a countersigned LoA in response to a request from the Ministry of Defence (MoD) for additional six aircraft. "There is a strong potential of additional orders from the Indian Air Force, if we continue to perform," adds Roger Rose.

The India Meteorological Department is seriously considering the WC-130J weather version of the aircraft, known in the US as the "Hurricane Hunter". Lockheed Martin is also considering offering C-130's maritime patrol aircraft (MPA) version to the Indian Navy and the Indian Coast Guard. An ongoing joint venture (JV) with Tata Advanced Systems in Hyderabad is involved in production of tail sections and centre wing box components for global customers.

The company is currently at the initial stages of discussions of potential provision of PAC-3 Air Defence System (operational in



IAF's first C-130J aircraft



various countries including USA) to the Indian Army. Javelin, the shoulder-fired weapon system jointly produced by Raytheon and Lockheed Martin is another potential which is being pursued to meet the requirements floated by the Indian Army.

A few other major programmes such as Boeing's Apache for Indian Air Force, MH-60 R/S helicopter (with Sikorsky) for the Indian Navy, laser-guided bombs for the Indian Air Force, and the emergency high frequency antenna on Scorpene submarines are being actively worked upon by Lockheed Martin.

The world's largest defence contractor's Corporate Engineering & Technology group is active on highly diversified areas such as the multi-objective ocean thermal energy conversion (MOOTEC) project with the National Institute of Ocean Technology (NIOT) in Chennai.

It is also pursuing a few unmanned aerial vehicle (UAV) programmes with several different organisations such as Delhi Technical University and a LNG-powered C-130J initiative with Aeronautical Development Agency and Tata.

Even though the company has been eliminated from the big ticket MMRCA programme, it continues to expand its disciplined programme performance on the C-130J programme and maintains full respect towards the steps taken by the Ministry of Defence to modernise the Indian military. **SP**

Boeing and Embraer join hands for KC-390

The Boeing Company and Embraer recently announced an agreement to collaborate on the KC-390 aircraft programme. Under this agreement, Boeing and Embraer will share some specific technical knowledge and evaluate markets where they may join their sales efforts for medium-lift military transport opportunities.

"Boeing has extensive experience in military transport and air refuelling aircraft, as well as deep knowledge of potential markets for the KC-390, especially those which were not considered in our original marketing plan," said Luiz Carlos Aguiar, President and CEO of Embraer Defesa e Segurança. "This agreement will strengthen the KC-390's prominent position in the global military transport market."

The KC-390 collaboration is part of a broader agreement that Boeing and Embraer signed in April. The companies previously announced that they are exploring ways to cooperate in commercial

airplane efficiency and safety, research and technology, and sustainable aviation biofuels. Boeing and Embraer will conduct a joint market assessment for the medium-lift military transport market and analyze business collaboration models. The market assessment includes potential customers that had not been considered in the initial market prospects for the KC-390.

"Embraer is a leading global innovator and we both understand the value of working in partnership to provide high-quality, affordable customer solutions," said Dennis Muilenburg, president and CEO of Boeing Defense, Space & Security. "This collaboration matches Boeing's proven excellence in military transport with Embraer's KC-390 accomplishments to further advance this highly capable and efficient medium-lift aircraft."

The KC-390 is a Brazilian Air Force project for which Embraer signed the development contract in April 2009. It is the biggest aircraft to be manufactured by the Brazilian aerospace industry and will set new standards in the medium-lift market in terms of performance, cargo capacity, flexibility, and life cycle costs. **SP**

US Army Research Lab improves Apache performance

The US Army Research Laboratory (ARL) helped figure out 20 years ago a revolutionary way to increase transmission power in the Apache helicopter without increasing the transmission's size or weight. Split-torque face gear technology is now inside the Improved Drive System of the new Apache Block III helicopter that began delivery in October 2011.

With split-torque face gear technology, helicopters can now have more power without becoming heavier or bigger, said Lt Colonel David "Blake" Stringer, Ph.D., who is the Chief, Vehicle Technology Directorate Field Element Office in Cleveland. With increased power density, the helicopter's drive system now has advanced from a horsepower of 2,828 to 3,400, with growth potential, and the helicopter can fly longer, at higher altitudes carrying almost 200 pounds more weapons with a fuel tank—thanks to, essentially, basic scientific research begun by ARL decades ago.

The current Army objective is to field 690 AH-64D Apache Block III helicopters over the next 15 to 20 years. The initial production phase calls for 74 transmissions plus initial spares.

"Face gear technology is really unique because it allows you to send a lot more power through the same geometric footprint than you could normally do with any kind of conventional or other gear configuration," he said. "The biggest benefit when we started the programme was weight reduction. The initial projections from the project were 40 per cent weight reduction compared to the current baseline Apache transmission."



An AH-64D Apache Longbow Block III attack helicopter is mounted to the US Army Research Lab's Rotorcraft Survivability and Assessment Facility's tilt-table for later live-fire and other tests and evaluations

Face gears are a specific type of intersecting-shaft gears that have been traditionally used in positioning mechanisms such as clocks, but the army found an application to use them in high power transfer applications. Think of gears as a circular disc, Stringer suggested. "The disc consists of the outer circular edge and two 'faces.' In spur or helical gears, the teeth are on the outer edge of the gear disc. In bevel gears, the teeth are set at some angle between the outer edge and the face. With face gears, the teeth are cut on the 'face' of the gear disc, or perpendicular to the edge of the disc."

The tests that the Block III and the PM have had with the face gears has been incredibly successful, a lot more successful I think than they had anticipated and so we'll just keep going and see how it evolves and if it's as successful on Block III as it continues through the acquisition process, it will probably proliferate through most of the helicopter fleet eventually.

Transmission failure is the second most dangerous in-flight emergency after fires, Stringer said, which is part of the reason that the US Army began an effort in 1988 to improve drive system technology. They focused most of their efforts on reducing aircraft weight and noise. He said the Army also undertook a project to find a way to keep the airframe itself in service much longer, and to develop technology for a future attack helicopter.

Other important contributors included Boeing, Northstar, the Army's Aviation Applied Technology Directorate, the University of Illinois, NASA, and DARPA. **SP**

iXBlue to be more active in India

French-based company iXBlue claims that its inertial navigation system (INS) has the latest and best technology which surpasses the INS programmes offered by some other global players. The company which already has a presence in India is now planning to expand its footprints in the country and is looking forward to larger cooperation with the Indian defence forces.

The iXBlue group provides a range of fine, high technology equipment, systems and turnkey solutions in the areas of navigation and surveillance, underwater positioning and communication, seabed imaging and surveying.

Besides the INS, iXBlue inertial products include gyrocompasses, attitude and heading reference systems (AHRS), inertial measurement units (IMU), all used in a wide variety of applications. Its range of inertial products is based upon iXSea's fibre optic gyroscope (FOG) technology. The company stresses that it provides its customers the low-



est life cycle cost in the market. iXBlue's other business areas include acoustic products, integrated solutions, marine works, motions systems, sea operations, sonar system, etc. **SP**



Australian PM ambushed in restaurant

Australian Prime Minister Julia Gillard was rescued by security as aborigines ambushed her at a restaurant in Canberra recently. The riot police formed a shield around Gillard as they helped her force a path through the protesters who surrounded a restaurant where she was attending an awards ceremony to mark Australia Day.

The Prime Minister stumbled after losing a shoe in the scuffle, but was caught by her personal security guard and managed to get into a waiting car.

The protests appear to have been aimed primarily at opposition leader Tony Abbott, who was also in the building when some 200 demonstrators began banging on its windows, shouting 'shame' and 'racist'. Mr Abbott had angered activists earlier in the day by saying it was time the nearby Aboriginal Tent Embassy 'moved on'. **SP**

TSA agents fired for security lapse

Five Transportation Security Administration (TSA) workers are out of the job and another 38 have been suspended after they reportedly failed to conduct random security screenings on passengers and their luggage.

The employees were all based out of Southwest Florida International Airport in Fort Myers, and have been replaced by agents from other locations.

The affected workers were employed in different capacities at the airport, including supervisors and front-line security screeners. **SP**



Private security guards 'flee' pirate attack

Three British private security guards threw themselves overboard into the Gulf of Aden when Somali pirates attacked the ship they were to protect.

The guards, from a UK-based shipping protection company, were rescued by a German navy helicopter, and they left the Singapore-operated MS Biscaglia unable to defend itself despite its "protection" and a distress call to a nearby warship. The pirates overran the Liberian-flagged chemical tanker, and kidnapped its mainly Indian crew of 28.

So far this year, there have been 97 attempted hijackings off the lawless Horn of Africa. A massive deployment of foreign navies to the vital shipping lane has so far failed to halt or even slow the rate of attacks, with new ships taken almost daily.

A spokesman for Anti-Piracy Maritime Security Solutions (APMSS), a shipping protection company based in Poole, Dorset, said the tanker was attacked in daylight by five pirates on a high-

speed launch. Despite the presence of the security men, the pirates boarded the tanker. APMSS, which advertises "non-lethal" security solutions, said their guards had been "under fire". A spokesman said: "Basically if they didn't [jump], we would probably have been picking three bodies out of the water." **SP**

'Rip' Torn arrested for drunken bank break-in

In 2010, actor Elmore 'Rip' Torn was charged with breaking into a Connecticut bank and carrying a loaded handgun while intoxicated. According to Connecticut police, the 78-year-old Salisbury resident was arrested after police found him inside the Litchfield Bancorp with a loaded revolver.

The *Men in Black* actor was taken into custody and booked on charges including burglary and possession of firearm without a permit. In 2009, Torn was given probation in a Connecticut for drunken driving case and granted permission to enter an alcohol education programme. He also has two previous drunken driving arrests in New York. **SP**



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