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Key Events

- In December 2012, Government approval for Joint Venture accorded.
- In April 2018 at DEFEXPO Chennai, MoU signed between Space Era and JSC KRET in the presence of Secretary (Defence Production).
- In August 2018 at ARMY 2018 Moscow, Agreement signed between Space Era and JSC KRET.
- In October 2018, completed MRO facilities at Aerospace Park, Adibatla including helipad, hangar, bonded warehouse, industrial production and repair facilities.

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- Manufacture, upgrade and overhaul of EW systems for rotary wing and fixed wing platforms.
- Manufacture of critical Su-30MKI spares and other Russian origin platforms to meet requirements of Defence Forces and HAL.

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-Editor

RESPONSE

'Raksha Anirveda' editorial team is always happy to receive comments on its articles and to hear readers' views on the issues raised in the magazine contact details can be found on page.

Editorial

SEAMLESS PROCUREMENT, R&D AND SELF-RELIANCE IS THE NEED OF THE HOUR



One year, four editions... the journey of *Raksha Anirveda* has been eventful – moving ahead on the learning curve, facing its own share of challenges. All the way, persistence and

patience to hold on, the constant play at the back of my mind of Robert Frost's Miles to go before I sleep, together with the all-time favourite Bob Dylan's The answer is blowing in the wind kept my focus and direction intact. Reflecting back, it feels nice to see that the magazine has started carving its own identity as a platform where ideas and opinions are shared freely and constructively.

The government is in the final lap of its term and very soon will be seeking support for a second term in office. So, it is an opportune time to do a quick assessment of the government's performance purely in terms of strategic-foreign policy and defence affairs.

The strategic-foreign policy has seen a significant shift moving from a non-aligned past to an aligned one, issue-based with a focus to play a prominent role in the rule-based global order. It would be worth following in the near future how India plays its role in G20 and Indo-Pacific to realise its aspiration of becoming a leading power. With renewed focus on attaining strategic autonomy through strengthened partnership based on various situations, India is moving ahead on a new pathway where it envisions deep engagement with its friends and partners in order to checkmate and deal efficiently with its adversaries and competitions.

On the defence front, the developments made till date have been a mixed bag. There have been few achievements

and many missed opportunities. The opaque policy making, lack of reforms in defence budgeting, rampant inertia in decision making with frequent shifting of poles and the sluggish pace of implementation have been a dampener that has overshadowed the positives such as a simplified participation of private sector in developing indigenous defence equipment, preference to Indian companies for revenue procurement and setting up of two defence corridors.

Self-reliance in defence manufacturing still remains a distant dream though with reforms and right intent, it seems the forward movement is on track. One hopes more clarity (buoyed by two order announcements) on strategic partnership model being implemented by the government will help in laying the foundation of a robust and collaborative ecosystems and creating a level-playing field for all. It is time to reinforce our commitments, expedite the mission mode development projects being pursued by DRDO and bring them to industrial fruitions in a fast-track mode. Now is the right time to give HAL the wings to fly on its own and reinvent itself to face the real competition. It would have been a game changer, had the government initiated a path breaking plan (backed by constitutional, legislative and administrative framework) to keep our defence procurement, R&D and self-reliance goal requirements move ahead seamlessly, irrespective of a change in government.

Before signing off, I wish all stakeholders associated with Aero India 2019 a grand success and also thank our mentors for being a pillar of strength and believing in the initiative.

Jai Hind!

Ajit Kumar Thakur
Editor & Business Director

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3.19 LAKH CRORE EARMARKED FOR DEFENCE IN BUDGET 2019-20

New Delhi. Approximately about Rs 3.19 lakh crore has been earmarked for Defence (excluding Defence Pension) in the Union Budget for the financial year 2019-20 presented by Interim Finance Minister Piyush Goyal in the Parliament on February 1.

The total outlay envisaged in the Budget is Rs 27,84,200 crore. For Defence Pension, an amount of Rs 1,12,079.57 crore has been provided in Budget Estimates (BE) 2019-20. Total Defence Allocation, including Defence Pension, accounts for 15.48 per cent of the total Central Government expenditure for the year 2019-20. The allocation of Rs 3,18,931.22



crore represents a growth of 7.93 per cent over Budget Estimates (2,95,511.41 crore) and 6.87 per cent over Revised Estimates (Rs 2,98,418.72 crore) respectively for the financial year 2018-19.

Out of Rs 3,18,931.22 crore allocated for the financial year 2019-20, Rs 2,10,682.42 crore for Revenue (Net) expenditure and Rs 1,08,248.80 crore for Capital expenditure for the Defence Services and the Organisations/Departments under the Ministry of Defence. The amount of Rs 1,08,248.80 crore allocated for Capital expenditure, includes modernisation related expenditure. The Capital Allocation of the Ministry of Defence under BE 2019-20 is 32.19 per cent of the total Central Government Capital Expenditure, which is Rs 3,36,293.00 crore.



WITH INTENT TO SHOWCASE REPUBLIC DAY EVENT HIGHLIGHT, MOD LAUNCHES 'RDP INDIA 2019'

New Delhi. As a new initiative in sync with the Digital India campaign of the Government, Ministry of Defence has launched a mobile app 'RDP India 2019' on the Republic Day with the intent of making available the highlights of the Republic Day event, not only to the spectators at Rajpath, but also to the general public all over the world.

This app contains information about the Parade on Rajpath, New Delhi, including Order of the March, details of the tableaux presented by different States and Ministries, children cultural performances, fly past and names of recipients of Pradhan Mantri Rashtriya Bal Puraskar 2019.

It was extremely informative to the spectators witnessing the Parade and was widely appreciated. The app also had the provision for live streaming of the Parade.

People who desire to know the theme and ideas depicted in the tableaux and also those who for some reason could not witness the Parade on Rajpath or watch it on TV, can still download the app and gather all information about the event.

DAC APPROVES INDIGENOUS CONSTRUCTION OF 6 PROJECT 75(I) SUBMARINES AT RS 40,000 CR

New Delhi. In a landmark decision the Defence Acquisition Council (DAC) on January 31 approved indigenous construction of six submarines for the Indian Navy at a cost of over Rs 40,000 crores. This is the second project under the Ministry of Defence's ambitious Strategic Partnership (SP) model that aims at providing a significant fillip to the Government's 'Make in India' programme. SP model envisages indigenous manufacturing of major defence platforms by an Indian Strategic Partner, who will collaborate with foreign Original Equipment Manufacturer to set up production facilities in the country. The model has a long term vision of promoting India as a manufacturing hub for defence equipment through transfer of niche technologies and higher indigenous content thereby enhancing self-sufficiency for meeting the future requirements of the Armed Forces. Today's DAC approval would be second such project following indigenous production of 111 Naval Utility Helicopters (NUH) that was approved in August 2018.

Construction of six submarines under Project 75(I) will provide a major boost to the existing submarine design and manufacturing eco-system in India through transfer of design and equipment technology as well as necessary skill sets. The DAC also approved the acquisition of approximately 5,000 Milan Anti Tank Guided Missiles for Indian Army.

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INDIAN ARMY MARKS 71ST ARMY DAY

New Delhi. Indian Army celebrated its 71st Army Day on January 15. General Bipin Rawat, Chief of the Army Staff (COAS), reviewed the Army Day Parade at the Cariappa Parade Ground, Delhi Cantonment and awarded fifteen Sena Medals (including five posthumously) for individual acts of Gallantry and seventeen COAS Unit Citations for commendable performance of their respective units. Every year Indian Army celebrates January 15 as 'Army Day' to commemorate the day when General (later Field Marshal) K M Cariappa took over the command of Army from General Sir FRR Bucher, the last British Commander-in-Chief in 1949 and became the first Commander-in-Chief of Indian Army post Independence. The Army Day parade was commanded by Maj Gen Rajpal Punia, Chief of Staff, Delhi Area. The leading contingent of the parade was formed of the recipients of the Param Vir Chakra and Ashok Chakra awardees. Earlier in the day, wreaths were laid at Amar Jawan Jyoti, India Gate by the three Service Chiefs to commemorate the Army Day.



INDIA SUCCESSFULLY FLIGHT TESTS SECOND INDIGENOUSLY DEVELOPED SFDR

Chandipur. India's Defence Research and Development Organisation (DRDO) successfully flight tested the second indigenously developed Solid Fuel Ducted Ramjet (SFDR) propulsion based missile system from Integrated Test Range (ITR), Chandipur in Odisha on February 8. Ground booster, separation of ground booster and Nozzle-less-booster performance were found satisfactory. Missile was guided to high altitude to simulate aircraft release conditions and subsequently nozzle-less-booster was ignited. SFDR based missile accelerated to achieve ramjet Mach number successfully. The trajectory was tracked by telemetry and radar stations till touchdown. All the mission objectives have been met. The success of SFDR propulsion technology is a significant milestone and will pave the way for development of long range air-to-air missiles in the country. Defence Minister Nirmala Sitharaman congratulated DRDO and associated team members for the stupendous mission.

INDIA, AFGHANISTAN AND IRAN HOLD FIRST FOLLOW-UP COMMITTEE MEETING FOR OPERATIONALIZATION OF CHABAHAR AGREEMENT

New Delhi. The first meeting of the Follow-up Committee for implementation of the trilateral Chabahar Agreement among India, Afghanistan and Iran at the level of Joint Secretary/ Director General was held at the port city of Chabahar in Iran on December 24, 2018. On the occasion, India Ports Global Limited company opened its office and took over operations at the Shaheed Behesti port at Chabahar.

Positive and constructive discussions were held between the three sides on full operationalisation of the Trilateral Transit Agreement for international transit & transport through the Chabahar Port. They agreed on the routes for the trade and transit corridors between the three countries. It was agreed to finalise at the earliest the Protocol to harmonize transit, roads, customs, and consular matters. It was agreed to allow cargo movement at Chabahar using TIR Convention provisions.

It was decided to hold an event to promote and popularize the potential of Chabahar on February 26, 2019. Also, a study would be initiated for determining measures to make the route attractive, decrease logistic costs and pave the way for smooth operationalisation of the Chabahar Agreement. The next Follow-up Committee meeting, followed by the 2nd Coordination Council Meeting the level of Secretaries/ Deputy Ministers, would be held in India in 2019.

IN A FIRST MOD ISSUES EOI TO SHORTLIST FIRMS FOR PROCUREMENT OF 111 NAVAL UTILITY HELICOPTERS

New Delhi. In-a-first-of-its-kind, Ministry of Defence (MoD) on February 12 issued Expression of Interest (Eoi) for shortlisting of potential Indian Strategic Partners and foreign OEMs for the 'Procurement of 111 Naval Utility Helicopters (NUH) for the Indian Navy. These helicopters will replace Chetak Helicopters and would be utilised for albeit SAR, CASEVAC, LIMO, passenger roles and torpedo drops. 95 helicopters out of 111 will be manufactured in India by the selected Indian Strategic Partner. The DAC approved the case on August 25, 2018. The project is likely to provide major boost to Government's 'Make in India' initiative and fillip to manufacturing capability for helicopters in India. The request for Eoi from Indian private companies for participating in the project has been hosted on the MoD/Indian Navy website on February 12. However, the Request for Eoi from foreign OEMs has been forwarded to companies that participated in the RFI deliberations. The OEMs have been mandated to set up dedicated manufacturing line, including design, integration and manufacturing processes for NUH in India and make Indian Manufacturing Line as a global exclusive facility for the NUH platform being offered. While Indian companies have been given two months to respond to the Eoi, the foreign OEMs have been given three months for responding due to the nature of inputs required.

GOVERNMENT, GSL SIGN AGREEMENT FOR CONSTRUCTION OF 2 FOLLOW-ON SHIPS WITH RUSSIAN ASSISTANCE



New Delhi. In line with an Inter-Governmental Agreement (IGA) signed between the Government of Republic of India and Government of Russian Federation on October 15, 2016 for construction of additional Project 1135.6, the Government on January 30 signed a contract for construction of two Follow on ships at Goa Shipyard Ltd, Goa. The time of scheduled delivery for the two ships is June and December 2026 respectively.

The Follow-on P 1135.6 series of frigates, customised to meet the Indian Navy's specific requirements, are potent platforms, with a mission span covering the entire spectrum of Naval warfare; Air, Surface and Sub-surface. The ships would be equipped to operate in littoral and blue waters; both as a single unit and as consorts of a naval task force. Advanced features of stealth include a special hull design, to limit radar cross-section, low electromagnetic, infrared and under water noise signatures. The two ships would carry highly sophisticated and state-of-art weapon systems and sensors. To support these ships through their life cycle, the Indian Navy has put in place requisite infrastructures for training and maintenance. More importantly in line with the Government's 'Make in India' initiative, these ships being constructed at M/s GSL, Goa under Russian assistance, would make these platforms the largest number of ships of a class in service showcasing indigenous equipment such as sonar system, Brahmos missile system, Combat Management System etc.



BOEING COMPLETES NATO AWACS UPGRADES

Oklahoma City. Boeing delivered the final Airborne Warning and Control System (AWACS) aircraft modernized with avionics and a digital cockpit to the North Atlantic Treaty Organization (NATO) in Manching, Germany, a company press statement said on December 18. This delivery is the final of 14 and ensures NATO AWACS compliance with current and future air traffic control and navigation requirements. Upgrades include five full-color digital displays in each aircraft, replacing 1970's-era dials and provides crewmembers with customizable engine, navigation and radar data. These digital capabilities also allow NATO to consolidate crew responsibilities. "The Communication Navigation Surveillance/Air Traffic Management (CNS/ATM) modernization project enables the NATO E-3A fleet to meet current and foreseen European air traffic management requirements," said Brig Gen Mike Hain, general manager, NATO Airborne Early Warning and Control Programme Management Agency.

The first modernized NATO AWACS plane was modified at Boeing facilities in Seattle and delivered to NATO in November 2016. The remaining 13 aircraft underwent modernization work in Manching, Germany. "We are delighted to deliver this final upgraded AWACS to NATO and honored by their continued partnership," said Scott Johnson, Boeing's CNS/ATM manager. "The modernized AWACS equipment provides real cost savings and efficiency so NATO can execute their vital mission for years to come."



INDIA, NEPAL TO STRENGTHEN TRADITIONALLY CLOSE AND FRIENDLY TIES

New Delhi. India and Nepal have reiterated their commitment to maintain the new momentum and further strengthen the traditionally close and friendly ties between the two countries. This was decided between the meeting of External Affairs Minister Sushma Swaraj and the visiting Minister for Foreign Affairs of Nepal Pradeep Kumar Gyawali in New Delhi on January 10. Nepalese Foreign Minister Gyawali is visiting New Delhi to attend the fourth edition of the Raisina Dialogue. The two Ministers reviewed recent developments in bilateral ties across diverse sectors, including progress achieved on the three transformative initiatives launched in 2018 in the areas of agriculture, railways and inland waterways as well as pace of implementation of ongoing bilateral development and connectivity projects.

FRENCH NAVY CHIEF VISITS INDIA TO EXPLORE NEW AVENUES FOR NAVAL COOPERATION

New Delhi. Chief of the Naval Staff, French Navy, Admiral Christophe Prazuck has been visiting India from January 6-9 to consolidate bilateral naval relations between India and France, as also to explore new avenues for naval cooperation. The latest visit is in conjunction with Raisina Dialogue to be held in the National Capital from January 8-9. During his visit, the French Navy Chief will hold bilateral discussions with Admiral Sunil Lanba, Chairman COSC and Chief of the Naval Staff and other senior officials of the Indian Navy. A range of issues of mutual interest to both navies, encompassing maritime operations, training, logistics and maintenance would be discussed during these meetings. The Indian Navy cooperates with French Navy on many fronts, which include Bilateral Naval Exercise 'Varuna', Interaction on Aircraft Carrier Operations and in generating Maritime Domain Awareness through the medium of Security Dialogue and Staff Talks. In addition to this, ships from both navies make regular port calls at each others' ports.



DAC GRANTS APPROVAL FOR PROCUREMENT OF BRAHMOS FOR INDIAN NAVY SHIPS, ARVS FOR MBT ARJUN

New Delhi. The Defence Acquisition Council (DAC) chaired by Defence Minister Nirmala Sitharaman on December 1 accorded approval for the acquisition of defence equipment worth Rs 3,000 crore including indigenous BrahMos missile for two Indian Navy Ships to be built in Russia. The development comes as a follow up action of the Cabinet Committee on Security (CCS) decision in October 2018 for procurement of four P1135.6 Follow-on Ships. The indigenously designed BrahMos Missile is a tested and proven supersonic cruise missile and will form the primary weapon on-board these Ships. The DAC also approved the procurement of Armoured Recovery Vehicles (ARVs) for the Indian Army's Main Battle Tank Arjun. The ARVs are designed and developed by India's Defence Research and Development Organisation (DRDO) and would be manufactured by M/s Bharat Earth Movers Ltd (BEML). The ARVs ensure efficient and speedy repair and recovery operations during the combat scenario.

SIKORSKY, BOEING PROVIDE FIRST LOOK AT SB>1 DEFIANT

West Palm Beach, Florida. Sikorsky, a Lockheed Martin company, and Boeing provided the first look at the SB>1 DEFIANT helicopter the companies have developed for the US Army's Joint Multi-Role technology demonstrator program, a Boeing press statement said December 26. The SB>1 DEFIANT is designed to fly at twice the speed and range of today's conventional helicopters and offers advanced agility and maneuverability. It will help inform the next generation of military helicopters as part of the US Army's Future Vertical Lift programme. The helicopter is participating in the Army's Joint Multi-Role-Medium Technology Demonstrator program. Data from SB>1 DEFIANT will help the Army develop requirements for new utility helicopters expected to enter service in the early 2030s.



SAAB, FMV SIGN CONTRACT FOR NEW GRIPEN E EQUIPMENT



Stockholm. Saab has received an order from the Swedish Defence Materiel Administration (FMV) regarding new equipment for Gripen E, a company press statement said on December 21. This is a supplementary contract to the previous Gripen E contract, and is valued to approximately SEK 430 million. The original contract, regarding development and modification of Gripen E, signed with FMV in February 2013, was based on the terms that certain equipment from the existing Gripen C/D fleet within the Swedish Armed Forces should be reused.

Instead of reusing equipment from the Gripen C/D, new equipment is acquired for a part of the total Swedish order of 60 Gripen E aircraft. This approach secures the availability of the Swedish Gripen C/D fleet in operational service, while Gripen E is being delivered and introduced to the Swedish Armed Forces. In December 2017 Saab received a supplementary contract from FMV for new equipment for Gripen E. This second supplementary contract covers another batch of new equipment.



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HOW ABOUT 'GUOCHANHUA' FOR INDIA?

In mid-1960s, China planned self-sufficiency in defence production by copying the Soviet technology. China started producing weapons and heavy machinery on a massive scale. This reverse engineering project was termed as 'guochanhua'

By **ADMIRAL (RETD) ARUN PRAKASH**

In their 2010 book "Arming Without Aiming", authors Stephen Cohen and Sunil Dasgupta have this devastating comment to make: "With the exception of nuclear weapons, the history of Indian defence research and development has been an unhappy one. DRDO is the best-funded research institution in India, but has not produced a single weapon-system that could alter the country's strategic condition. In fact India probably lags behind Pakistan...."

Statements, such as this, can either be dismissed as ill-informed rhetoric or taken as yet another proof of our own technological inadequacy and used to reinforce the case for continued import of weapon systems from abroad. We must not adopt either approach because the reality, as usual, lies somewhere in-between.

The essentials of India's Defence Technological and Industrial Base (DTIB) are undoubtedly sound. We are fortunate in having not only a vast pool of world-class scientists but also an extensive network of advanced defence laboratories as well

as production facilities for aircraft, ships, tanks, missiles, aero-engines and electronics; with the Indian armed forces as a huge captive market. Given a functionally-oriented organisation, visionary leadership and a user-friendly attitude, there is no reason why this DTIB should not have made our armed forces 75-80 per cent self-sufficient in weapon systems by now. Quite the contrary, India remains the world's largest arms importer, and our armed forces' inventories continue to be 75-80 per cent of foreign (mainly Soviet/Russian) origin.

This piece is not so much

about the DRDO and the Defence PSUs as about the stark contrast with neighbouring Peoples' Republic of China, whose flourishing and multi-faceted DTIB is the envy of many in the West. China is not just self-sufficient in most weapon systems, its defence industry exports arms to a very large number of countries in Asia (many in our close neighbourhood), Africa and South America. Inevitable fallout of this arms relationship is the close bilateral bonding that it creates and political leverage it accords.

Business and industry in the USA as well as Europe are said to be somewhat wary of partnering





Swathi, the Weapon Locating Radar (WLR) by DRDO

with the Chinese firms, for good reasons. Experience shows that while an unpredictable regulatory environment stimulates clever techniques for intellectual property theft, the local penchant for counterfeiting often makes China a risky place to conduct business in.

But this is nothing new. Well before the Sino-Soviet doctrinal falling-out of 1960, the Chinese leadership had ordered the purloining of Soviet hardware and technology - weapons know-how, dual-use goods and heavy machinery - on a massive scale. Once the break actually occurred, in mid-1960, the Chinese leadership proclaimed the

general policy of “basing on our own forces” and concentrating energies on reproducing the Soviet technology. This was to be a reverse engineering project, termed “guochanhua” in Mandarin, mounted at the national level.

It is now apparent that within two decades China had accomplished the reverse engineering of major weapons and heavy machinery required by its armed forces. By 1983, systems of Soviet origin under serial production in China included, the Dong Feng-5 ICBM, nuclear strategic and attack submarines of the Xia and Han classes, the second generation Ming class

diesel submarine, the MiG-21 fighter and the Tupolev-28 bomber (dubbed J-7 and H-6 respectively) and destroyers, frigates and patrol craft for the PLA Navy. The Chinese have not rested on their laurels, and fresh cycles of “guochanhua” have been launched every decade or so with the aim of acquiring newer technologies required by the armed forces from all sources.

An outstanding example of the Chinese dexterity in “guochanhua” is the Shenyang J-15, or Flying Shark, carrier-borne fighter. The Chinese are then said to have acquired a Ukrainian version of the Sukhoi-33 and used it to undertake a reverse-engineering

WHILE ETHICAL CONSIDERATIONS AND RESPECT FOR INTELLECTUAL PROPERTY RIGHTS MAY NOT PERMIT “GUOCHANHUA” IN INDIA, THERE STILL IS A GREAT DEAL THAT THE DRDO AND DPSUS COULD HAVE DONE DURING THE PAST SIX DECADES TO ACQUIRE OR CO-DEVELOP TECHNOLOGIES THAT WOULD HAVE PROVIDED CRITICALLY-NEEDED CAPABILITIES TO INDIA'S ARMED FORCES

STRAIGHT TALK

project that has produced this machine. The first J-15 prototype is believed to have performed its maiden flight in mid-2009, powered by Russian-supplied AL-31 turbofan engines. A more powerful Chinese engine is reportedly being fitted to this aircraft.

We must note the depressing statistics that while China's annual arms exports are about US \$ 2-3 billion, India currently imports arms worth 2-3 times that amount each year. The nonchalance with which this country continues to spend such colossal sums in acquiring weapon systems from foreign sources remains a deeply disturbing aspect of our

national security policies. There does not seem to be adequate realisation of the fact that every ship, submarine, aircraft, tank or artillery piece that the Indian armed forces acquire from abroad, places them at the mercy of the seller nation for 30-40 years thereafter. This seriously undermines our security as well as independence of action, and all talk of "strategic autonomy" is rendered meaningless.

The denial or even delay in supply of just one tiny component can render modern weapon systems non-operational. A glance at the annual reports tabled by the CAG in Parliament will clearly bring out the dismal serviceability/availability of

imported weaponry, much of which forms the cutting edge of our defensive and offensive capability. This is bound to happen when we are so heavily reliant on imported systems and the product support is so whimsical and unreliable. One often wonders if this is the underlying cause of the "strategic restraint" that India displays with such fortitude in the face of repeated provocations.

The fundamental reasons for India's failure to attain self-reliance in defence are attributable to three glaring lacunae in the current system. First, the main stake-holders in defence research – the three armed forces HQs – are outside the Government's decision-making loop since they remain subservient to the Department of Defence of the MoD. Secondly, the DRDO having been given complete freedom to spend its budget dedicates it largely to exploration of high technology, which may or may not have a bearing on badly needed defence capabilities. And thirdly, advice on scientific/technical matters with a crucial bearing on national security is delivered directly to the apex level by senior scientists. Therefore no instrumentality exists for a cross-check of overstated scientific claims or failure to deliver weapon systems on time, cost and performance.

As far as the DPSUs are concerned, for far too long, have they claimed "transfer of technology" and "indigenisation" when they have been engaged merely in assembling knocked-down kits imported from abroad using "screwdriver technology". In any self-respecting country heads would have rolled; but the inefficiency as well as consistent lack of ingenuity, initiative or innovation displayed by our



(Above) Indian Air Force MiG -21; HAL-built Light Combat Aircraft Tejas

DPSUs has remained shielded by the protective umbrella of the Department of Defence Production & Supply.

While ethical considerations and respect for intellectual property rights may not permit “guochanhua” in India, there still is a great deal that the DRDO and DPSUs could have done during the past six decades to acquire or co-develop technologies that would have provided critically-needed capabilities to India’s armed forces.

Countries bridge technological gaps using every possible means at hand. As the end of WW II approached, there was a desperate race between the Soviets and the Americans to see who could snatch away the cream of German scientists in disciplines such as nuclear weaponry, rocket science and submarine design; and thus gain an advantage. The Manhattan Project as well as NASA’s achievements in space owed much to the German scientists. Many feel that the DRDO missed a golden opportunity, at the disintegration of the Soviet Union, by failing to induct Russian scientists desperately looking for employment, into some of our critical research projects.

With globalisation, the quest for attaining autarchy in every aspect of technology has become an unnecessary and wasteful activity. A conscious and early decision must be taken in every project regarding the technologies we need to develop in-country and those that we can buy or acquire from abroad. Developmental projects undertaken by DRDO must have fairly rigid time-frames, after which they should become candidates for review and abortion. The DRDO practice of in-house “peer reviews” of



(Above) Chinese Shenyang J-15 Flying Shark on an aircraft carrier Liaoning (Below) Indian Navy's INS Chakra

projects by scientists must be replaced by hard-nosed audits and progress-checks by the end-users, assisted by independent experts.

For all the criticism that is often, justly, heaped on DRDO and the DPSUs, the fact remains that properly restructured, synergised with India’s innovative private sector and made accountable to the armed forces, both these national institutions have the capability to rescue India from the unending arms-dependency trap.

A nation’s claim to major-power status does not rest solely on its ability to produce a few

nuclear devices, and such claims will ring hollow unless India can create a capability for designing contemporary missiles, aircraft, tanks, warships and submarines, as well as the industrial wherewithal to undertake their indigenous serial production in large numbers. The unstated but crucial consequence of this will be the assured product-support and unfettered access to spare parts, for the lifetime of the system that the armed forces will have.

Only then can we honestly stake a claim to “strategic autonomy.”

—The author is a retired
Navy Chief



INDIA'S MILITARY AVIATION INDUSTRY – POTENTIAL SET TO GROW

The journey of India's military aviation industry goes hand-in-hand with the evolution of State-owned aerospace and defence company HAL. However, HAL's biggest challenge is not so much in the development of its capabilities but in the lack of orders

By **DR SANJAY BADRI-MAHARAJ**

In 1948, India tasked its nascent aircraft industry - in the form of Hindustan Aeronautics Limited (HAL) - to work on a basic piston-engine trainer to supplement and then supplant the Tiger Moths and Percival Prentice aircraft then in service. The result was the Hindustan HT-2 which served with distinction from 1953 until its retirement in 1990. Over 170 were built, with a dozen being used to form the Ghanaian Air Force in 1959.

By starting with a basic trainer, the HAL had embarked

upon its learning process in a sensible manner and intended to develop this core competency into an advanced trainer - the HT-11 - and an armed trainer - the HT-10 - which would have replaced the T-6 Harvard in the training roles. However, even at this early stage, short-sightedness combined with



HJT-16 Kiran

nearly unqualified successes, the resultant aircraft – the HJT-16 Kiran – first flew in 1964 and in a modified version continues to this day as the IAF's basic trainer.

Simultaneously, the HAL had laid the foundations for fighter production with a license agreement for the Folland Gnat being signed in 1956 and Dr Kurt Tank was engaged to begin work on designing the HF-24 Marut.

The Gnat, despite its British origin, became an Indian fighter. At its peak, the HAL could build four Gnats per month and this diminutive fighter transformed the Indian Air Force's (IAF's) combat arm completely. The HAL also received a license to produce the Bristol Orpheus engine.

The HAL Ajeet, while intended to improve on the Gnat's performance, was only marginally successful as

by 1975, the desired performance could only be achieved with a more powerful engine and more advanced avionics. While four squadrons of Ajeets served between 1975 and 1991, the type never achieved its potential.

It should be noted here that while underpowered, the Marut was an excellent weapons platform and though somewhat short on range, its performance characteristics – even with the Mk.703 were not dissimilar to contemporary types like the French Dassault Etendard IVM (which served until 1987) or even the Dassault Super Mystere B.2 (which continued in service until 1996 with Honduras). In contrast, the last Maruts left squadron service in 1985.

Despite some half-hearted efforts to find a suitable engine for the Marut, the IAF was never

IN MORE RECENT TIMES, INDIA'S MILITARY AVIATION INDUSTRY HAS BECOME CAPABLE OF UNDERTAKING SIGNIFICANT UPGRADES OF COMBAT AIRCRAFT SUCH AS JAGUAR, MIRAGE 2000 AND MIG-29. AS INDIA GRADUALLY INCREASES PRODUCTION OF THE TEJAS FIGHTER

budgetary constraints conspired to stymie these plans. Aircraft could not progress beyond the mock-up stage and a valuable learning process ended prematurely.

The first jet combat aircraft to be manufactured in India was the De Havilland Vampire in its FB.52 and T.55 variants. Under a license granted in 1950, which included the Goblin 2 turbojet, India was able to replace its piston-engine fighters with jet aircraft in a systematic and low-risk manner while simultaneously building its aviation industry.

The years 1956 to 1959 were critical ones for the Indian aviation industry. In 1959, the HAL received permission to proceed with the development of a basic jet trainer to replace the Vampire T.55s and the T-6 Harvard. In one of HAL's



(Above) HJT-36 (below) HAL HF-24 Marut aircraft

EXPERT VIEW

entirely supportive of the project. An attempt to integrate Adour turbofans (used in the Jaguars and Hawks) was confounded by an IAF demand that the thrust of the Adour be increased by 20 per cent.

This decidedly caused unhelpful attitude, at least in part, because the IAF's immediate requirements were being catered for by a substantial infusion of Soviet aircraft – the Su-7 for tactical strike and the MiG-21FL/M and MF variants. A very realistic and cost-effective proposal to create a strike-fighter based around the Marut airframe and the R-25 engine (the HF-25) received no sanction and while efforts to procure RB.199 turbofans were seriously considered for a Marut Mk.3 – the HF-73 – the project failed to materialise.

In a real sense the Marut power

plant saga was the beginning of the end for the HAL as designer and developer of aircraft. While license-manufacture of MiGs, Jaguars and Alouette helicopters continued (some projects with greater indigenous content by value than others) to meet the requirements of the IAF, the HAL's potential was squandered. This was made worse when the development of India's Light Combat Aircraft (LCA) was given over to the new Aeronautical Development Agency (ADA), robbing the HAL of much of its design capability and creating a schism between the design agency and the production agency.

THE ERA OF LICENSE MANUFACTURE

The HAL has invested enormous efforts into phased indigenisation



MiG-29



(Above) Mirage 2000 in flight (Below) Su-30 MKI

of license-manufactured products. This has come at a considerable cost, but it has meant that license-production in India is not mere assembly but involves a progressive increase in indigenous content. The HAL has produced hundreds of combat aircraft and helicopters under license.

The HAL produced and produces MiG-21, MiG-27 and Su-30MKI aircraft under license from the USSR/Russia, Jaguars and Hawks from the UK, Dornier Do-228 from Germany and Chetak and Cheetah helicopters from France. The degree of indigenisation achieved is broken down into indigenisation by content and indigenisation by value. By these measures, in the past, India achieved 90 per cent indigenisation by content of the Chetak (72 per cent of its engine), 88 per cent of the Jaguar (84 per cent of its engine) and over 96 per



IAF Tejas aircraft

cent of the MiG-21bis engine, again by content.

In more recent times, the HAL has achieved a 75 per cent indigenisation by content of the Su-30MKI (60 per cent by value), 72 per cent indigenisation by content of the BAE Hawk (42 per cent by value) and 73 per cent by content of the Do-228 (40 per cent by value). Contractual decisions as to indigenisation levels by content and value are decided by the priority to be given to the project and the timelines involved.

The MiG-21/-27 and Su-30MKI manufacture has resulted in a quantum leap in the manufacturing capability of the HAL. Though Su-30MKIs manufactured in India are more expensive than those manufactured in Russia, HAL's efforts have made fleet sustainability (now at 68 per cent availability) somewhat easier.

This may be further enhanced as spares/LRU are indigenised and stockpiled.

NEW INDIGENOUS DESIGNS COME TO THE FORE

The HAL has two indigenous designs in production – the Light Combat Aircraft Tejas and the Advanced Light Helicopter (ALH) Dhruv. The former is 75 per cent indigenous by content and 60 per cent indigenous by value while the latter is 75 per cent indigenous by content and 52 per cent indigenous by value. While over 150 Dhruv helicopters have been produced to date, plus additional numbers of a weaponised version called the

Rudra, only 10 Tejas combat aircraft have entered service with No. 45 squadron of the Indian Air Force.

This slow production rate is causing problems for the IAF as it seeks to rebuild its combat strength around a strong nucleus of modern combat aircraft of which the Tejas is a critical component. On the plus side, the Tejas has been cleared for a wide variety of air-to-ground ordnance while for air defence tasks, it has completed integration and testing with R-73 and Derby air-to-air missiles. These latter two systems have been cleared for use with the in-service IAF aircraft. As many as 40 Tejas Mk1 aircraft are on order with orders for an additional 83 of an improved Mk.1A variant being

THE YEARS 1956 TO 1959 WERE CRITICAL ONES FOR THE INDIAN AVIATION INDUSTRY. IN 1959, THE HAL RECEIVED PERMISSION TO PROCEED WITH THE DEVELOPMENT OF A BASIC JET TRAINER TO REPLACE THE VAMPIRE T.55S AND THE T-6 HARVARD. IN ONE OF HAL'S NEARLY UNQUALIFIED SUCCESSSES

EXPERT VIEW



(Above) Dornier Do-228 (Below) HAL Rudra helicopter

THE HAL PRODUCED AND PRODUCES MIG-21, MIG-27 AND SU-30MKI AIRCRAFT UNDER LICENSE FROM THE USSR/RUSSIA, JAGUARS AND HAWKS FROM THE UK, DORNIER DO-228 FROM GERMANY AND CHETAK AND CHEETAH HELICOPTERS FROM FRANCE

nearing contract signing.

While the long development period for the Tejas, and to a lesser extent the Dhruv, have attracted much adverse comment, the aircraft are proving to be effective and popular in Indian service as the HAL has improved its product support to the extent of being able to substantially increase availability rates of platforms – 68 per cent in the case of the Su-30 and roughly 70 per cent in the case of the Dhruv. All Tejas aircraft with No.45 squadron are currently operational and available for service.

A new combat helicopter – the Light Combat Helicopter - has begun testing and initial orders for 15 have been placed. In addition, a Light Utility Helicopter (LUH) to replace the Chetak and Cheetah has also flown with orders of over 100 being anticipated. These two helicopters make use of many components from the basic Dhruv variant and can be expected to have

much commonality of components.

HAL's efforts to produce training aircraft, however, have not been as successful. A project to produce an Intermediate Jet Trainer (IJT), the HJT-36, started with much promise but spin trials showed significant design defects. With the IAF adopting a two-stage training programme based on the PC-7 and the Hawk, there was no requirement for the HJT-36 and the project, while ostensibly still alive, has virtually ground to a halt. The HTT-40 turboprop trainer is designed to complement the PC-7 in IAF service. Two prototypes are currently flying and it is anticipated that up to 68 could be ordered.

A DEARTH OF ORDERS

HAL's biggest challenge is not so much in the development of its capabilities but in the lack of orders. The delay in concluding the Tejas Mk1A order and that for an initial 15 Light Combat

Helicopters is proving to be problematic. While money outstanding to the HAL for work already done must be paid, the need of the hour is to sign contracts for new products, or perhaps repeat orders for existing ones. This is not an act of charity to the HAL. The Indian Air Force desperately needs additional combat aircraft and such orders – perhaps 40 more Su-30MKI and 20 more Tejas Mk1 – would be a boon for both the IAF and HAL. It would be ridiculous if such low-risk options are ignored while negotiations continue for other orders as both the user and the supplier will suffer in the interim.

CONCLUSION – OPPORTUNITIES LOST BUT STRONG CAPABILITIES BUILT

India's military aviation industry is a story of lost opportunities. However, it has also been invaluable in building a strong military aircraft manufacturing, repair and overhaul base. In more recent times, it has become capable of undertaking significant upgrades of combat aircraft such as Jaguar, Mirage 2000 and MiG-29. As India gradually increases the production of the Tejas fighter, it is hoped that the HAL proves equal to the challenge to improve its delivery rate of the type.

India's aircraft design capabilities, on the other hand, are not as extensive as the initial promise portended. Squandered opportunities robbed the country of following an evolutionary path. It is therefore essential that the Tejas continues to evolve even while in service and its design taken to its logical conclusion in its Mk2 version.

–The author is an independent defence analyst and attorney-at-law based in Trinidad Tobago

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INDIA – FUTURE HUB OF DEFENCE, AEROSPACE AND DISASTER MANAGEMENT

The major pointers indicate that India must be the global hub of Defence, Aerospace and Disaster Management industry and the favourable part is that it has the best credentials and potential to be one as the global shift takes place to the east

By **LT GEN (RETD) PR SHANKAR**



megatrends: Certain discernible megatrends are impacting the Defence, Security and Disaster Management firmament. The first is that there is a growing shift in global economic power from West to East. Secondly, the rate of demographic changes taking place all over the world due to migration and varying birth rates is giving rise to new conflicts. It triggers a further demographic change-conflict cycle. Thirdly, rapid urbanisation fuelled by growth is creating social tension and conflicts. Fourthly, new technologies are changing/driving the nature of conflicts. Lastly, climate change and

resource scarcity give a whole new dimension to conflict. It has succeeded in bringing disaster management on par with security.

Recent events are proving that disasters happen with greater frequency than wars. Hence militaries and societies are preparing accordingly. Largely,

the response mechanism and capabilities required for conflicts and disaster are virtually the same and can no more be developed separately. These megatrends are driving a change which opens opportunities for India in becoming a hub of the Defence, Aerospace and Disaster Management industry.



SHIFT IN CONFLICT ZONES

The Industrial Revolution gave rise to massive growth in Western Economies. This growth has fueled conflict. The last century was hence dominated by the two world wars and the cold war which took place largely over the European and North African continents between developed Western powers. Weapons were designed and developed for those theatres and battlefield conditions. Resultantly European nations and the US became the hubs for the global defence and security industry. Conflict Zones of this century are West Asia, South Asia, Central Africa, East Asia-Pacific and Indian Ocean Region (IOR).



Defence Minister Nirmala Sitharaman inaugurating UP Defence Industrial Corridor (Launch of projects) in Aligarh

THE MEGATRENDS LIKE SHIFT IN GLOBAL ECONOMIC POWER, DEMOGRAPHIC CHANGES, RAPID URBANISATION AND CLIMATE CHANGE AND RESOURCE SCARCITY ARE DRIVING A CHANGE WHICH OPENS OPPORTUNITIES FOR INDIA IN BECOMING A HUB OF THE DEFENCE, AEROSPACE AND DISASTER MANAGEMENT INDUSTRY

In addition, nature of conflict has changed. There is a discernible shift from the conventional warfare of the last century to the hybrid and humanised conflicts of this century. This is being complicated by the impact of disruptive technologies which are sprouting like never before. The defence industry must respond accordingly and be rooted to the ground on which conflicts are raging. In this context India must be central to the new conflict zones in more ways than one.

DISASTER ZONES

Major earthquakes of this century have occurred in Gujarat (2001), Iran (2003),



Defence Minister Launches Projects in Tamil Nadu Defence Industrial Corridor

Indonesia (2004 Tsunami), Pakistan (2005), Sichuan (2008), Haiti (2010), Japan (2011), Christchurch (2011) and Nepal (2015). Devastating

floods/ hurricanes have occurred in the US (2005), Myanmar (2008) and Thailand (2011). An analysis of disaster zones indicates that the bulk

DEFENCE HUB: EMERGING PROWESS



(Above) Indian Army's Dhanush (Below) DRDO-built Advanced Towed Artillery Gun System (ATAGS)

of the major earthquakes and floods have happened in and around Asia with India as the geographic centre.

In many cases India has been among the first responders due to its centrality. Very importantly, these disasters have occurred at a rate greater than those at which conflicts have taken place and with far greater devastation. In such conditions, India has the best potential to develop as a major Disaster Management hub. India's development as a Disaster Management hub with a view of creating capability to combat disasters in the neighbouring countries and creating dependencies will only

increase its soft power. The potential is immense.

THE INDIAN TRENDLINE

India is a growing power. Its GDP is predicted to shortly overtake that of Great Britain. By 2050 it is expected that its GDP will be third behind the US and China. As a growing power it has huge domestic demands of defence, aerospace and disaster management equipment. The demand straddles capital as well as revenue channels. As of now the country is a net major importer of defence equipment. Increasingly procurements from foreign sources have bedeviled the establishment and putting

big ticket items through is being thwarted due to one reason or the other. Public pressure to indigenise is growing. Hence the story is set to change. Imports are being actively discouraged. Governmental policy is to turn India into a net exporter. The Make in India initiative might not have succeeded but the drift towards self-sufficiency is clear with a lucid understanding that India must increase exports in this field. As Conflict Zones have shifted to the East, big spenders have also emerged here. Currently big defence spenders include West Asian countries, Central African countries, Singapore, Iran, Indonesia, Taiwan, Australia and Japan. These are countries with which we have excellent relations and this potential and goodwill needs to be tapped.

IMPACT OF DISRUPTIVE TECHNOLOGIES

The last generation of military grew in an era of Revolution in Military Affairs (RMA). However, technologies like Internet of Things (IoT), Artificial Intelligence



(AI), Space Colonisation, 3D Printing, High Speed Travel, Robotics, Blockchain Technology, Autonomous Vehicles, Advanced Virtual Reality, Renewable Energy, Propulsion Technology, Sensor Technology, Digital Revolution, Energy Harnessing and Direction, Navigational Aids and New Material Technology are disrupting everyday life. These have tremendous dual use potential. However, these disruptive technologies are leading to Disruption in Military Affairs (DMA). Their impact will change the way conflicts or disasters will be handled. That is a given. However, the issue must be looked at differently. The brick and mortar defence industry as we know it is being impacted by disruptive technologies.

A hybrid form of defence and aerospace industry is emerging with a heavy bias on digital software and disruptive technologies. Every technology has a dual use. For example, the aerospace industry in India must cater for Military Aircraft, Helicopters, Unmanned Aerial Vehicles (UAVs), Missiles, Rockets and Spacecraft. In addition, it

is estimated that Indian requirement of passenger aircraft is growing at a dizzy 15 per cent. It translates into a need of 1000 civil aircraft in the next seven to eight years. That is the potential for a new frontier of defence and aerospace industrialisation. Look at it differently. Almost 50 per cent of Microsoft and Google products are based on research from their India centric operations. It highlights India's ability in latest and potentially Disruptive Technologies. If this logic is extended further India's digital software potential and industrialisation make it an attractive proposition as a future

defence, aerospace and disaster management hub.

TRANSLATING POTENTIAL INTO REALITY

There is no doubt that India has best credentials and great potential to be the next hub for the Defence, Aerospace and Disaster Management industry. However, this is easier said than done. Deliberate steps must be taken to ensure that this potential turns into reality. The first step in this process is to accept this thought process and develop a vision and policy for realisation. The outlines



(Clockwise) HAL's Rudra; Indian Air Force Dhruv and Indian Navy's ALH Dhruv

DEFENCE HUB: EMERGING PROWESS



Indian Army's tank T-90 in action

REFORM OF OUR DEFENCE PUBLIC SECTOR UNITS (DPSUS) AND ORDNANCE FACTORY BOARD (OFB) FACTORIES IS A MUST IF INDIA IS TO BE A GLOBAL DEFENCE HUB. REFORM OF THE PUBLIC INSTITUTIONS MUST BE FOCUSED ON MODERNISATION, TECHNOLOGICAL UPGRADE, IMPROVING QUALITY, INCREASING EFFICIENCIES AND ENSURING DELIVERY ON TIME

of such a thought and action process are outlined below:

Defence Acquisition Reforms.

Defence acquisition processes have missed laid down benchmarks repeatedly. Politicking and bureaucratic hurdles have imposed slowdowns and delays on the system. The entire defence acquisition process must be reformed with purpose. Hitherto our attempts at reform have been largely cosmetic and ineffective. It must be realised that defence acquisition in requisite numbers and correct time have tremendous payoffs. It meets out burgeoning requirements, cuts costs and inspires confidence for investment and export. Till such time there is an assured market, there will be no investment or possibility of export.

Investment in Research.

Indian investment in research is narrow in bandwidth and financially meager too. We need to expand our research bubble by going beyond Defence Research and Development Organisation (DRDO). India has a wide scientific base. This needs to be exploited and synergised with defence requirements. The potential of our Indian

Institutes of Technology (IITs) and other excellent academic institutions must be tapped. The areas of research have also to be expanded. New technologies must be explored. We must master the disruptive technologies on the horizon. Otherwise our young minds will start working for others. We will end up in a situation where we buy defence items developed by our minds from outsiders! Budget outlays for focused outcome-based research into new technologies must be enhanced. These outlays need to be channeled into the wider stream of technological dual-purpose enhancement rather than for defence purposes only.

Incentivise Private Players.

Private investment whether indigenous or global must be incentivised. The effort in establishment of Defence Corridors or investment conclaves like the one being done by Tamil Nadu are a good start point in incentivisation. Startups need to be encouraged and incubated to grow. The real incentivisation will come when markets are assured. The other area where

incentivisation is feasible is in easing rules and regulations and providing a level playing field for private players vis-a-vis public industry. Presently there is too much bias to support the public enterprises to the extent of a monopolistic situation. This scares private investment off.

Reform Public Players.

Reform of our Defence Public Sector Units (DPSUs) and Ordnance Factory Board (OFB) factories is a must if India is to be a global defence hub. Reform of the public institutions must be focused on modernisation, technological upgrade, improving quality, increasing efficiencies and ensuring delivery on time. The umbilical of assured orders irrespective of all other considerations must be seriously reviewed. They must be shaken out of their comfort zones. Tremendous capacities have been created at great public cost. They must be made to deliver. We need a strong government with a clear-headed capable leader at the helm to achieve this objective.

CONCLUSION

All pointers indicate that India must be the global hub of Defence, Aerospace and Disaster Management industry. India has the best credentials and potential to be one as the global shift takes place to the East. Equally, India must surmount multiple challenges and hurdles in case it is to emerge as a global hub of consequence. Notwithstanding detractors and pessimistic views as India's power grows, certain reforms will take place which will ensure that India realises its potential. That is the hope. However fond it is. ■

The author is a retired Director General of Artillery, Indian Army and Professor of Aerospace Department, IIT Madras

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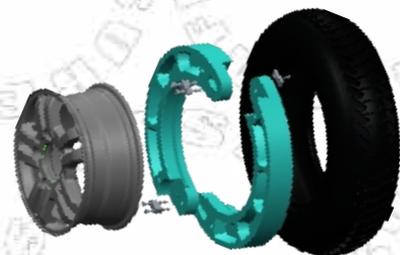


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DEMISTIFYING THE ANTI ACCESS/AREA DENIAL (A2/AD) THREAT

A2/AD projection is a series of overlapping capabilities across multiple domains like Air, Land, Sea, EW, Ai, Cyber and Space, with the sole aim of imposing maximum attrition on the adversaries' war fighting capability in all spectrums

By **SAMEER JOSHI**

A

Anti-Access/ Area- Denial (A2/AD), Why does it matter?: Like many of the metaphorical phrases emanating from the Western alliances, A2/AD —or anti-access and area denial — is primarily a new characterisation for an old way of war! From the invention of the English longbow to the development of the German Fritz-X guided anti-ship bomb, nations have mostly sought cost-effective means to deny access and inflict heavy losses on their foes. Military thinkers have long cautioned that air forces and navies would encounter increasing difficulties in conducting operations in congested air defence setups and bathymetrically challenging littoral waters. During the Cold War, the United States understood any attempt to project its massive naval superiority in high seas against the Soviet coastal bastions might result in nightmarish levels of attrition.

Similarly, the Soviets devised armaments like the Tu-26 bombers with long range AS-6 'Kingfish' supersonic Anti-Ship missiles (ASM) and Kirov class Battlecruisers, dubbed arsenal ships, to take the sheen off the USN Carrier Battle Groups at high seas. The potentially devastating effect of Russian surface to air (SAM) missiles was made painfully apparent to the Israeli air force as early as 1973. And then came Operation Desert Storm (OSD) in 1991, which was

a game-changing military action in the annals of warfare. While the world watched on television, coalition forces led by the United States defeated what was then the world's fourth-largest standing army with surprising ease. Large-scale, multi-layered air attacks led by the United States, which Iraqi defences were unable to stop, dislocated large numbers of Iraqi ground forces and other targets from their sanctuary bases. It appeared to be a swansong of the much-vaunted

Soviet-era weaponries, which the non-western world had taken for granted to assure balance of power across the world.

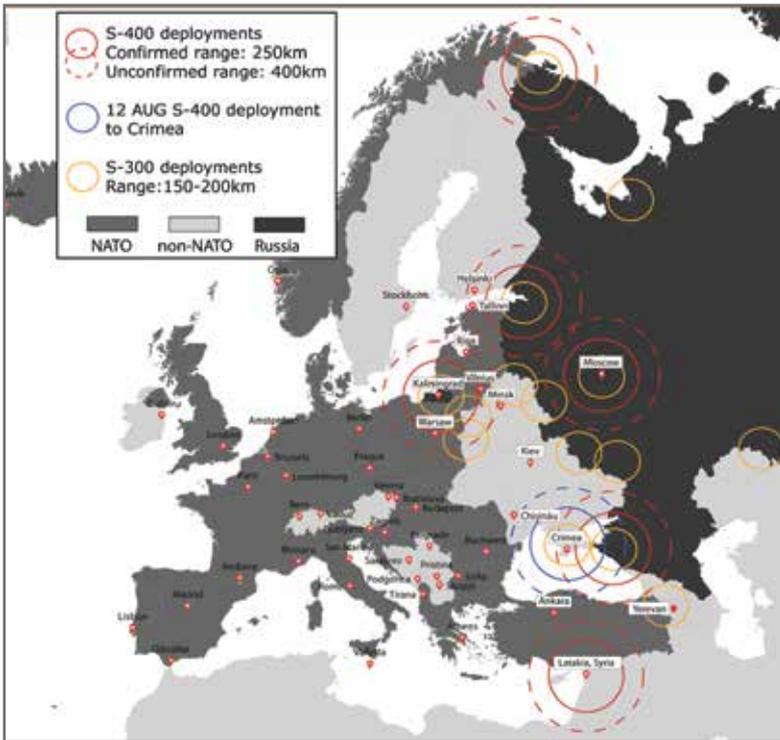
The nations across the world 'learned' from this conflict that there was a need to prepare for the next level of imminent warfare, that would take place under what some military strategists began to describe as "high-technology conditions." To mitigate the primarily United States' airpower advantage in future conflicts, many countries began to invest in means of keeping enemy fighters and bombers from enjoying the same freedom of movement as seen over the skies of Iraq in ODS. The concepts of operation that emerged from this desire came to be collectively known as Anti Access - Area Denial, with Russia and China emerging as two geographical pivots - establishing offensive, multi-layered, cross networked, electromagnetic interference resistant, Integrated Air Defence (IAD) zones in their quest to project resurgent power within and outside their borders by early 2000s.

A2/AD - DEFINING THE PHILOSOPHY

ANTI-ACCESS: "Action intended to slow deployment of friendly forces into a theatre or cause forces to operate from distances farther from the locus of conflict than they would otherwise prefer. A2 affects movement to a theatre."

AREA DENIAL: "Action intended to impede friendly operations within areas where an adversary cannot or will not prevent access. AD affects maneuver within a theatre."

The A2/AD projection is not limited to a single weapon system or tactics, but instead are "a series of overlapping capabilities across multiple domains like Air, Land, Sea, EW, Ai, Cyber and Space, with



Russian A2/ AD capability in Europe and Ukraine

the sole aim of imposing maximum attrition on the adversaries' war fighting capability in all spectrums.

Hence, as a concept, A2/AD encompasses two separate but related categories of investment. A2 measures are designed to render opposing forces unable to make an initial entry into a theatre of operations. The People's Liberation Army's (PLA) development of its arsenal of theatre ballistic and long-range cruise missiles is a recent, well-publicized example of an A2 measure. By maintaining a large store of accurate, very long-range missiles, delivered through air and land-based launchers, the PLA has significantly raised the potential cost of any hostile operation in the Asia-Pacific and Tibet regions. Existing layered, ultra-long range A2/AD arrangements with integrated terrestrial, air and space sensors, capable of detecting and intercepting a wide variety of aircraft, including stealth, ballistic and cruise missiles, which are

highly resistant to jamming and spoofing; supplemented by hypersonic ballistic missiles like the Chinese DF-21A ASBM, the Russian Iskandar-M land attack system and the MiG-31 launched KH-47M2 Kinzhal 2000 km range hypersonic ASBM, have shaken the roots of the superiority which NATO enjoyed post the fall of the

Soviet Union.

These have imposed a serious degree of caution on any misadventures on part of the US and its NATO allies, especially seen when Russia annexed Crimea and blatantly supported the formation of an independent state in eastern Ukraine much to the chagrin of the west in 2014; and recently in Syria, where the Russian IADs has stabilised its presence, intimidating the western allies to no end. Russian A2/AD protected zones matter to the extent, that it contributes to fostering the perception within NATO that Russia might enjoy local escalation dominance in parts of NATO's eastern flank, whether in the Baltics or the Black Sea Basin. China on its part is fortifying the island chain within the so-called nine dashed line in the South China Sea with a heady A2/AD arsenal, which protects nearly 80-90 per cent of the contested waters in the region. The nine-dash line runs as far as 2,000km from the Chinese mainland to within a few hundred kilometers of the Philippines, Malaysia and Vietnam, who are but mute spectators in this blatant territorial grab. Similar systems have also been deployed by China

TO MITIGATE PRIMARILY THE UNITED STATES' AIRPOWER ADVANTAGE IN FUTURE CONFLICTS, MANY COUNTRIES BEGAN TO INVEST IN MEANS OF KEEPING ENEMY FIGHTERS AND BOMBERS FROM ENJOYING THE SAME FREEDOM OF MOVEMENT AS SEEN OVER THE SKIES OF IRAQ IN OPERATION DESERT STORM



The Russian KH-47M2 hypersonic Anti-Ship and Land Attack missile, seen on a MiG-31

IN FOCUS



The Chinese HQ-9 SAM is a potent layer in its A2/AD capability

HOWEVER, MUCH OF THE CHINA'S RAPIDLY MATURING RECONNAISSANCE-STRIKE COMPLEX AND BRISTLING ARRAY OF MISSILES, ESPECIALLY THE POTENT DF-21D AND DF-26 ASBM, ARE AIMED AT INTERCEPTING THE UNITED STATES NAVY'S RENOWNED CARRIER BATTLE GROUPS (CBGs), THOUSANDS OF KILOMETRES AWAY FROM THE CHINESE MAINLAND, AS WELL AS THREATENING THE US FORCES IN GUAM

on the Fujian coast near Taiwan, and in the Tibet, where the PLA recognises the quick reaction ability of the Indian Air Force (IAF) well and expects the IAF to deploy rapidly to conflict zones. It realises a gap in functional capability, choosing to ingest the A2/AD environment with modern S-300, HQ-9 and HQ-12 SAMs, all of which pose grave danger to the IAF. Major A2/AD SAM complexes have been identified in Xinjian and TAR, which guard the likely ingress routes of the Indian Air Force. In 2017, India halted China's efforts to extend a road in territory disputed with Bhutan near the Indian border at Doklam, resulting in a protracted standoff lasting more than 70 days. The Chinese brazenly deployed the potent HQ-9 SAM during this standoff to deter the IAF from undertaking any CAS missions had any military skirmish taken place.

However, much of the China's rapidly maturing reconnaissance-strike complex and bristling array of missiles, especially the potent DF-21D and DF-26 ASBM, are aimed at intercepting the United States Navy's renowned Carrier Battle Groups (CBGs), thousands of

kilometres away from the Chinese mainland, as well as threatening the US forces in Guam.

Though A2/AD's popularity may well be justified, it also has its critics all over the strategy think tanks. However, for all its possible criticisms and shortcomings, the concept can help us better understand the unfolding global competition for military access and movement in an increasingly mature precision-strike context. Hence, the growing availability of increasingly potent A2/AD capabilities poses a serious threat

to the ability to deploy and employ forces into many theaters around the world.

A2/AD - MUTATION & REGIONAL ADOPTION

The link between the development of these military systems by revisionist powers and their adoption of several destabilising security policies to further their national aims, now appears increasingly self-evident. What is less frequently discussed, however, is how this century's two major challengers to the Western dominated order, Russia and China, have deliberately strengthened mid-sized revisionist actors with advanced anti-access weaponry. In some cases, the motivation may be to ensure an embattled ally's survival, as when Russia shields the Syrian regime of Bashar Al-Assad behind a dense umbrella of advanced, integrated air defense systems (IADS). In others, forming a material sub-component of a wider regional strategy, like when China supplies Pakistan with large numbers of HQ-16 and possibly the HQ-9 SAMs (HQ-9/ FD-2000 talks are underway), to take on the potential of the Indian Air



China's A2/AD power projection

Force, WS-2 technology to develop the Nasr battlefield missiles with tactical nuclear weapons (TNW) to take on India's Cold Start doctrine (CSD), mobile batteries of C-802 anti-ship cruise missiles (ASCMs) or the CM-400AKG supersonic air-launched cruise missiles designed to cripple Indian aircraft carriers and naval assets.

Similarly, China's sale of a broad gamut of weaponry to Iran and Saudi Arabia, ranging from naval mines, fast-attack craft, cruise missiles, SAMs and Ballistic missiles, may go beyond simple commercial imperatives and possess a diversionary strategic rationale. In addition, the recent emergence of North Korea as a rogue, ballistic missile armed muscle flexing policy disruptor in Asia Pacific, has been possible with decades of Chinese technical and military investments. The secondary motivations behind such arms sales and transfers may vary, but their first-order strategic effects are the same: They strengthen the nuisance capacity and resolve of aggressive regional actors, while significantly raising the risks and costs of military intervention. Broadly, these direct measures also benefit from ongoing economic doctrines like the Chinese 'One Belt One Road' (OBOR) initiative, which aims to have a widespread Chinese socio-economic dominance across the globe.

A2/AD - UPSETTING THE WORLD ORDER

For decades, global stability and prosperity have rested on the maintenance of an open economic order, and on freedom of access to the global commons. The rapid metastasis of these regional denial complexes — what the west refers to as "A2/AD bubbles" — risks



Pakistan's Nasr missile armed with Tactical Nuclear Weapons (TNW) aims to counter India's Cold Start capability

upsetting the foundations of the open-minded international order by expanding spaces of enclosure or instability. Powers like the United States can no longer rely on their ability to project power with impunity or harness their military superiority to impose their will or ensure deterrence, with the United States and its allies, finding themselves outmaneuvered or outbid in ongoing battles for regional influence. Similarly, the military prowess of regional powers like India and Japan have taken a widespread hit, with traditional foes complementing their warfare doctrines with layered defences and counter attack capability.

Across the world, despite the fact that aggression into other countries' sovereign territory is not acceptable in international law, 'fait accompli' conditions such as the Crimean Peninsula and the Middle East, could bring the various alliance into situations where A2/AD bubbles need to be offensively and defensively dealt during the early phases of intervention.

A2/AD - COUNTERING THE THREAT

Fundamentally, there are two main options for countering A2/AD. These are the Inside-Out and the Outside-In approach. Inside-Out is based on a technological advantage which strives for a short, high-intensity conflict, hitting the A2/AD system's centre of gravity with the factor of surprise and breaking open the obstacles hindering the advance of friendly forces. In contrast, Outside-In chooses the potentially lengthy approach of dismantling the adversary's capabilities layer by layer. This bears the obvious risk of higher attrition and mission fatigue, which generally may not be politically acceptable and difficult to sustain. Hence, Inside-Out may be the most logical and feasible method of countering A2/AD. To be successful with this approach, the necessary military effectors must penetrate the A2/AD bubble to get within their weapon engagement range. However, this is exactly what modern, highly-sophisticated

IADS supported by China. Post the Doklam crisis, the Chinese are putting in place a robust A2/AD environment in Tibet, consisting of layered S-300/ HQ-9/ HQ-16 Surface to Air Missile defences and offensive Intermediate/ Short Range Ballistic Missiles like the DF-11/15/16 under the PLARF to strike in depth of the Indian mainland. Concurrently, Pakistan which is rapidly upgrading its IADS capability with modern SAMs (with likely induction of the HQ-9 and HQ-16 in the near future) and LR detection assets, as well as offensive attack capability in form of Tactical Nuclear Weapons (TNW) like the Nasr and Ra'ad to counter the Indian Army's offensive doctrine; is well placed to negate India's advantage in numbers and offensive firepower. The evolution of defensive capabilities into protracted offensive A2/AD capability in the neighbourhood will be a reason for concern to the IAF, especially given its depleted aircraft squadron strength, which is likely to fall to 26 combat aircraft squadrons in the coming decade. Chinese footprints around the Indian periphery and the Indian Ocean Region (IOR) with the OBOR and military aid to nations will empower even smaller nations to project offensive power in the form of miniature A2/AD bubbles.

Towards countering this clear and present danger and maintaining command of air in the coming decades, the Indian Air Force will urgently need to induct the next generation stand-off strike capability in form of missiles and unmanned platforms. Given the massive shortfall of combat aircraft, newer doctrines featuring innovative usage of Low Observable UCAVs with manned aircraft need to be adopted urgently. This will also mitigate the expected attrition manned platforms are



'Manned Unmanned Teaming' with Unmanned Wingmen like the Kratos X-58A Valkyrie will be essential to avoid attrition in A2/AD space*

likely to face while countering well defended IAD complexes. Stealth, Stand Off precision strike, Manned Unmanned Teaming (MUT), Swarming technologies and development of a robust C4ISR & EW potential, will ensure the IAF retaining a measure of success in penetrating the existing and next generation A2/AD zones in contested airspace.

CONCLUSION

Despite A2/AD being prevalent in current warfare doctrines, it is principally not a new threat. It is a mere logical consequence of the conventional arms and technology race which has been ongoing since the end of WWII. Simply put, A2/AD is the response to western force projection, precision strike, and highly-networked C2 capabilities over a period of time, which due regional adoption, possess a threat to a fragmented world order, where geopolitical economic measures need to be supported by a strong military presence. Enhanced capability, such as extended detection and engagement ranges

in combination with high mobility, low detection probability, and networked redundancy, have created new defensive capabilities, that will govern the way war is fought in the coming decades. Since attrition warfare will not be the first option for most nations, technical solutions and creative concepts will need to be found to assure future mission success. Specific counter A2/AD capability gaps need to be clearly identified and filled by robust and appropriate means to maintain an acceptable level of conventional deterrence. This will need to take into account the immense technological innovation speed of next generation A2/AD systems like the S-500, HQ-19 and integrated anti-stealth detection capability into account, demanding faster and more adaptive solutions. In addition, warfare doctrine should be reviewed in order to reflect the highly integrated joint and combined processes needed in countering A2/AD. ■

– The author is the CEO of NewSpace Research & Technologies Pvt Ltd

INDIA IS PREPARING TO FIGHT A TWO FRONT WAR IN FUTURE, WITH THE INDIAN AIR FORCE AS THE PRIMARY MOBILE SPEARHEAD TO COUNTER THE THREAT POSED BY THE OFFENSIVE CAPABILITIES OF CHINA'S WESTERN THEATRE COMMAND (WTC) IN THE TIBET AUTONOMOUS REGION (TAR); AND PAKISTAN WITH ITS DEVELOPING IADS SUPPORTED BY CHINA

THE FICV STORY - ONGOING FOR DECADES, UNSURE FUTURE

The story of Futuristic Infantry Combat Vehicle (FICV) has been unfolding i.e. going on for years but yet no substantial result was seen on this front

By **LT GEN (RETD) P.C. KATOCH**

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he DRDO began developing Abhay, an Infantry Combat Vehicle (ICV), in the late 1990s and the design work was completed by 2001. Abhay is a pre-technology demonstrator to develop and test technologies to be used in a futuristic ICV (FICV) to replace the BMP-II in service with the army. The pre-production prototype was rolled out in June 2005 and development of the first armoured prototype has been in progress. India imported hundreds of BMP-I from Soviet Union between 1976 and 1982. With useful life of 10-15 years, their life expired during period 1991-1997. Production in India of BMP-1 with imported engines and opto-electrical devices costing Rs 16.50

crore was sanctioned in June 1984. Under another agreement in February 1985, import of BMP-II and its technology was approved costing Rs 57.17 crore. Production was to commence in 1987-88 and sanctioned capacity achieved by 1992-93; but this could not be met due to various reasons.

In 1990, the production plan was reduced to 231 and 1991-92 onwards to 150 due to budgetary constraints. The production targets for 1991-92 was restricted to 120 and 100 vehicles from 1992-93 onwards.

Production of the BMP-2, called Sarath, was undertaken



at 100 per year. By 2012 approximately, 1900 BMP-2/2K were in service with the army (now around 2500) and were likely to remain operational till 2017. On October 29, 2015, MoD approved acquisition of 149 BMP-2 to be built in the country under license from Russia, with India spending over \$140 million; the potential contract stipulated licensed assembly in India at the facilities of one of the plants of the Ordnance Factory Board (OFB), a state holding company for the production of ammunition, weapons and vehicles. The details of the contract were to be discussed during then Defence



The development of ICV Abhay started in late 1990s

Minister Manohar Parrikar's visit to Moscow. In 2017, Army conceived 'Project FICV 2017' on private-public partnership basis under Defence Procurement Procedure 2008 (DPP-2008), which laid down "Make" procedure for developing "high-tech, complex systems" through Indian industry. Based on the GSQR, the Expression of Intent (EOI) issued in 2009 laid down that the FICV will be operated by three crew members, and carry seven additional soldiers with combat loads; it must provide protection from bullets fired by 14.5mm calibre weapons; it must be amphibious, i.e. capable

of floating in water; it must be air-transportable, which would imply a maximum weight of 18-20 tons; and it must have a grenade launcher, co-axial machine gun, and be capable of firing anti-tank missiles (fire and forget type). MoD was to fund 80 per cent of the development cost; selected contractor was to pay 20 per cent, and FICV must have indigenous content of at least 50 per cent.

The Expression of Interest (EOI) was sent to Mahindra Defence Systems, Tata's, L&T and Ordnance Factory Board (OFB) in 2009, each of whom had submitted their technical and

commercial bids. Considering army's requirement for better and advanced replacements for upgraded BMP-2, FICV project was to be put on fast track. The army was looking at production of 3,000 FICVs to replace the upgraded BMPs at a cost of \$10 billion. The project got bogged down because Russia offered the BMP-3 but was not accepted since indigenous firms had invested heavily in the project. Finally, two developing agencies (DAs) are to be shortlisted who would be required to produce five prototypes in the laid down time frame for user trials. Attempt by OFB to

IN 2017, ARMY CONCEIVED 'PROJECT FICV 2017' ON PRIVATE-PUBLIC PARTNERSHIP BASIS UNDER DEFENCE PROCUREMENT PROCEDURE 2008 (DPP-2008), WHICH LAID DOWN "MAKE" PROCEDURE FOR DEVELOPING "HIGH-TECH, COMPLEX SYSTEMS" THROUGH INDIAN INDUSTRY

FICV: IN THE WISH LIST

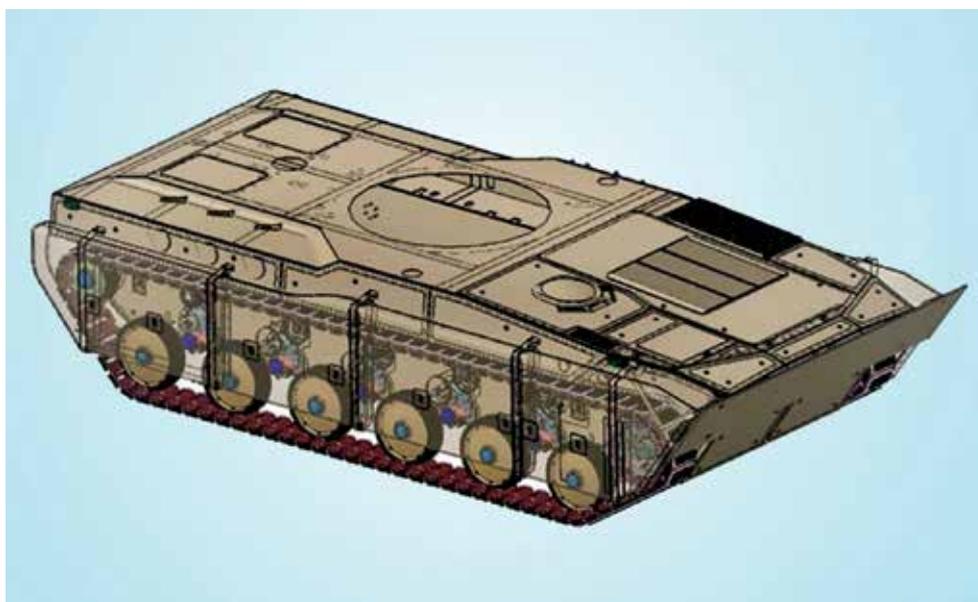
partner DRDO as design partner was not accepted on grounds that eventually DRDO will be responsible for technology evaluation and approval. As per earlier reports, the project was not to be a winner-take-all competition since MoD planned to retain two production lines, the winner given 65-70 per cent of the order; the runner-up to build 30-35 per cent of the army's requirement of FICVs, provided

the latter company agreed to build the winning design at the same cost as the winner. With two assembly lines operating, India's private defence players expected that the FICV contract will create an eco-system of suppliers extending far beyond the winner of the contract.

With change of the government in 2014, Project FICV was restarted afresh to include indigenous firms like

Bharat Forge, Punj Lloyd, Force Motors and Ashok Leyland. These additional indigenous firms were included through a fresh "acceptance of necessity", as approved by the MoD. The foreign firms that were likely to go in for joint ventures (JVs) with Indian partners reportedly included Rosoboronexport (Russia), General Dynamics (USA), Rafael (Israel), Nexter and Thales (France), Krauss-MaffeiWegmann (Germany) and Doosan Group of Republic of Korea. After approval of the 'acceptance of necessity' and inclusion of more domestic companies, detailed reports were to be submitted to MoD by end 2014. Accordingly, a second EoI was issued to 10 vendors on July 16, 2015, seeking firm proposal, capital expenditure and other details. Simultaneously, MoD also approved that OFB with two private firms would make the prototype of the FICV. The two DAs were then to be shortlisted to build the prototypes. However, all this got log-jammed in bureaucratic bottlenecks, corporate rivalry and controversies.

On February 15, 2016, MoD received response to the EoI from L&T, Mahindra Defence Systems, Reliance Defence, Consortium of Tata Motors and Bharat Forge, OFB and Consortium of Tata Power SED and Titagarh Wagons Limited. But more hurdles came up with private domestic companies objecting to MoD nominating state-owned OFB as one of the DA, especially since DPP 2008, according to which the procurement is being done states that the DPB would select the best "two" DAs out of the short-listed companies of the design and development of the prototype. In mid-2017, the US also offered trilateral



(Above) A model of Futuristic Infantry Combat Vehicle; Indian Army's BMP-2 Combat Vehicle

collaboration of US-India-Israel JV for producing the FICV under the DTTI. Media reports of June 2017 indicated that the FICV project is likely to be taken up by the Defence Procurement Board (DPB) headed by the Defence Secretary. A MoD source was quoted as saying, "As per the procedure, once the DPB addresses some issues related to the FICV project raised by certain companies earlier this year, it will go to the DAC." Apparently many issues, even procedural, were hampering progress of this project.

Post issue of second EoI, Mahindra Defence Systems had lodged a complaint questioning empanelment of three other vendors, issue of a second EoI, and questioning MoD on the project status. MoD referred the complaint to a panel of Independent Expert Monitors (IEMs). In February 2018, it was reported that the IEMs found the evaluation process for selecting firms to produce FICV prototypes correct and the FICV project would finally move. But that is not to be. MoD has now sent the FICV proposal back to the army to study the possibility of shifting it under the 'Make II' category. Under the Make II category, there is no funding required from the MoD, whereas under the Make category the MoD has to provide 90 per cent of funds up to prototype stage. As per the Chapter III of DPP-2016, the 'Make' procedure for indigenous design, development and manufacture of defence equipment/ weapon systems was simplified in 2016. And a new sub-category, Make II (industry funded), was introduced. No government funding is mentioned for the development of the prototype albeit there is an assurance



Russia offered to supply BMP-3 but was not accepted by GoI as indigenous firms invested heavily in FICV project

of orders after successful development and trials. Incidentally, Mahindra Defence Systems, Reliance Defence and Engineering and Titagarh, Wagons had submitted their plans for the FICV as required under Make II category. Others had not because none had been asked to submit their proposals accordingly.

The question here is that after DPP 2016 and the Strategic Partnership Model (SPM) came into force, why were all firms / consortiums that had responded to the second EoI not asked to submit their proposals under Make II category? There obviously is no accountability and sense of responsibility. By throwing the file back at the army, it is quite likely that the whole process may recommence. With the US-India-Israel JV proposed by the US, even a third EoI could be floated. The irony is that the BMP-II has no night fighting capability. It was hoped that the FICV will at least commence replacing the BMP-II by 2017,

with phasing out of BMP-II commencing in 2018. In 2017, MoD awarded Rs 2,400 crore contract to upgrade 693 BMP-2s with night fighting capabilities but the army is yet to receive first of the upgraded BMP-2. Follow up of the first EoI was stunted because of perceived inconsistencies in evaluation of EoI responses between the IPMT and MoD's Acquisition Wing; MoD scrapped the process saying it would restart it in nine months but took three years before the project was restarted in 2015. With the current impasse, vendors selection may take another 3-4 years after the prototypes are trial evaluated. Therefore, induction of the FICV will likely commence only around 2029-30, provided there are no more hurdles. This indeed is a sad state of affairs. Yet the government is unconcerned that MoD is manned purely by bureaucrats; sans military professionals – an irony peculiar to India. ■

– The author is veteran
Lieutenant General.

WITH THE CURRENT IMPASSE, VENDORS SELECTION MAY TAKE ANOTHER 3-4 YEARS AFTER THE PROTOTYPES ARE TRIAL EVALUATED. THEREFORE, INDUCTION OF THE FICV WILL LIKELY COMMENCE ONLY AROUND 2029-30, PROVIDED THERE ARE NO MORE HURDLES

INDIA-KOREA RELATIONS AND STRATEGIC IMPORTANCE FOR REGIONAL SECURITY

Both countries should expedite the process of enhancing military exchanges, training and experience-sharing and contain the increasing presence of China in the region by creating far-sighted mutual confidence

By **SANGEETA YADAV**

India-Republic of Korea relations have been making great strides in the recent years and have become truly multi-dimensional, spurred by a significant convergence of interests, mutual goodwill and high-level exchanges. In November 2018, South Korean First Lady Kim Jung-sook visited India and Ayodhya prominently featured on her four-day schedule. She was invited as the chief guest by the Government of Uttar Pradesh during Diwali celebrations in Ayodhya. This is not only an indication of strong ties between both the countries but also a demonstration of efforts to trace relations that go all the way back to 48 AD. As per the historic legend “Samguk Yusa” or “The Heritage History of the Three Kingdoms”, written in the 13th century, a Princess from Ayodhya (Suriratna) came to Korea, married King Kim-Suro of the Gaya dynasty and became Queen Hur Hwang-ok.

If we look at the more recent history of relations between India and Korea, India has played an important role in Korean affairs after its independence in 1945. During the Korean War (1950- 53), India played a major role as a negotiator between both the warring sides as they accepted a resolution sponsored by India under the leadership of Lieutenant General K.S. Thimayya, thus declaring a ceasefire in July 1953. Since then, consistent Indian support for peaceful reunification of the two Koreas has been well received in Korea.

BILATERAL RELATIONS DURING COLD WAR

As the cold war between the USSR and the US kept the world bipolar and relations among nations were more driven by ideologies of the two power blocs, India opted for non-alignment where it stayed neutral as a state. Nevertheless, due to interactions of the leaders with communist bloc, South Korea being a pro-US state kept its relations at par with India with no further involvement and substantial development in the direction.



Prime Minister Narendra Modi with South Korean President Moon Jae-in during the latter's visit to New Delhi

LIBERALISATION OF INDIAN ECONOMY AND SOUTH KOREA'S NEW ASIA INITIATIVE

Indo-Korea relations took the first important step with the end of cold war as India opened its doors for foreign investment by liberalising its economy in 1991. India's 'Look East' policy, which was initiated along with its liberalisation in order to develop closer ties with East Asian economies, was not only part of its reform package but a strategy to counterweight China's influence in the region. Developed and enacted during the Prime Minister Narshima Rao's government (1991-1996), it was rigorously pursued by the successive administrations, with the Modi government taking it to next level as Act East Policy.

On the other hand, Korea which has achieved marvelous economic growth in a short span of time has been mostly focused on the western countries as a potential market. With liberalization of the economy, along with Look East Policy, India allowed it to look for new markets with tremendous growth potential. Korean Chaebol-like LG, Samsung and Hyundai were quick to react and entered the Indian market with their high quality and price competitive electronics and automotive products.

INDO-KOREA DEFENCE RELATIONS OVER THE YEARS

India and Korea political-security ties got momentum after signing of "CEPA" in the field of Military, Maritime and Naval agreements, arms market and Nuclear energy agreements. India conducted joint naval manoeuvres with the Korean Navy in 2000, 2004, and again in 2008. The first visit was made



(Above) PM Modi being welcomed by the then South Korean President Park Geun-hye during a meeting in Seoul; (Below) Electronics and Information Technology Minister Ravi Shankar Prasad addressing the delegates

by S.M. Krishna, External Affairs Minister of India. Krishna went on an official visit to Korea in 2012 to attend the sixth Joint Commission Meeting (JCM) in Seoul. In his visit, he met with President Lee Myung-bak to strengthen trade and bilateral relations among the two and development for manufacture of military equipment.

Defence relations between India and South Korea have expanded in recent years, spurred by a convergence of strategic interests, shared mutual goodwill and several high-level exchanges. Bilateral ties between the two

countries were raised to the level of 'Strategic Partnership' during the visit to India by the previous President of Korea Lee Myung-bak in January 2010 and further elevated to "Special Strategic Partnership" during the visit of Prime Minister Narendra Modi to Korea in 2015.

Several important agreements were signed during the visit to Korea of then Defence Minister A.K. Antony in September 2010 including MoUs on Defence Cooperation, and Defence Research and Development. India agreed to set up a Defence Wing

DEFENCE RELATIONS BETWEEN INDIA AND SOUTH KOREA HAVE EXPANDED IN RECENT YEARS, SPURRED BY A CONVERGENCE OF STRATEGIC INTERESTS, SHARED MUTUAL GOODWILL AND SEVERAL HIGH-LEVEL EXCHANGES

BILATERAL RELATIONS



(Above) Delegates at the India-ROK Strategic Consultation Forum 2017 at Bengaluru; (Below) Defence Minister Nirmala Sitharaman with her South Korean counterpart

THE TWO COUNTRIES HAVE INSTITUTED SEVERAL FORUMS FOR REGULAR INTERACTION BETWEEN THE TWO MINISTRIES OF DEFENCE. THE DEFENCE POLICY DIALOGUE (DPD) INSTITUTED AT THE LEVEL OF DEPUTY MINISTER IN 2013, HAS SINCE BEEN UPGRADED TO THE LEVEL OF DEFENCE SECRETARY AND WILL NOW BE A PART OF '2+2 DIALOGUE', BETWEEN THE TWO SIDES.

at its Embassy at Seoul, which opened on October 26, 2012. This was followed by several apex level engagements, to include, visit of Minister of National Defence of Korea, Kim Kwan-jin to India in December 2012, and visit of former Defence Minister of India, Manohar Parrikar, to Korea in 2015. A bilateral Agreement on the Protection of Classified Military Information was concluded during the state visit of President Park Geun Hye to India in January 2014. It was also agreed to hold a regular dialogue between the national security

structures of the two sides.

The current President of Korea, Moon Jae-in visited India in July 2018 and held summit with Prime Minister Modi. In a joint statement the two leaders agreed to explore further possibilities to coordinate efforts in the defence and strategic spheres in order to benefit from each other's unique capabilities and experience and in this context agreed to enhance military exchange, training and experience sharing, Research & Development and to enhance defence industry cooperation.

The two countries have

instituted several forums for regular interaction between the two Ministries of Defence. The Defence Policy Dialogue (DPD) instituted at the level of Deputy Minister in 2013, has since been upgraded to the level of Defence Secretary and will now be a part of '2+2 Dialogue', between the two sides, Joint Committee Meeting (JCM), a bilateral dialogue for cooperation in defence industries & logistics, between Minister Defense Acquisition Program Administration (DAPA) and Secy (DP) is held every year. A total of seven JCM have since been held with the last one at Delhi in April 2018. Steering Committee Meeting (SCM) is a bilateral dialogue for joint defence R&D between DRDO & DAPA / ADD (Korea). A total of four SCM have since been held with the 4th one held at Seoul in December 2017.

Bilateral Maritime cooperation has been one of the vibrant aspects of defence & security relations between India and Korea. Navy and Coast Guard ships have been visiting each other's ports on a regular basis and have also been holding joint exercises. In 2017 Three Korean Navy ships

visited Indian ports and held exercises with the Indian Navy, while Indian Coast Guard (ICG) Ship "SHAURYA" visited Korea. In April 2018, one Korea Coast Guard (KCG) ship visited India and participated in SAREX-18, conducted by ICG. A delegation led by Commissioner General KCG also held 9th High level meeting with DG, ICG, while ICG participated as an observer in MMEX (Multilateral Multi Disciplinary Exercise) hosted by KCG.

There have been regular and active exchanges of bilateral visits by delegations from various military training establishments that include the National Defence College (NDC), higher command and management courses and training centre for United Nations peace keeping operations.

CONCLUSION

Keeping in mind the above mentioned fact, it can be concluded that Indo-Korean defence relations are nothing less than a win-win situation for both the countries. In order to modernise its defence capabilities, India has emerged as the largest arm importer in the world which has been traditionally supplied by Russia and more recently by the USA, France and Israel. With its robust arms industry meeting 70 per cent of its domestic needs, South Korea has become a major player in the global arms market and is well positioned to cater many of India's military requirements. India and South Korea should expedite the process of enhancing military exchanges, training and experience-sharing, and research and development, including innovative technologies for mutual benefit.

By creating far-sighted mutual confidence, both the countries can contain the increasing presence of China in the region. Since India



South Korean First Lady along with UP Chief Minister Yogi Adityanath during the former's visit to the state



ICG, JCG personnel during exercise SAREX-18

is facing pressure in its own turf in South Asia due to China's 'string of pearls' strategy, India has no reason not to design a similar strategy in East Asia. India-Japan relations are an example of this policy. Being two leading democracies in Asia, with no conflict in the past and similar strategic interest in the region, India and South Korea are natural allies. Moreover, recent developments across Korean peninsula will have significant positive impact on the relationship between the two nations. Similarly, both the countries can also contain North Korea too.

In the future ahead, the two

nations must extend their ties in sectors like infrastructure development project (e.g, shipping and port), intelligence sharing, information and communication technology. At the multilateral level, they can cooperate with countries like Japan in sectors like renewable energy, telecom healthcare, higher education, maritime security, counter terrorism, climate change, etc. In the end, India must continue to develop its relations with Korea, with special focus on defence and strategic relations .

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THE UNTOLD STORY OF COMBAT PROVEN SUBMARINE INS ARIHANT

INS Arihant is a nuclear underwater shield and deterrent sword in India's nuclear triad. With the commissioning of INS Arihant, India achieved a significant milestone of becoming a nuclear triad

By **CMDE (RETD) RANJIT B RAI**

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Submariners motto is to 'Run Deep Run Silent' hence submariners seldom boast, but the world over they are admired as the epitome of naval service. Submarines are dubbed as the sword arms of a nation for war, and nuclear submarines are the vehicles of stealth for nuclear deterrence from the seas with underwater launched missiles. Here it would be relevant to recount Indian Navy's tryst to induct nuclear submarines from Russia and then successfully building them in India, with Russia's help resulting in the evolution of the untold story of INS Arihant (S2) commissioned in 2016, connected with acquisition of K-43, the first Chakra in 1988.

In the 1971 war when the US Task Group (TG-74) led by USS Enterprise entered the



Prime Minister Narendra Modi announcing the completion of deterrence patrol by country's first nuclear ballistic missile submarine

Bay of Bengal to intervene on behalf of Pakistan on President Richard Nixon's orders, the Soviet Union leaders sailed a nuclear submarine at high speed to the Bay and warned the US not to intervene. This ability of nuclear submarines made a mark on the then Prime Minister Indira Gandhi. After India's 'Peaceful Nuclear Explosions' (PNE) at Pokhran in May 1974 code named Op Buddha, Mrs Gandhi sounded the Department of Atomic Energy (DAE) and Bhabha Atomic Research Centre scientists at Mumbai to think of making a nuclear reactor. She explained

Germany had built a nuclear propelled ship the Otto Hahn, Mitsui in Japan had built a similar vessel despite public outcry, the US had sailed Savannah and Soviet Union operated the Sevморпут. Nuclear propulsion looked like the future even for merchant ships, as fuel prices were on the rise. The US was fitting aircraft carriers with nuclear propulsion after submarines as Soviet Union was doing.

Indian Naval engineers were accepted by Indian nuclear scientist Dr Homi Nusserwanji Sethna for nuclear training at (BARC) in Mumbai, but funds were short for the construction of the reactor. In 1977, Mrs Gandhi's Principal Private Secretary PN Haksar, as Deputy Chairman of the Planning Commission, advanced funds to BARC during the emergency and work was begun for designing a miniature reactor in a project called Plutonium Reactor Project (PRP). Naval technical officers in BARC led by

Captain Subba Rao convinced the engineers to use enriched uranium as plutonium reactors would not allow swift speed changes in a vessel. Rare Materials Plant near Mysore was tasked to produce fuel with uranium and later was acquired from Russia to make the mix.

The Indian Navy's desire to operate and construct nuclear submarines took shape in 1980 when the Advanced Technology Vehicle (ATV) project was set up in Kashmir House in New Delhi under Dr V S R Arunachalam, Chairman of the Defence Research and Development Organisation (DRDO) as a classified project headed by Vice Admiral Mihir Roy, and later Vice Admiral Bharat Bhushan supported by his student roommate in London Dr Raja Ramanna, Chairman Department of Atomic Energy (DAE), with funding from the Prime Minister's Office (PMO) and DAE to DRDO.

Navy agreed to fund the manpower and provided the space



THE INDIAN NAVY'S DESIRE TO OPERATE AND CONSTRUCT NUCLEAR SUBMARINES TOOK SHAPE IN 1980 WHEN THE ATV PROJECT WAS SET UP IN KASHMIR HOUSE IN NEW DELHI UNDER DR V S R ARUNACHALAM, CHAIRMAN OF THE DRDO



INS ARIHANT

Arihant Class SSBN: India's first of the five nuclear submarine projects.
Displacement: 6,000 tonnes **Dimensions:** 112m x 11m x 10m
Speed: 24 knots, 93 MW Plant Complement. 95 **Armament:** 6 x 533mm
Torpedo tubes: 12 x K15/B05 750 VLS SLBM

Notes: This Ballistic Missile submarine is the first of three "SSBN's" to be constructed by India at SBC after Indians disregard for nuclear weapons, changed in the early 1970s when USSR sent a submarine to thwart the USS Enterprise Task Force and the Chinese naval build-up, and India's maritime power projection in the Indian Ocean. It is based on Soviet help from Rubin after operating the leased INS Chakra (1988-91) as a six "Nuclear Powered Ballistic Missile Submarines working template for the "Arihant" class.

NUCLEAR TRIAD

for a submarine building facility in Visakhapatnam’s sprawling naval dockyard built in 1970s with Soviet help. Naval architects, technical staff and BARC personnel jointly designed a land based prototype nuclear reactor S1 at the Indira Gandhi Centre for Atomic Research (IGCAR) at Kalpakkam, overcoming Navy’s plans to build it at Mangalore where Mazagon Docks Ltd (MDL) had acquired sea front.

The half submarine (S1) was made operational with a prototype nuclear reactor and turbines and a propeller around BARC’s reactor under Dr Anil Anand, who commissioned the facility with Dr S Basu in early 1991. India contracted and acquired a nuclear submarine K-43 from the Soviet Union on lease to gain operational experience. Admiral of the Fleet Sergie Gorshkov supported the transfer under Soviet supervision. Captain RN Ganesh (later DG ATV) was appointed Commanding Officer and A Terenov was appointed as the Russian Safety Captain. Later Chakra did not have any Russians on board.

Twenty year old K-43 was commissioned after PM Rajiv Gandhi met Soviet President Gorbachev and overcame US objections as INS Chakra S-71 on January 5, 1988 in -25* C with minimum fanfare and only a lunch by Ambassador TN Kaul and dinner by C-in-C Pacific Fleet Admiral GA Khvatov and sailed submerged from Vladivostok for the long passage to avoid detection. The Indian Navy operated INS Chakra from 1988 to 1991 on both the Indian coasts with 63 km range Amethyst missile firings (SS-N-7 NATO Code name Starbright), Casexes (Combined Ship cum Aircraft and Submarine exercises) and torpedo firings, in company of the fleet.

The story of Arihant began soon



“THE SUBMARINE HAS CREATED ITS OWN TYPE OF ‘OFFICER AND MAN’ WITH LANGUAGE AND TRADITIONS APART FROM THE REST OF THE SERVICE, AND YET AT HEART UNCHANGINGLY OF THE SERVICE”

RUDYARD KIPLING, BRITISH JOURNALIST AND AUTHOR

of Ship Building, supported the construction of the SBC and the Machinery Test Centre (MTC). While work shares were given to Bharat Electronics Ltd (BEL) for turbines and heat exchangers, Larsen & Toubro Ltd (L&T) for construction in a leased shed at SBC and the Defence Research and Development Laboratory (DRDL) many smaller SMSEs contributed to the indigenous construction of the Arihant.

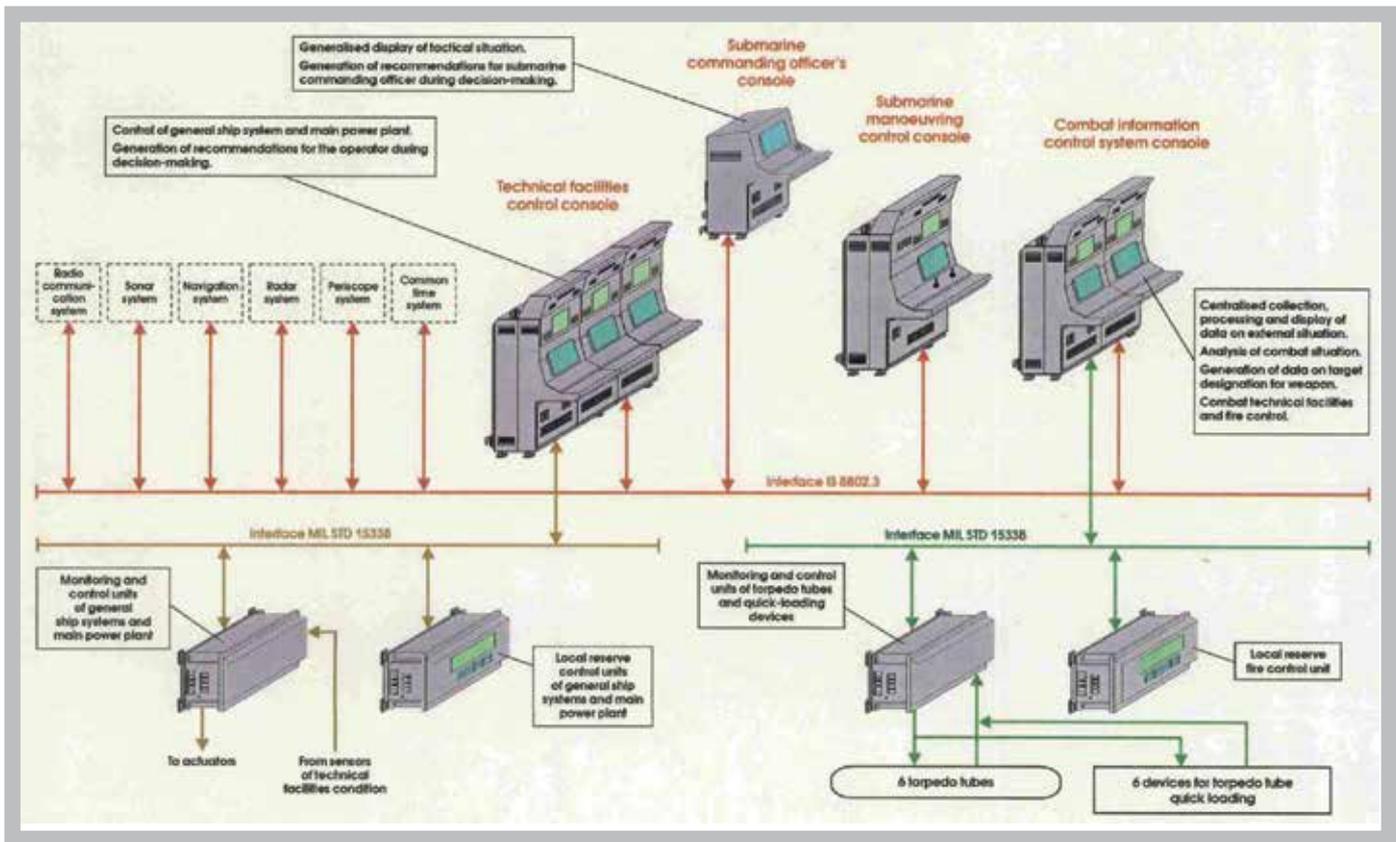
The sprawling Defence Machinery Development Establishment (DMDE) in Hyderabad was set up to execute trials of major equipment before installation. DRDO under Dr APJ Kalam was most enthusiastic to support the project to be executed by naval Director Generals of the Vice Admiral rank. DG ATV Vice Admiral PC Bhasin cut the first steel in the 1990s and a replica reactor with enriched Uranium was installed later on Arihant. On August 10, 2013 Dr Usha Paul was the first to insert the rods to set alight the Indian built 80 MW Pressurised Water Reactor (PWR) on Arihant based on a Russian design by Malakit of Russia with modifications by Indian Navy’s

after under Project Akashanka (Hope Ex ATV) to build the 6,000 tonne nuclear submarine as a technology demonstrator at the Ship Building Centre (SBC) is an inspiring story not made fully public. The Joint Indo-Soviet Working Group (JISWG), alternately chaired by DG ATV and the Soviet Deputy Minister

The nuclear submarine INS Chakra



NUCLEAR SUBMARINE K-43 WAS COMMISSIONED AFTER THEN PRIME MINISTER RAJIV GANDHI MET THEN SOVIET PRESIDENT GORBACHEV AND OVERCAME US OBJECTIONS AS INS CHAKRA S-71 ON JANUARY 5, 1988



Submarine Design Directorate (INSDD) and Weapons & Electronics Systems Engineering Establishment (WESEE) for conversion to Indian conditions.

The reactor performed. The sleek black pear shaped submarine was launched on July 26, 2009 by Gursharan Kaur, wife of then Prime Minister Manmohan Singh in his presence who said: "I thank our Russian friends for their consistent and invaluable cooperation which symbolises the close strategic partnership that we enjoy with Russia." The INS Arihant (S2) was commissioned at the Ship Building Centre (SBC) in August 2016 and the commissioning warrant signed by Chief of Naval Staff (CNS) Admiral Sunil Lanba was read out in a low key ceremony by Capt KJ Venkatraman. She is capable of firing twelve 750 km ranged vertical launched one tonne nuclear tipped K-15 missiles, and

was reported on patrol. India became the sixth nation in the world to build nuclear boats.

A new submarine base Varsha is coming up at Rombilli south of Visakhapatnam with a complex of the Department of Atomic Energy (DAE) to support nuclear submarines and relieve the congestion in SBC where the second larger SSBN Arighat (S3) is in advanced stage of contraction and S4 is progressing to be fitted with eight long range 2,500 km K-4 underwater launched nuclear missiles. Some construction work for facilities to build S5 based on the Typhoon design is reported.

In October 2018 after some repairs needed due to flooding, INS Arihant completed a long deterrent patrol in the Indian Ocean, and while underwater reported readiness to fire the 750 km ranged nuclear tipped K-15 missiles on to a designated target whose co-ordinates

were surely provided by the Nuclear Command Authority (NCA) and Strategic Forces Command (SFC). Thereafter, the missile release codes provided by the Prime Minister must have been transmitted from INS Kattabomman's large antennas and received in an Extra Low Frequency (ELF) bit rate encrypted signal by the Submarine's Commanding Officer from the trailing French supplied Neredis antennae. This proved INS Arihant was an integral part of India's Triad and she was received and complemented by Prime Minister Narendra Modi at Visakhapatnam on November 5 and personally gave a message that India cannot be blackmailed by nuclear neighbours. ■

The writer is author of Warring Nuclear Nations-India and Pakistan (ISBN 978-93-5158-638-0) and Future Indian Navy 2018 (ISBN 9-78-0-9932898-6-6)



THE INS ARIHANT (S2), COMMISSIONED BY CHIEF OF NAVAL STAFF (CNS) ADMIRAL SUNIL LANBA AT THE SBC VISAKHAPATNAM IN AUGUST 2016, CAPABLE OF FIRING TWELVE 750 KM RANGED VERTICAL LAUNCHED ONE TONNE NUCLEAR TIPPED K-15 MISSILES. INDIA BECAME THE SIXTH NATION IN THE WORLD TO BUILD NUCLEAR BOATS



‘WE ENSURE TO MAKE HUGHES PRECISION A MAKE IN INDIA SUCCESS STORY’



anjay Soni is the Managing Director of Izmo Limited. An alumnus of Indian Institute of Management, Bangalore (IIMB), he focuses on defence production and new ventures.

In conversation with Raksha Anirveda, Mr Soni talks at length about Izmo Ltd’s associate company Hughes Precision’s recent foray into the manufacturing and proof testing of Military Caliber Ammunition.

An excerpt:

Q *Congratulations from Raksha Anirveda as Izmo Ltd’s associate company Hughes Precision Manufacturing Ltd, received a license from Ministry of Home Affairs (MHA), Government of India,*

in September last year to manufacture and proof test Military Caliber Ammunition (MCA). What is it all about?



Hughes Precision will be manufacturing and proof test Small Caliber Ammunition

(SCA), the Calibers are:

- 9 x 19 mm
- 5.56 x 45 mm
- 7.62 x 39 mm
- 7.62 x 51 mm
- 7.62 x 54 R
- 8.6 x 70 mm
- 12.7 x 99 mm
- 12.7 x 108 mm

Projected capacity of these Calibers is 60 millions rounds per year in Phase 1. The trial production of SCA would start in Goa in July 2019.

Q *Will the manufacturing and proof testing of Military Caliber Ammunition (MCA) be totally indigenous or you have tied up to form a JV with a foreign entity to take it forward?*

The manufacturing and proof testing of MCA are totally indigenous. In the first phase we will be importing propellant and primers, which are roughly 15 per cent of the cartridge cost, and subsequently only the primer will be coming here which is just 2.5 per cent.

It is the best example of ‘Make in India’. It will be an Indian product with minimal import content with the quality to match any renowned ammunition brand. The facility set up in Goa is world class with the best possible machines and equipment required for such manufacturing.

Q *A report quoted you as saying that your company is the first in the private sector to receive such a license. How do you feel about this?*



Hughes Precision is grateful to the Ministry of Home Affairs to have issued the first license in this sector. The company will manufacture a quality product that matches imported ammunition and fulfill the requirement of the Indian Armed Forces. Hughes Precision will also export 60 to 70 per cent of the production to neighbouring countries Ministry of Defence. We will ensure and make Hughes Precision an



example of the success of the 'Make in India' policy in defence sector.

Q How will the latest development boost indigenous defence manufacturing and Make in India? Your views.

A As per the market surveys, Asia Pacific is projected to expand at the highest CAGR during the period from 2019-2026 due to increasing military spending and growing demand for Small Caliber Ammunition from countries such as China, India and Pakistan. China accumulated the highest market share in 2017 due to increasing investments in development and procurement of arms. The ammunition market in China is

expected to expand at the highest share of 5.4 per cent during the forecast period. Apart from China, countries such as India, South Korea, and Japan are also expected to contribute significantly to the Asia Pacific ammunition market.

This way the latest development will boost indigenous defence manufacturing and Make in India.

Q How is this going to reduce import dependence in terms of defence ammunition / equipment and also in opening up avenues for companies like yours. Please elaborate?

A. Quality and quantity concerns regarding ammunition from the Ordnance

Factories in India:

As per reports, accidents caused by faulty ammunition made in Ordnance Factories (OF) in India have seen an abnormal rise in the last few years. One of the main anti-aircraft guns, L-70, of the Army is largely inactive because of being unserviceable, a senior official from the Ministry of Defence said.

Six people were killed and 18 injured in a massive explosion at Pulgaon-based Central Ammunition Depot in Maharashtra's Wardha district, around 110 km from Nagpur, in late November 2018 when they were disposing of unused ammunition made at the Khamaria Ordnance Factory Board (OFB). These were unserviceable anti-aircraft ammunition. On average, unserviceable ammunition has caused 65-70 accidents annually since 2013-2014.

The present state of preparedness has created voids due to the limited production capacity of the Ordnance Factory and consistent slippage in production targets. Informing the Ministry of Defence and Parliamentary oversight committee, Indian Army wrote, "Out of 22 items indented on Ordnance Factory Boards

SMALL CALIBER AMMUNITION SEGMENT IS EXPECTED TO COMPRISE 35.3 PER CENT OF THE OVERALL AMMUNITION MARKET IN 2026



(OFBs), as part of the ammunition road map, 14 items were not supplied at all.”

The same was substantiated by the Comptroller and Auditor General (CAG) in the Audit report tabled in Parliament on the issue of critical shortage of ammunition in the Indian Army. The state-run Ordnance Factory Board (OFB) has been slammed on the following:

- Deficiency in availability of ammunition to Army
- Inadequate quality of ammunition supplied to Army since March 2013.

- No significant ammunition management in Army in 2015, no significant improvement took place in the critical deficiency of ammunition and quality of ammunition supplied by the OFB.

- Shortfall in meeting the production target by OFB continues

B.The Global Demand Scenario:

The global ammunition market is broadly segmented by type, caliber, and application. By type, the Full Metal Jacket (FMJ) ammunition segment is consistently expected to garner the highest market share

between 2019 and 2026.

The growing demand for Full Metal Jacket (FMJ) ammunition for military applications is the major reason for its dominance throughout the forecast period. FMJ provides various advantages such as high accuracy, high-volume shooting, and reduced depositing of metal due to jacket over the core. It is also cheaper and more resistant to damage, thereby escalating its demand in various industries. Additionally, tracer ammunition segment is expected to expand at a significant CAGR of 3.6 per cent because of increasing military applications as they are visible to the naked eye during daylight, and are very bright during night time firing.

By caliber, small caliber ammunition represented the highest share in 2017 and is further expected to lead the global ammunition market during the forecast period due to the growing demand for combat and premium projectiles. SCA segment is expected to comprise 35.3 per cent of the overall ammunition market in 2026. By application, the military segment represented highest market share in 2017.

Increasing military activities and changing role of modern military troops are increasing the demand for various ammunition for specific applications. Furthermore, increased defence expenditure in order to reinforce the military strength, modernise the armed forces, and firmly safeguard national security and sovereignty. Developing interests are further responsible for its significant share among all applications. All these above mentioned factors really amplify the need for manufacturing Small Caliber Ammunition in the private sector so that quality and quantity concerns are taken care of and dependence on imports becomes an issue of the past. ■

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DEFENCE FORCES USING OFF THE SHELF CHINESE DRONES IS A THREAT TO NATIONAL SECURITY



By **SAI PATTABIRAM**

Self Reliance coupled with responsible use advocacy globally is a great opportunity for India to lead the world in the future expansion of the sensitive dual use technology

in the case of the telecom sector in the USA.

The truth and facts clearly weigh heavily against the Chinese manufacturers who hold a strangle hold on the global drone manufacturing as a consequence the shipments as shown in the bar chart:

These figures translate to a ratio of around 600:1; 600 drones for every civilian aircraft which is expected to double in three years. With such high population densities of drones it is inevitable that they would cross paths with airliners more often than they did earlier.

The current situation has been created by Chinese companies dumping this sensitive Dual Use Technology Product by the millions with questionable ethics and intent knowing fully well that regulators across the world did not have any regulatory framework in place and hence drone use in civilian airspace was questionable. The result civilian drones are populated all over the world in the millions even before the regulators could conceive a drone regulatory framework.

D

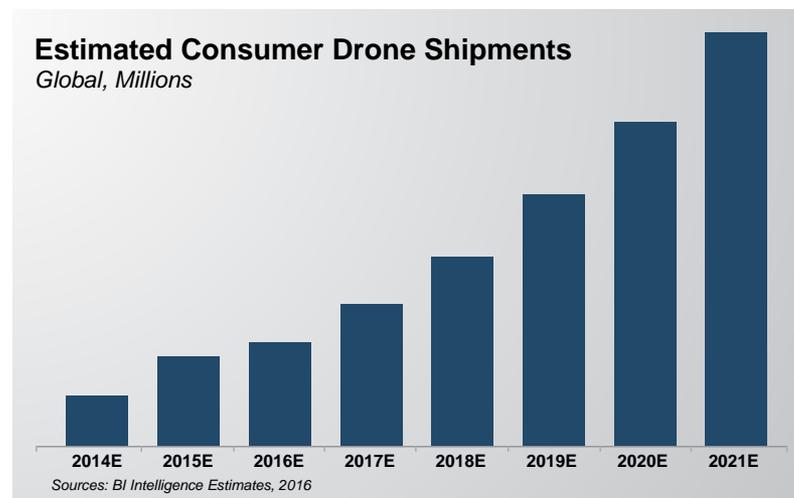
rone Tech is in fact a Sensitive Dual Use Technology that has been Proliferated Across the World Largely by the Chinese in a completely irresponsible and unregulated manner presenting threats to National Security for countries across the world Given the Use of Chinese Off the Shelf Unsecure Drones by their Defence forces.

GLOBAL DRONE SCENARIO IN DETAIL

UAVs or drones as they are better known have been grabbing headlines for all the wrong reasons in the recent past primarily being blamed for causing severe disruptions to commercial airlines' flight schedules over the Christmas weekend at Gatwick and later at Heathrow in the UK.

Today within the drone industry, the anti-drone segment is far more active than ever before with the drone manufacturers predominantly Chinese led by DJI being on the defensive projecting a very high

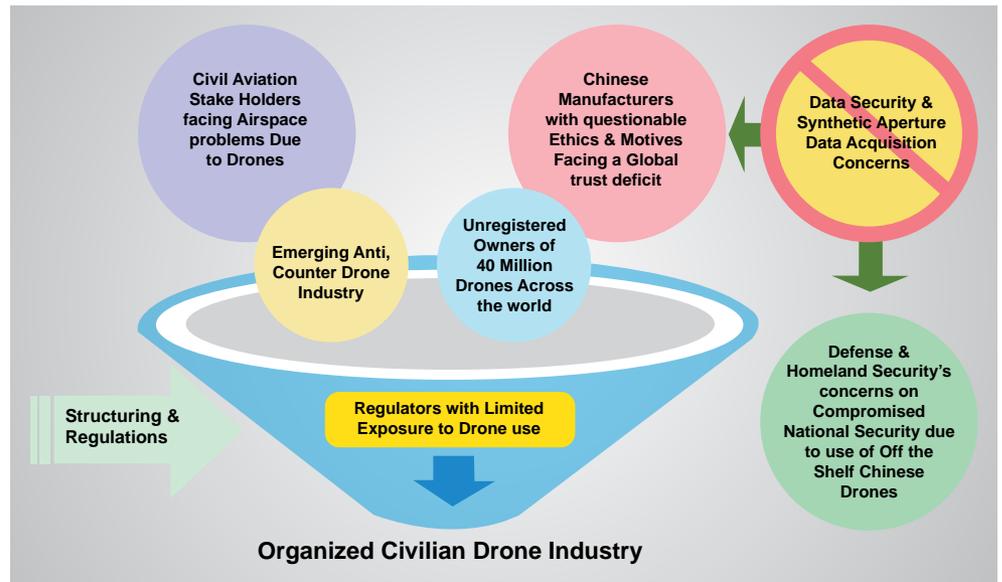
moral and ethical ground in relation to data security despite the actions of ZTE and Huawei being proven to be otherwise



It is only now that the countries across the world are waking up to the fact that these predominantly Chinese drones are posing tangible threats simultaneously to:

- 1 Civilian Air Traffic
2. Airports
3. Strategic defence assets by way of Synthetic Aperture Data Acquisition being a strong possibility given the ZTE & Huawei Experience and the fact that defence forces are using these Commercial Off the shelf Chinese drones at Strategic Defence installations.

Use of off-the-shelf civilian drones by defence forces is best visualized by the image right:



EFFECTIVE REGULATION KEY FOR DEFENCE

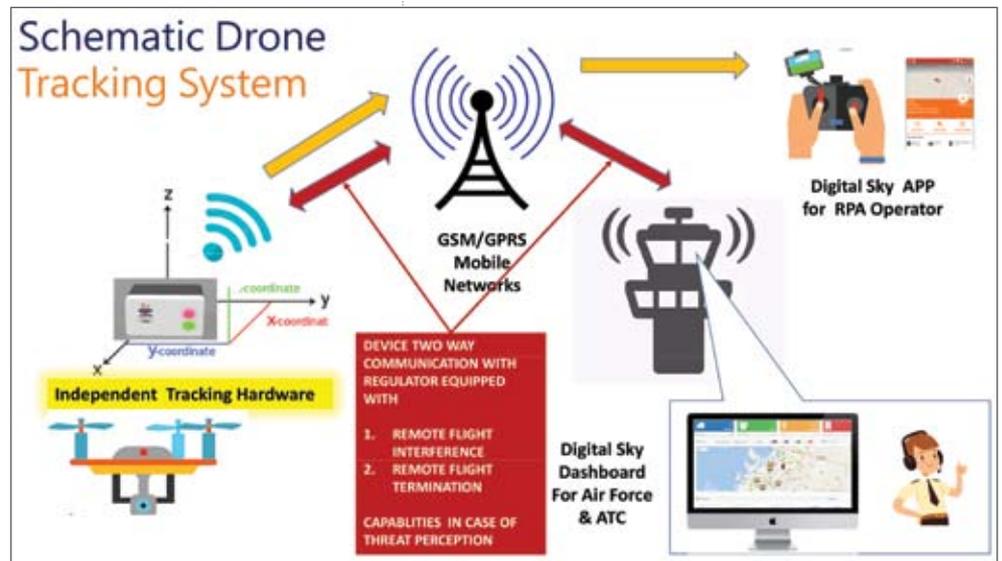
We have all seen the omnipresent DJI's consumer drones like the Phantom and Mavic flying around capturing selfies, videos and any kind of images. We have been wonderstruck at the high definition and clarity they deliver with such small cameras, the ease of transfer of data and information.

They are so user friendly that flying a drone has almost become as easy as using a point and shoot camera on a mobile phone.

Today DJI drones are practically spread across every country in the world with half a million of them estimated to be the population in India.

The threat to national security can be best explained by taking the example of Pune, a strategic city from the defence perspective in the state of Maharashtra. Pune is home to the following defence organisations:

- The home to one of its most strategic Airbases



- The headquarters of the Army's Southern Command
- It houses one of the army's largest strategic supply depots
- It houses three defence educational institutions
- It houses one of the largest defence hospitals in India
- It house ordnance factories
- DRDO has a significant presence as well
- Multiple other Corps, regiments, units of the army

Pune has an estimated 10,000 DJI drones which are completely Illegal without any trace or

paperwork of ownership.

- The national security threat to defence installations like those in Pune or many others across India is a reality.
- Hence effective regulation and control of civilian use of the Sensitive Dual Use Technology is a critical component of national defence as well

The suggested two layered regulatory framework for civilian drones as below:

Quasi-Passive Systems: That tracks and log the operations of registered drones and also



enables Regulators to warn operators & Commandeer it in the event of Dangerous violations that pose danger to other air traffic as shown in the Image:

The Tracking Hardware Device can be integrated with DGCA's Digital Sky to provide both live tracking of every registered Drone and Log Flight Data:

Aggressive Interventional Systems to be Installed at all Defence Installations:

The aggressive Interventional layer consists of Warning a Registered Drone user as the first step and Commandeering the Drone to either Land or Crash it remotely as well

as the Option of Shooting Registered Or Rouge Drones Down in the Event of Violation of Restricted Geo Fenced Airspace such as Airports and classified No Fly Zones.

Current details of such

locations in India are as below:

- No. Airports, Airstrips, Flying Schools and Military bases: 486
- Operational Airports : 131
- Other Locations Notified by Either Central Or State Governments as No Fly Zones

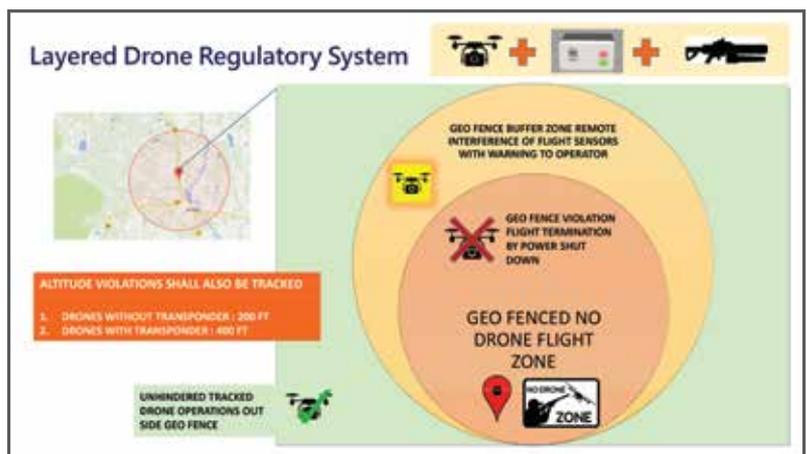
Structuring and Monitoring Airspace along above mentioned line would be a completely unique system of Drone regulation with a huge Export Potential

NOT ALL DRONE THREATS TO NATIONAL SECURITY ORIGINATE FROM CIVILIANS

The Easy access and availability of Off Chinese Origin Civilian Drones classified as COTSUAS (Commercial off The Shelf Unmanned Aerial Systems) by the US Department of Defence is a Carrot on offer to Defence Forces across the world to use them to resolve their requirements for UAVs for over the hill surveillance and other day to day uses Its hard to resist them at the very attractive prices on offer compared to military grade Drones

Indian Defence Forces also use them on a regular basis with periodic reports of DJI's operated by the Indian forces being shot down by Pakistanis.

Evidence is now emerging that given the fact that every



Drone has to register on DJI servers prior to use drones registered from specific locations could be a cog in the wheel for a larger Synthetic Aperture Data acquisition Network

Investigations by the US Department of Defence and several other in countries like Israel , Australia , UK etc have revealed that there are reasons to believe that COTSUAS can be used to access locational specific data

Post these Investigations US Department Of Defence have banned use of COTSUAS across all Defence and Strategic Installations.

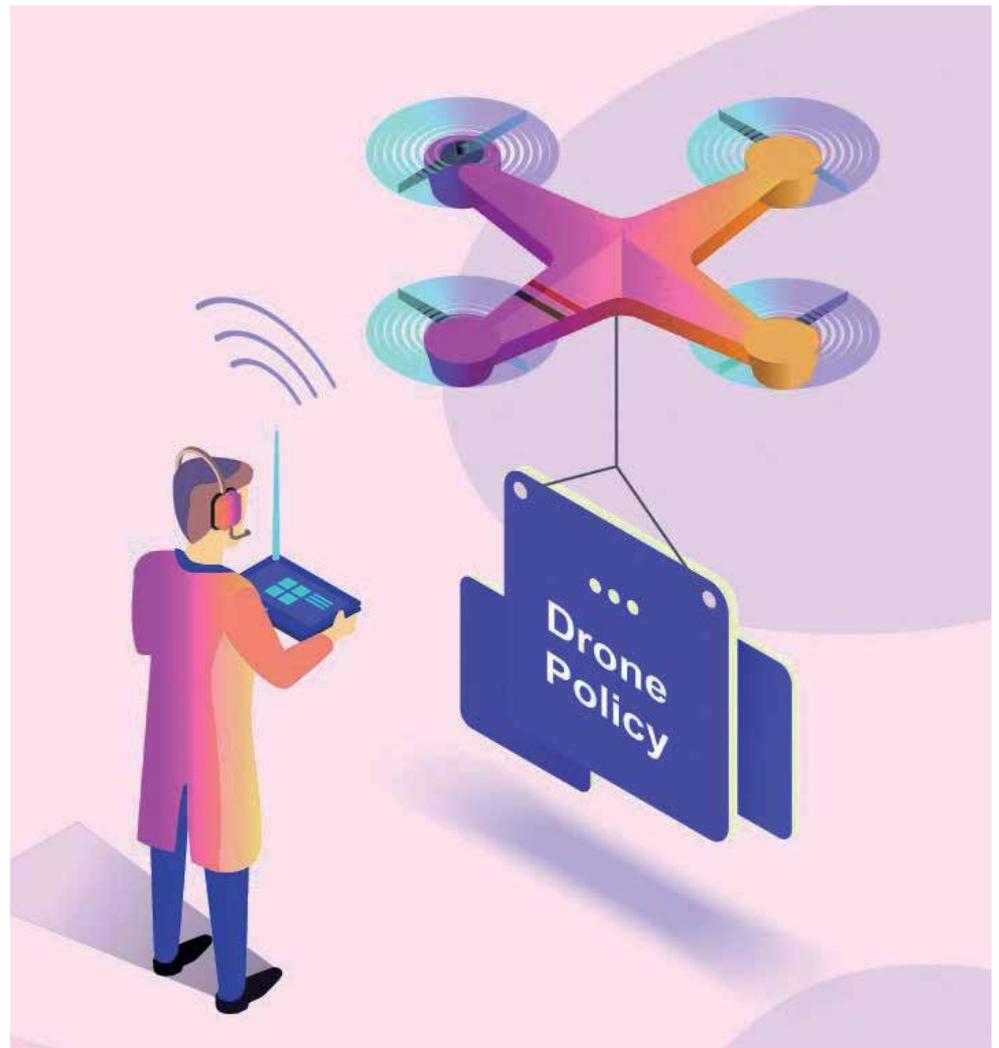
Interestingly it might also be noted that Drone use by Civil Defence Personnel like Police , CRPF use Illegal Chinese Origin COTUAS for High Security applications like VVIP “Z Level” Security. With DGCA having banned Civilian Drones in India on 7th October 2014 it is obvious that the DJI Drone used on most of these occasions is itself illegal and its remote data acquisition capabilities as mentioned above is also suspect.

EXCELLENT ‘MAKE IN INDIA IN DEFENCE’ OPPORTUNITY WITH EXPORT POTENTIAL

The use of Chinese COTSUAS by the Indian Defence Forces in itself proves the requirement and need for such low cost Unmanned Aerial Systems.

For Security reasons and based on either an Investigation by India OR based on the findings of other Defence forces like the US the use of Chinese COTUAS should be discontinued and options for development of similar cost “Made in India” options should be started.

Of Course Indian UAS



manufacturers will not be in a position to immediately Deliver the Quality levels of the Chinese COTSUAS but with perseverance on both sides these gaps can be filled out and the required functionality and quality can be achieved by Domestic Manufacturers when working directly with the Defence forces on timeline specific projects there by assuring the integrity of National Security related matters.

The Drone Systems developed by working closely with the Defence forces will also have many takers across the globe for their defence use specifically being of Indian Origin.

Hence “Make In India” Exports is a distinct possibility

CONCLUSION

Drones by their very nature are a sensitive Dual use technology that has the potential to proliferate deep into and across countries as demonstrated by the Chinese who used the lack of regulations to do so.

Hence Self Reliance coupled with responsible use Advocacy Globally is a great opportunity for India to lead the world in the future expansion of the sensitive Dual use Technology. ■

–The author is Director of Sree Sai Aerotech Innovations Pvt Ltd



DEFENCE MINISTER INAUGURATES INFORMATION FUSION CENTRE – INDIAN OCEAN REGION

The IFC-IOR aims to engage with partner nations and multi-national maritime constructs to develop comprehensive maritime domain awareness and share information on vessels of interest

Gurugram. Defence Minister Nirmala Sitharaman launched the Information Fusion Centre – Indian Ocean Region (IFC-IOR) at Information Management and Analysis Centre (IMAC) Gurugram on December 22.

Apart from representation by officials from the Ministry of Defence (MoD), Ministry of External Affairs (MEA), Ministry of Home Affairs (MHA), Ministry of Shipping and National Security Council Secretariat (NSCS), Ambassadors and Resident Defence Attaches of partner countries also participated in the event.

The Indian Ocean Region is vital to world trade and economic

prosperity of many nations as more than 75 per cent of the world's maritime trade and 50 per cent of global oil consumption passes through the IOR. However, maritime terrorism, piracy, human and contraband trafficking, illegal and unregulated fishing, arms running and poaching pose myriad challenges to maritime safety and security in the region.

Response to these challenges requires enhanced situational awareness of the maritime activities in the region so as to enable security agencies function effectively.

However, the scale, scope and the multi-national nature of maritime activities, make it difficult for countries to address these challenges individually. Hence, collaborative efforts between maritime nations in the IOR, is essential.

Towards this, the IFC-IOR aims to engage with partner nations and multi-national maritime constructs to develop comprehensive maritime domain awareness and share information on vessels of interest. The intention of this collaborative endeavour shall be to secure the global commons for a peaceful, stable and prosperous region towards the well-being of all.

In his address to the gathering, Admiral Sunil Lanba, the Chief of the Naval Staff (CNS) said that the IFC - IOR shall be a collaborative construct that will

work with partners, countries as well as international agencies; to enhance maritime security and safety.

It would also aim to work closely with the multi-national constructs and other information fusion centres said the Admiral. He further added that the IFC-IOR would work towards capability building in the region, coordination of incident response and disaster relief, and in time, also share submarine safety information.

During her address, the Defence Minister said that the objective of having an IFC-IOR is more for partners, equals to work towards keeping the global commons safe and democratically available for all of us.

She further added: "In addition to utilising our collective wisdom and resources towards addressing the myriad challenges in our region, the IFC-IOR will help us interface and integrate, wherein, we would benefit from each other's best practices and expertise.

More significantly, the IFC-IOR will help foster bonds of trust, camaraderie and partnership; ingredients that are vital for relationships between nations to transcend from being merely transactional to ones that are transformational."

The information exchange at the IFC-IOR would be initially undertaken by virtual means, using telephone calls, faxes, emails and video conferencing over internet. Subsequently, to enable better interaction, quicker analysis of information and provide timely inputs, the IFC-IOR would host Liaison Officers from partner countries.

Additionally, towards enhancing capability building, the IFC-IOR would undertake conduct of exercises and training capsules in maritime information collation and sharing.

The IFC-IOR website is accessible through <https://indiannavy.nic.in/IFC-IOR/index.html> and will be hosted as an independent portal in due course of time.



"THE IFC-IOR WILL HELP FOSTER BONDS OF TRUST, CAMARADERIE AND PARTNERSHIP; INGREDIENTS THAT ARE VITAL FOR RELATIONSHIPS BETWEEN NATIONS TO TRANSCEND FROM BEING MERELY TRANSACTIONAL TO ONES THAT ARE TRANSFORMATIONAL"

DEFENCE MINISTER
NIRMALA SITHARAMAN



INTERVIEW: TUSHAR CHHABRA

'SINCE INCEPTION ENDEAVOUR OF CRON SYSTEMS IS TO KEEP THE INDIAN BORDERS SECURE'



T

ushar Chhabra is the co-founder and Chief Executive Officer at CRON Systems. Starting his entrepreneurial career at a very young age, Tushar was Director at Chanakya Strategic Solutions Pvt. Ltd. which provided expertise in bridging the gap between conventional politics with analytics and technology. Post that he co-founded CRON Systems with a core goal to work towards making people feel safer and using IoT to automate the entire process of border surveillance.

He realised the importance of automation after spending six months at the border front and realising that developing countries would not be able to devote enough resources to man every part of the border and require technology to bridge the resource gap. With this idea he went on to found CRON Systems which has now developed some breakthrough products in perimeter security that can be customised according to the terrain and end-user requirements.

Tushar is an engineering graduate in electronics and communication engineering and he also worked as a senior strategy consultant to Google leading the Billion User Project.

*In a tête-à-tête with **Ajit Kumar Thakur** of **Raksha Anirveda**, he explains about the disruptive technology the CRON Systems is using and how his company is instrumental in securing India's long and strategic border fence:*

Q *CRON Systems is a defence technology startup which builds multi-sensor enabled intrusion detection systems, please elaborate?*

A CRON Systems is a disruptive startup within the multi-billion dollar border defence space, developing state-of-art Intrusion Detection Systems that implement the latest technologies and designs at a fraction of the costs of other leading products in that space. The solutions built are completely customised, and have been built after months of active learning at

the borders to develop a deep understanding of the end users' problems.

CRON Systems launched Kavach Z and CRON Geosight in Leh in September 2018 to secure India's 15,000 km long border, where our products can radically improve counter-insurgency measures. It has multiple elements, all of which combine to offer impenetrable surveillance to any kind of border.

Q Apart from ground intrusion, the company builds solutions to detect drones, and is also working on automated patrol vehicles? Any other area besides the border detection systems you are into?

 Our prime focus will always remain Perimeter Intrusion Detection System (PIDS) and currently we are working to empower our existing Kavach series. Working on drone related integrations are next in the pipeline.

Q Two years ago, the Border Security Force (BSF) installed KVI 101 model of CRON systems with a camouflage design along India's western border. Would like to get a sense on KV Product Line, the technology your company is into? Is this related to AI?

 The CRON KV series works on encrypted data transmission that detects intrusion. After detecting the intrusion, it transmits data over an encrypted communication network, which sends automated rovers or drones for verification.

The entire mapping and control of the concerned perimeter are done on the C&C platform miCRON. miCRON uses

advanced Machine Learning and AI algorithms to continuously evolve with the growing threats around your perimeter. miCRON secures data and gives analytics based on patterns around your perimeter to help take better and faster decisions.

Q CRON Systems products Kavach Z and GeoSight seem to be very popular for border security and surveillance needs. Your comments?

 The idea behind launching Kavach Z and CRON GeoSight was to secure India's 15,000 km long border, where our products can radically improve counter-insurgency

measures. The system has multiple elements all of which combine to offer impenetrable surveillance for any kind of border.

The revolutionary Kavach Z is the only way to prevent intrusions providing actionable intelligence about the potential attacks. Quanergy's LiDAR technology provides Kavach Z with the ability to see' ahead of the perimeter boundary. Kavach Z provides a complete 360-degree situational awareness to the defending forces by detecting object approaching the perimeter from as far as 200m away. It has the ability to detect, track and classify objects as threats providing the defending



INTERVIEW: TUSHAR CHHABRA

KAVACH Z PROVIDES A COMPLETE 360-DEGREE SITUATIONAL AWARENESS TO THE DEFENDING FORCES BY DETECTING OBJECTS APPROACHING THE PERIMETER FROM AS FAR AS 200M AWAY. IT HAS THE ABILITY TO DETECT, TRACK AND CLASSIFY OBJECTS AS THREATS PROVIDING THE DEFENDING FORCES WITH VITAL INFORMATION BEFOREHAND, GIVING THEM TIME TO PREPARE TO INTERCEPT AND NEUTRALISE THE THREAT

forces with vital information beforehand, giving them time to prepare to intercept and neutralize the threat.

CRON System's GeoSight is an advanced 3D scanner for surveillance and mapping. Its robust design makes it capable of providing reliable results in even the most extreme environmental conditions, relying on multiple laser beams that work on the Time of Flight principle to create an accurate 3D visualisation of the surrounding area.

Q Kindly elaborate on your clientele base besides the Indian Army and Border Security Force?

 Our customers include government organisations, security forces, large conglomerates and high value facilities, basically anyone who needs to secure perimeter security.

Q CRON Systems has partnered with a California based technology firm Quanergy Systems Inc, a global leader in developing light detection and ranging (LiDAR) sensors and smart



“THE IDEA BEHIND LAUNCHING KAVACH Z AND CRON GEOSIGHT WAS TO SECURE INDIA'S 15,000 KM LONG BORDER, WHERE OUR PRODUCTS COULD RADICALLY IMPROVE COUNTER-INSURGENCY MEASURES. THE SYSTEM HAS MULTIPLE ELEMENTS ALL OF WHICH COMBINE TO OFFER IMPENETRABLE SURVEILLANCE FOR ANY KIND OF BORDER”

TUSHAR CHHABRA, CO-FOUNDER AND CHIEF EXECUTIVE OFFICER, CRON SYSTEMS

sensing solutions, to avert more specifically the Uri and Pathankot like attacks. How it is helpful in safeguarding the internal security of India?

 Quanergy's LiDAR technology provides Kavach Z with the ability to see

ahead of the perimeter boundary. Kavach Z provides a complete 360-degree situational awareness to the defending forces by detecting object approaching the perimeter from as far as 200 metre away. It has the ability to detect, track and classify objects as threats providing the defending forces with vital information beforehand, giving them time to prepare to intercept and neutralise the threat.

Q CRON Systems popularly known as Defence IoT Startup gets funding from Venture Capital firm Your Nest. What is it all about?

 CRON Systems is driven by a vision to make PIDS simpler, smarter and safer. It's been endeavour of the founders of CRON Systems since inception to keep the Indian borders secure. The solutions built by CRON Systems have been completely customised and have been built after months of active learning at the borders to develop a deep understanding of the end users' problems.

Your Nest as an early stage investor invest in companies which are technology driven and come up with innovative solutions. CRON Systems received pre-series A round of investment from Your Nest last year. The capital raised was utilised for research and development, talent acquisition, and expansion to the Middle East, Africa and Europe.

Q You raised the fund to supposedly develop R&D market and new hiring in West Asia, Africa, and Europe. How far have you been able to achieve this objective?

 Every country, region has its unique geography and





terrain and CRON takes great pride in providing bespoke solutions for each of these regions. Our R&D team is working hard and we will soon have dedicated teams for site customisation, installation and customer support in these regions.

Q *Established in 2015, CRON Systems is evolving into an IoT based Intrusion Detection Systems leader? How do you rate yourself on the scale of success or your achievements thus far?*

 With today's changing threat environment, perimeter security is one of the most vital components of any country's national security and anti-terrorism programme. Over the last year itself, several

attacks on key facilities have resulted in a loss of life and assets. All of these attacks have been due to breaches in perimeter security infrastructure. While physical barriers are important to demarcate boundaries and provide deterrence to trespassers, they fail to prevent well planned and orchestrated attacks. By virtue of being visible to the naked eye, a countermeasure can easily be planned.

CRON Systems has been successful in addressing three pain points that the army faces daily. There is no communication channel, due to lack of infrastructure they cannot install new-age products

and most of the time it becomes so complicated for the end users that they cannot even use it.

CRON Systems had taken the initiative to open a Technology Centre to provide technical support and maintenance for the crucial equipment used by the forces. Availability of technology centre and accessibility of ground support is what this tech centre will provide for the forces.

CRON Systems will continue to introduce innovative solutions for perimeter security to keep the citizens and defence forces safe from any possible intrusion.

Q *CRON offers complete Engineering - Procurement-Commissioning-Maintenance (EPCM) services*

IT'S BEEN AN ENDEAVOUR OF THE FOUNDERS OF CRON SYSTEMS SINCE INCEPTION TO KEEP THE INDIAN BORDERS SECURE. THE SOLUTIONS BUILT BY CRON SYSTEMS ARE CUSTOMISED AND HAVE BEEN BUILT AFTER MONTHS OF ACTIVE LEARNING AT THE BORDERS TO DEVELOP A DEEP UNDERSTANDING OF THE END USERS' PROBLEMS

INTERVIEW: TUSHAR CHHABRA



THE SUCCESSFUL EVOLUTION OF CRON SYSTEMS IS A TESTIMONY TO THE POWER OF MAKE IN INDIA, CAPABILITY TO CREATE NEW PRODUCTS. CRON SYSTEMS IS AN INDIAN DISRUPTOR WORKING RELENTLESSLY TO PROVIDE BORDER SURVEILLANCE, PERIMETER SECURITY AND COMPLETE SITUATIONAL AWARENESS SOLUTIONS

- the only Indian defence technology company to do so, even in the most hostile of conditions. Your take?

 We are a company involved in nation building, and it matters to us to reach our customers within 24 hours to cut their downtime to the minimum. We believe that the prime focus should be on the products: how they are built, installed and maintained and if this is seamless, the money will follow.

Q *With the advent of various government agencies as facilitators and private industry associations as policy influencers, how do you see the scope of evolving ecosystem and start-ups role as innovative solution provider in defence and aerospace industry in India?*

The Scope is immense and evolution of CRON is an example.

CRON is India's first and only security and surveillance startup that is building products using the latest technology available in the world. The company has successfully installed several customised solutions at most sensitive camps and borders. Unlike foreign Original Equipment Manufacturers (OEMs) that either do not provide after sales services or provide them through their Indian partners who come with inherently long downtimes and at exorbitant costs, CRON has created a competitive strength in prompt and affordable after sales support.

Q *How CRON Systems is contributing to Make in India? Your views regarding the right security and surveillance solution for India's vast coastline which is considered the weakest link in border security management.*

 The successful evolution of CRON Systems is a testimony to the power of Make in India, capability to create new products. CRON Systems is an Indian disruptor working

relentlessly to provide border surveillance, perimeter security and complete situational awareness solutions. A burning desire to resolve problems that our Jawans face at the borders in terms of perimeter security by offering superior & user-friendly technology. It provides complete range of services from site survey, to installation to commissioning to AMC to ensure there are no gaps in the offering.

Q *Lately in February 2018, CRON Systems forayed into global market partnering with Bangladesh based GETCO Ltd. Elaborate?*

 CRON entered into a partnership with Bangladesh based GETCO group last year. GETCO is one of the oldest engineering consultancy and services companies to provide technology for perimeter security along the sensitive Bangladesh borders. GETCO provides marketing and channel support for some of the breakthrough perimeter security products of CRON Systems that are already being successfully deployed by Indian paramilitary forces.

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Minister of State for Communications Manoj Sinha at a ceremony in New Delhi that was also attended by NITI Aayog CEO Amitabh Kant, Prasar Bharti CEO Shashi Shekar Vempati, BJP MP Suresh Angadi, Additional Secretary, DoT, Government of India Anshu Prakash and officials from Army's Signal Corp

SAANKHYA LABS LAUNCHES PRUTHVI-3, FIRST MOST ADVANCED NEXT-GEN SYSTEM-ON-CHIP

Indigenously designed and developed the Pruthvi-3 family of processors will drive the next generation communications architecture

By **AJIT KUMAR THAKUR**



New Delhi. Considering the limited opening that exists in the Indian R&D sector at present, Indian start-ups have grabbed this opportunity with aplomb to prove their innovative enterprise and have helped Indian industries in various sectors including defence in solving their specified needs. Gradually, Indian start-ups' focused effort and product development are helping India gain traction and more visibility on the global R&D scene.

On December 27, Saankhya Labs, a start-up and a vertically integrated communication system and transformative technology solutions provider, launched Pruthvi-3, the world's first and most advanced multi-standard Next Generation System-On-Chip (SoC). Pruthvi-3 is a fully programmable multi-standard chipset that supports next generation broadcast

standards and is powered by Saankhya's award-winning SDR architecture and is available in multiple package options (SL3000 and SL4000) and will enable live broadcast TV capability on mobile devices and support video offload services from mobile networks to broadcast network.

The chip was unveiled and launched by Minister of State for Communications Manoj

Sinha at a ceremony in New Delhi that was also attended by NITI Aayog CEO Amitabh Kant, Prasar Bharti CEO Shashi Shekar Vempati, BJP MP Suresh Angadi, Additional Secretary, DoT, Government of India Anshu Prakash and officials from Army's Signal Corp.

In his address, co-founder and CEO of Saankhya Labs Parag Naik said, "It is an honour to unveil this Make in India chipset to the world. Indigenously designed and developed, the Pruthvi-3 family of processors will drive the next generation communications architecture required in the 'Convergence era' of broadcast and broadband infrastructure. Powered by our award-winning, patented Software Defined Radio (SDR) architecture, SL-30xx and SL-40xx can support worldwide broadcast communication standards and is targeted for use in the Mobile, UHD TV, STB, IoT and in-vehicle entertainment."

Amitabh Kant said while highlighting the development, "It's remarkable and moment of delight for all that Saankhya Labs has successfully designed and developed the most advanced



Mr Sinha during inauguration

multi-standard, next generation TV system on a chip. This is a very commendable achievement and will propel not only Saankhya Labs, but also India into the

global R&D arena.”

Shashi Shekhar Vempati said, “This is a proud moment for India. I see this as a convergence of Make in India, Start-up India

and Digital India and the future of mobile, broadband and broadcast convergence. The future of terrestrial TV is direct-to-mobile and this will need chipsets embedded in mobile phones capable of receiving video signals on both broadcast and terrestrial networks, leading to a one-converged user experience for smart phone owners. I hope to see this convergence between broadcast and broadband and availability of smart phones with this capability within a year or so.”

Communications Minister Sinha, in his address, assured all necessary support and emphasised that the government under Prime Minister Modi’s vision has been and will be an enabler to extend to assist startups and entrepreneurs achieve success. ■

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INDIGENISATION: MY VIEW



INDIGENISATION: FOCUS ON LOCAL EXPERTISE FOR SELF-SUFFICIENCY

Changes brought in Defence Procurement Procedure introducing categories under indigenously designed, developed and manufactured would help in expediting indigenisation process and 'Make in India' in defence in real terms

By **ASHOK ASERI**

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Meaning of indigenisation: Indigenisation is to innovate, develop and continuously improve the function of any system locally, in order to provide lifelong service and support; aiming towards self-sufficiency and developing strategic capability at a reasonable effort, time and cost. In other words, indigenisation signifies to substituting any imported item or product with one that is manufactured within the country, resulting in reducing bought-out component and thus less dependency on other nations.

Changes brought in Defence Procurement Procedure (DPP) introducing categories under indigenously designed, developed and manufactured (IDDM) would help in expediting indigenisation process and 'Make-in-India' in a real term. To make it commercially viable and sustainable, the system developed should cater for domestic and global requirements.



POOL OF EXPERTS

It is necessary to have expertise in all the relevant sectors to take up any indigenisation task. A large pool of technologists possessing domain expertise, technicians, academicians, scientists and research scholars are now available within the country. The aerospace & defence community in India has the potential and capability, which needs to be brought together and supported at every stage of development. If we further improve our working environment and culture, we may attract Indians (a) who are working abroad and (b) who are planning to migrate to other countries.

It is important that organisations like defence PSUs, ordnance factories, Defence Research and Development Organisation (DRDO), Indian Space Research Organisation

(ISRO) and Council of Scientific and Industrial Research (CSIR) who have individually contributed significantly to build this nation; work as a team for specific project/ technology development by utilising infrastructure and knowledge available with each of these giant tech-temples. This will certainly pave path for India to show its might and soon become a technology hub.

ISSUES WITH TOT CONTRACTS

Though the import from foreign OEM is the easiest and quickest way to fulfil the requirements, but to execute ToT contract and maintaining operationability of equipment has always been a challenge. Once a platform / equipment is imported, either direct or manufactured in India under ToT, the dependency on foreign supplier continues for decades and also we never get the best of technologies and adequate support. A large number of spares and system would continue to be purchased from the distant

supplier, at unreasonable cost. In most of the purchase contracts, there will be a clause of 'minimum order quantity' resulting in non-moving inventories of unwanted and obsolete parts and sub-assemblies. Equipment and their sub-systems would still be serviced at the OEMs abroad under a tag of 'proprietary technologies', involving considerable cost and time. Such contracts hardly provide any details of design of the parts and systems. OEM may pass on incomplete and obsolete design. They also may not share the Defect Investigation reports and modifications done at a later stage, which are necessary for bringing improvements in functional quality of imported equipment. Sometimes repair and overhaul technology might not have been prepared, since OEM would not have reached to that stage of operational life. Tooling drawings may not have been updated, even though tools were modified at their end. All these practical issues result in delays at every stage of production, leading

ALSO, LOOKING AT THE URGENCY TO MONITOR IMPORT OF SYSTEMS, A HIGH-LEVEL GROUP COMPRISING EDUCATIONAL INSTITUTES, DRDO, CSIR, ISRO, DPSUS, OFB, CII, FICCI, SOCIETY OF INDIAN DEFENCE MANUFACTURERS AND THE MOD SHOULD MEET ON A REGULAR BASIS AND REVIEW THE IMPORT CONTENT IN EACH OF MAJOR PROJECTS OF AEROSPACE AND DEFENCE



ALH - Dhruv



LCA Tejas



Kiran Mk II

INDIGENISATION: MY VIEW



HPT – 32 Trainer: It is a propeller-driven Basic trainer



SARAS aircraft is under development at NAL



HPT-24 Marut

to poor serviceability of our final equipment / assets. Indigenisation of any item is a time consuming and painful process but once we succeed, the above mentioned difficulties will not arise.

OFF-SETS

Offset is a powerful tool which definitely has the potential to encourage and speed up indigenous manufacturing and service sectors. Offsets of more than \$ 10 billion were projected at various forums and platforms in last couple of decades. Offsets so far have been the lost opportunities for Indian industries. Though the policy has been amended a number of times, but the lack of transparency, clarity and effectiveness in the offset

clauses and its implementation have been obstacles in gaining the desired benefits. Domestic manufacturing industry could have gained by exporting a large variety of parts and services under offset clauses in major purchases. It would have taken them to a different level of managerial and tech skills. Further, sub-clauses in our policies, which allow the qualified-vendor to escape from offset, need to be altered.

CONCLUSION AND RECOMMENDATIONS

Cultivate and support sub-sectors such as design, manufacturing (structure, precision parts and composites), systems (power-

plants, hydraulics, fuel, electrical, electronics, materials, coating and painting, special processes), tooling, test benches / rigs. Educational Institutes such as IITs, IISc, NITs and private universities should be entrusted with continuous innovative and R&D work in specific fields. DRDO can monitor this task and it's associated funding. This gold mine is mostly being utilised by our competitors.

Capacity and capability of private industries are unlimited hence a cluster of private industries, DPSUs and OFs can be assigned with few selected programmes. In recent past, some of the projects have been assigned to private sectors but much more is to be done at a quicker pace.

Strategic Partnership Model, which permits Indian industry and foreign OEM to work together, will work fine and hence should be encouraged.

Looking at the urgency to restrict import of systems, a high-level group comprising educational institutes, DRDO, CSIR, ISRO, DPSUs, OFB, CII, FICCI, Society of Defence Manufacturers and the MoD should meet on a regular basis and review progress on indigenisation of systems and sub-systems with a focus on time-bound reduction in import content in each of major projects of Aerospace and Defence. The advisor in the PMO should preside over the meeting and issue guidelines. It is time to realise the problems in import and ToT contracts, though some individuals feel more comfortable with such arrangements. It is never late to get up, start running and be a winner.

The writer is Managing Director at Bangalore based 'Aseri Defence & Aerospace Consultancy', and former GM (Indigenisation) in HAL. He also served in private aerospace industries at a level of VP / CEO

BOEING APPOINTS SALIL GUPTA PRESIDENT, BOEING INDIA

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ew Delhi. Boeing on February 13 announced the appointment of Salil Gupta as president of Boeing India effective March 18. Gupta, who was vice president of Boeing Capital Corporation, a wholly-owned subsidiary of the Boeing company, succeeds Pratyush Kumar, who was appointed vice president and program manager of Boeing's F-15 fighter aircraft in November 2018.



The newly-appointed Boeing India president will be based in New Delhi, serving as Boeing's senior executive in India, and report to Marc Allen, president of Boeing International.

Gupta will advance the development and execution

of Boeing's strategy in India, integrate business activities across Boeing Commercial Airplanes, Boeing Defense, Space and Security, and Boeing Global Services, lead Boeing's growth and productivity initiatives in India, and manage Boeing's partnerships with India's government and business stakeholders.

He will lead a team of over 3000 employees and joint venture personnel located in New Delhi, Bengaluru, Hyderabad, Mumbai and Chennai. His leadership will extend to cover Boeing's large supply chain presence in India, its engineering and technology center in Bengaluru, and Boeing joint venture with Tata in Hyderabad.

At Boeing, Gupta has played a leading role in Boeing Capital Corporation, which manages a USD three billion portfolio of aircraft and other assets while supporting all Boeing businesses with innovative financing solutions, working closely with customers across the enterprise.

He also has experience in commercial and defense supply chain, overseeing manufacturing, sourcing, and fulfilment activities for Boeing products.

Gupta joined Boeing in 2009 in the services strategy and business development team of Boeing commercial airplanes. Previously he was with Citigroup and Goldman Sachs, as an investment banker in the aviation and infrastructure sectors. Gupta earned his MBA from Stanford University, and a Bachelor's degree in Economics from Cornell University.

"Salil is an accomplished business leader, with a terrific set of commercial and services experiences," said Marc Allen, president of Boeing International. "In leading the Boeing India team, he will build on Pratyush Kumar's great work of growing Boeing's business and partnerships in India and supporting the development of a thriving aerospace and defense industry for India."

"I'm thrilled to be joining my colleagues at Boeing India during such an exciting time, when the business is growing exponentially and we are building the future of global aircraft manufacturing, services, supply chain, engineering, technology and innovation, right here in India," Gupta observed. ■



HOW THE MENACE OF TERRORISM IS AFFECTING SOUTH ASIA PEACE PROCESS?

India wants restoration of peace in Afghanistan, however Pakistan aspires to dismantle India's stake in development process of Afghanistan thus disturbing the whole South Asia peace process

By **JK VERMA**



South Asian nations are suffering from terrorism and several regional, national and international terrorist outfits are active in the region. Peace is illusive in the area because of diverse reasons but the most important cause of failure of peaceful negotiations is terrorism. The principal terrorist outfits active in the region include Al Qaeda, the Islamic State of Iraq and the Levant (ISIL) also known as the Islamic State of Iraq & Syria (ISIS), Jaish-e-Mohammed (J-e-M), Lashkar-e-Taiba (L-e-T), Sipah-e-Sahaba Pakistan (SSP), Lashkar-i-Jhangvi, Hizbul Mujahideen, Harkat-ul-Mujahideen etc.

Sometimes these organisations are banned on paper but continue working under new names or on the same names. Out of these, a few terrorist outfits were created and assisted by the sinister Inter Services Intelligence (ISI)

as Pakistan has waged a low intensity war against India and want to install puppet regime in Afghanistan. Pakistan is using these terrorist outfits to achieve its goals and inflaming terrorism in the neighbouring countries as part of its foreign policy.

Pakistan-abetted outfits continuously carry out terrorist activities in India and Afghanistan. October 1, 2001 attack on Jammu & Kashmir Assembly in Srinagar and December 13, 2011 attack on Indian parliament took both countries on the verge of war. As fallout of the Pakistani terrorists attack on the Army base at Uri in September 2016 in which 18 valiant soldiers were martyred, 200 Indian soldiers entered the Pakistan Occupied Kashmir (PoK) and killed 40 Pakistani terrorists including guides and their trainers. India, Bangladesh, Afghanistan and Bhutan refused to attend 19th South Asian



Taliban terrorists in Afghanistan

Association for Regional Co-operation (SAARC).

Not only this, the present government is adhering to the policy that cross-border terrorism and peaceful negotiations cannot go together, hence India constantly refusing Pakistani overtures of starting negotiations. Pakistani Prime Minister Imran Khan sends feelers to start negotiations but does not promise to curb cross-border terrorism. Analysts claim that overtly Pakistan wants to start peaceful negotiations, but covertly will continue infiltrating terrorists in India. Islamabad also wants to show to

the world that it wants to start peace negotiations but India is refusing to talk.

The pre-requisite of peaceful negotiation is bilateral trust. In case of peace negotiations between Pakistan-India or Pakistan-Afghanistan both India and Afghanistan have no trust in Pakistan, as military-controlled ISI is involved in fomenting terrorist activities in both countries.

Mutual trust is essential for peace negotiations. In the past Sri Lanka alleged that India was assisting Tamil terrorist outfits, consequently there was trust deficit between both countries;

AS FALLOUT OF THE PAKISTANI TERRORIST ATTACK ON THE ARMY BASE AT URI IN SEPTEMBER 2016 IN WHICH 18 VALIANT SOLDIERS WERE MARTYRED, 200 INDIAN SOLDIERS ENTERED THE POK AND KILLED 40 PAKISTANI TERRORISTS INCLUDING GUIDES AND THEIR TRAINERS. INDIA, BANGLADESH, AFGHANISTAN AND BHUTAN REFUSED TO ATTEND THE 19TH SAARC SUMMIT TO BE HELD IN ISLAMABAD

hence there was bitterness between Delhi and Colombo. Same way India has cordial relations with the present Awami League government as there is a confidence that Prime Minister Sheikh Hasina will not allow terrorist outfits to operate from Bangladesh against India.

Terrorism is also a big

impediment in Islamabad-Kabul peace talks. Pakistan wants to achieve strategic depth in Afghanistan hence it tries to establish a puppet regime in the country. It has created few terrorist outfits which continuously carry out terrorist activities inside Afghanistan. These terrorist outfits especially the Haqqani network uses asymmetric warfare against Afghan forces as well as US-led NATO troops. The Haqqani network is close to Taliban

and has a base at Miramshah or Miranshah, a town and administrative headquarters of North Waziristan in Pakistan.

The United States rendered maximum assistance to the Haqqani network in 1980 but later in 2012 designated it as a terrorist outfit. The ISI renders full assistance to the Haqqani network as it feels that the terrorist outfit will safeguard Pakistan's interest in war-torn Afghanistan. Islamabad maintains that Iran, Russia,

China and India would increase their influence in Afghanistan after departure of the US troops. As Islamabad lacks money power it wants to retain its influence in Kabul through the Haqqani network which has a base in Pakistan. The ISI provides Afghan Taliban especially the Haqqani network intelligence, weapons as well as protection and safe-haven in the country. Pakistan also wants to reduce India's influence in Afghanistan through these terrorist outfits.

Pakistan is also suspicious that anti-Pakistan terrorist outfits would take refuge in unstable Afghanistan. It is needless to say that diverse separatist movements are active in Pakistan. Pakistan feels that Taliban will remain powerful in Afghanistan and they may be able to obtain power in the country.

Islamabad is also afraid that if action is taken against Afghan Taliban there would be a strong reaction in Pakistan, especially in Punjab and it will be difficult to control. Pakistan also does not want India to have any influence in Afghanistan as it feels that India tries to encircle Pakistan. Pakistan time and again alleges that India assists Baloch rebels through Afghanistan.

Islamabad's assistance to the Haqqani network proved beneficial, as at present the US is desperate to leave Afghanistan and took Pakistan's assistance to have rapprochement with Taliban. Following the development, US special representative for Afghanistan Zalmay Khalilzad met the Pakistani authorities in Islamabad on January 17. It is apparent that now Islamabad is mediating between the US and Taliban hence Pakistan has become emboldened and its foreign office spokesperson



Prime Minister Narendra Modi with his the then Pakistani counterpart Nawaz Sharif in New Delhi (file photo)



reverted to the country's old position that India has no role to play in Afghanistan. The US has also changed its policy that Taliban should negotiate with Afghan government, instead the US agreed with Taliban's contention and talks were held between Khalilzad and Taliban representatives without Afghan government.

In case of India-Pakistan relations, Islamabad continues to sponsor outfits to carry out terrorist activities in India especially in Kashmir. Pakistan claims insurgency in Kashmir as a freedom struggle. Although Pakistan is aware that terrorism will not resolve Kashmir problem and the former may not be interested in restoration of peace in the valley as its sole aim is to weaken its sworn enemy India. A strong lobby in India feels that Pakistan will continue its terrorist activities until Indian forces destroy terrorist hideouts and training places well inside PoK.

Besides Kashmir issue, there are several other unsettled issues between India and Pakistan, which include Sir Creek, water dispute and most important



(Above) Indian delegates along with their foreign counterparts in a regional peace process meeting;
(Below) Pakistan Prime Minister Imran Khan addressing the media

is the nuclear issue. However, Islamabad claims that nuclear issue comes to the fore following no solution of the Kashmir issue. India fought three wars excluding Kargil, out of these two wars were fought over Kashmir.

The powerful Pakistani army does not want peace with India as it is enjoying multifarious privileges in the name of danger from India. They allege that

India has not reconciled with the existence of Pakistan hence there is perpetual danger from the eastern neighbour. On the other hand, Islamic extremists with collusion of army claim that they will capture whole of Kashmir and it will be merged with Pakistan. The hardliners claim that Kashmir is unfinished agenda of 1947 and it has to be liberated. This is the reason that whenever a



Afghanistan President Dr Ashraf Ghani with Prime Minister Modi

TERRORISM IS HURTING THE SOUTH ASIAN NATIONS AND ISLAMABAD HAS EMERGED AS THE EPICENTER OF TERRORISM HENCE IT IS THE FOREMOST DUTY OF PAKISTAN TO ERADICATE VARIOUS TERRORIST HIDEOUTS OPERATING FROM THE COUNTRY

moderate ruler in Pakistan wants to have peace with India, the hardliners and Islamic extremists sabotage the same. Consequently, the peace negotiation between India and Pakistan either could not be initiated or if started it was derailed because of distrust and terrorism.

In India-Pakistan peace negotiations, terrorists are the main spoilers. In 2008, Pakistani Foreign Minister Shah Mehmood Qureshi came to India to negotiate vital issues including Kashmir, Chenab river water dispute, trade ties etc. But army-controlled ISI infiltrated few Pakistani terrorists of Lashkar-e-Taiba, these terrorists attacked Mumbai and more than 166 innocent people were killed. The then Indian Foreign Minister immediately told Qureshi to leave India as terror and peaceful negotiations cannot

go together. The Pakistani foreign minister was sent back and further negotiations were suspended. Hafiz Saeed, who was the architect of this heinous crime, was extolled in Pakistan.

Terrorism is hurting the South Asian nations and Islamabad has emerged as the epicenter of terrorism hence it is the foremost duty of Pakistan to eradicate various terrorist hideouts operating from the country. Pakistan launched several operations to exterminate terrorism, the major anti-terrorist operations included Al-Mizan, Zalzal, Rah-e-Haq, Rah-e-Raast, Rah-e-Nijat, Black Thunderstorm, Sher Dil, Koh-e-Safaid, Zarb-e-Azb, Radd-ul-Fasaad etc. but these operations could not wipe out terrorism because Pakistani authorities distinguished between good and bad terrorists. The outfits carrying out terrorist activities in India and Afghanistan or attacking Shias, Sufis or non-Muslims were considered as good terrorists and were accorded shelter by ISI. Pakistan should treat all

terrorists alike and stringent action should be taken against all the terrorists. If Pakistan feels difficult in obliterating terrorists it should take assistance from India, the US, Afghanistan and other nations.

In Pakistan, religious fanatics are also supporting terrorism within and outside the country. Religious fanaticism initiated by General Zia-ul-Haq and fuelled by the petro-dollars is enhancing terrorism. Several thousand registered and unregistered Madrassas are running in the country and several Madrassas are run and controlled by terrorist outfits like L-e-T, J-e-M, SSP, Lashkar-i-Jhangvi etc. These Madrassas produce terrorists and suicide bombers. Pakistan government is afraid to take action against these Madrassas due to the fear of Islam Pasand parties.

Terrorism is one of the main reason that Pakistan has reached on the verge of economic collapse and about to default payment. Prime Minister Imran Khan and other ministers visited Saudi Arabia, China, the UAE and other places with begging bowl. Saudi Arabia and the UAE agreed to render financial assistance while China refused to oblige. According to a report, several thousand Pakistanis were killed due to terrorism and Pakistan lost about \$68 billion due to terrorism between 2000 and 2010. It is high time that Pakistani army amends its policy and eradicates terrorism from the country so that South Asia peace process can effectively be implemented in the region. ■

– The writer is a Delhi-based strategic analyst and member of United Services Institute of India and Institute for Defence Studies and Analyses. The views expressed are personal

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MARKING A DECADE OF PRESENCE IN INDIA NAVAL GROUP SHOWCASES LATEST TECHNOLOGIES AT MAST

Since inception, Naval Group’s India subsidiary has objective to support the Indian defence industry and Indian Navy to realise the policy of ‘Make in India’ and self-reliance



New Delhi. Naval Group has showcased its latest technological prowess during the Maritime/ Air System and Technologies (MAST) trade show held at Noida on the outskirts of New Delhi recently. Naval Group’s presence in the National Capital Region (NCR) is key as the group has recently celebrated the 10th anniversary of the subsidiary Naval Group India.

Since its inception, the company’s India subsidiary has objective to support the Indian defence industry and Indian Navy to realise the policy of “Make in India” and self-reliance.

OVER TEN YEARS OF SUCCESSFUL PARTNERSHIP BETWEEN NAVAL GROUP AND INDIA

Naval Group India was created in 2008 as a 100 per cent-owned subsidiary of the group to ensure a long-lasting



PM Narendra Modi at the commissioning of Scorpene Class Submarine INS Kalvari in Mumbai

and will be commissioned in coming months. The remaining four submarines will be commissioned by 2022-23.

Rear Admiral Rahul Shrawat, Chairman and Managing Director, said on this occasion: "Naval Group is pleased to present its latest innovations at MAST 2018 and is fully dedicated to provide the Indian Navy with the most advanced and adapted technologies. Its subsidiary Naval Group in India is committed to support Indian Navy through indigenous industrial activities and dedicated design, services and maintenance support".

BUILDING ON NAVAL GROUP'S LEGACY TO PREPARE THE FUTURE

As the leading service and system provider, Naval Group is uniquely positioned on the naval defense market allowing its clients to obtain an unparalleled level of overall fleet performance during the whole ship's lifecycle. On

Naval Group's booth, visitors will discover the state-of-art innovations created for modern navies among which:

THE SCORPENE SUBMARINE

The Scorpene is a 2000 tons conventional-propulsion submarine designed and developed by Naval Group for all types of mission, such as surface vessel warfare, anti-submarine warfare, long-range strikes, special operations or intelligence gathering. Extremely stealthy and fast, it is equipped by 6 weapon launching tubes, 18 weapons (torpedoes, missiles, mines). 14 submarines were sold by Naval Group internationally; the Scorpene is an essential reference product in the area of modern conventional attack submarines (SSK) for navies across the globe. Six Scorpene class submarines are currently manufactured at Mazagon Dock Shipbuilders Limited (MDL) for the Indian Navy with transfer of technology from Naval Group.

NAVAL GROUP INDIA WAS CREATED IN 2008 AS A 100 PER CENT OWNED SUBSIDIARY OF THE GROUP TO ENSURE A LONG-LASTING PRESENCE IN THE COUNTRY, THEREBY DEMONSTRATING THE STRONG COMMITMENT TO THE INDIAN NAVY. THIS PARTNERSHIP LED TO THE EMERGENCE OF A STRONG INDUSTRIAL ECOSYSTEM WHICH FOSTERS THE INDIGENOUS MANUFACTURING OF SUBMARINES

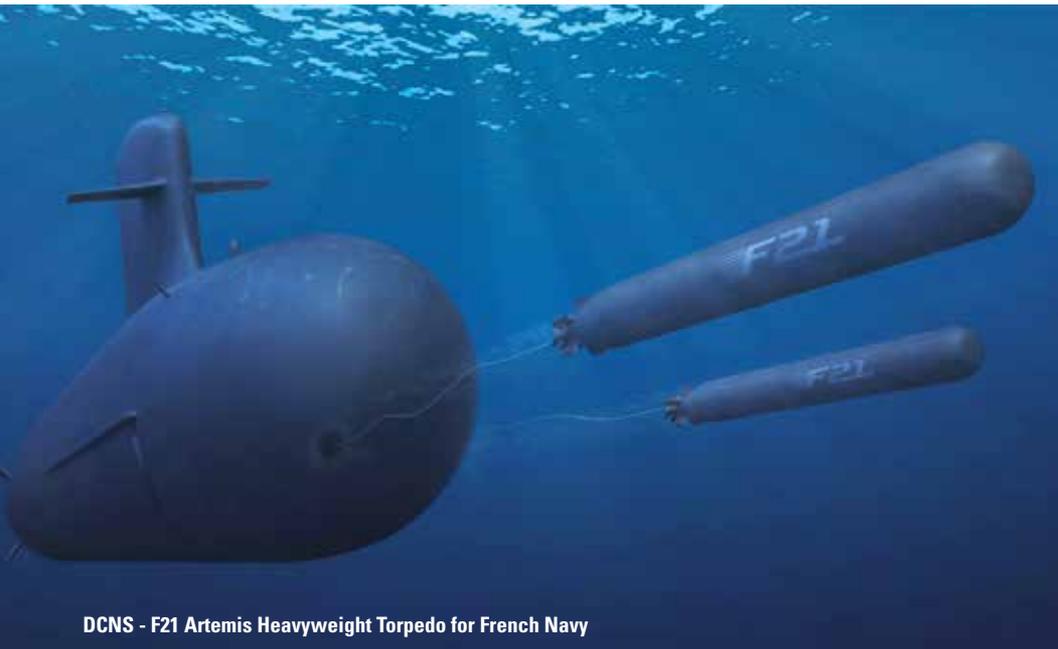
presence in the country, thereby demonstrating the strong commitment to the Indian Navy. This partnership led to the emergence of a strong industrial ecosystem which fosters the indigenous manufacturing of submarines.

The P75 programme is an illustration of the successful indigenisation process. The first submarine of the class, INS Kalvari, built by Mazagon Dock and Shipbuilders Limited (MDL) with a transfer of technology, was commissioned on 14 December 2017 in the hands of Prime Minister Narendra Modi. The second submarine called Khanderi launched at the beginning of 2017 is undergoing sea trials



The guided missile destroyer USS Barry (DDG 52) steams through the Atlantic Ocean while participating in Majestic Eagle 2004 (file photo)

DEFENCE INDUSTRY



DCNS - F21 Artemis Heavyweight Torpedo for French Navy

shallows and confined waters and an unmatched endurance. Equipped with a complete “sonar suite” and an advanced mission system, both with extremely high data processing for a complete and clear tactical picture even against the most sophisticated torpedo defence system, including a high level of discrimination and identification of acoustic counter-counter measures (ACCM). The F21 offers to the submarine the capability to carry out long range engagement while remaining outside the very long detection distance of the modern anti-submarine forces.

BELH@RRA

Belharra is the new combat ship for naval supremacy and crisis management designed for navies looking for a compact frigate able to perform a large range of missions, stand-alone or within a task force either for high sea duration missions as for shallow water operation in congested and contested operational environment. As the first digital frigate, Belharra features high level capabilities in anti-air, anti-surface, anti-submarine and asymmetric warfare domains, taking into account French Navy operational legacy acquired in wartime situation.

F21 HEAVY WEIGHT TORPEDO

Using state-of-the art technology, the F21 features exceptional performances, fulfilling the stringent French Navy requirements, combining a highly advanced auto-guidance mode allowing the torpedo to perform its mission autonomously, including

THE P75 PROGRAMME IS AN ILLUSTRATION OF THE SUCCESSFUL INDIGENISATION PROCESS. THE FIRST SUBMARINE OF THE CLASS, INS KALVARI, BUILT BY MAZAGON DOCK AND SHIPBUILDERS LIMITED (MDL) WITH A TRANSFER OF TECHNOLOGY FROM NAVAL GROUP, WAS COMMISSIONED ON DECEMBER 14, 2017 IN THE HANDS OF PRIME MINISTER NARENDRA MODI

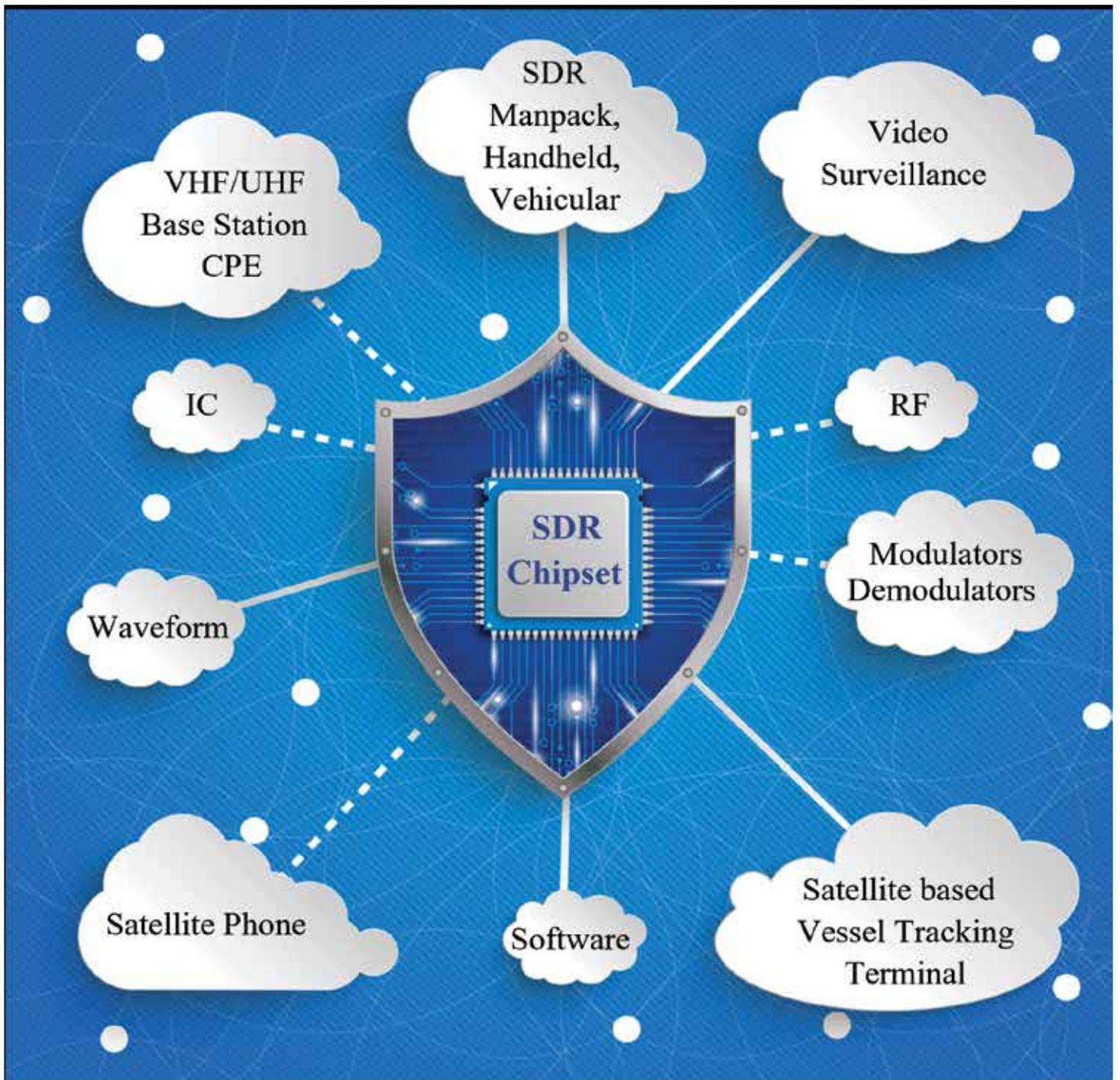


“NAVAL GROUP IS PLEASED TO PRESENT ITS LATEST INNOVATIONS AT MAST 2018 AND IS FULLY DEDICATED TO PROVIDE THE INDIAN NAVY WITH THE MOST ADVANCED AND ADAPTED TECHNOLOGIES. ITS SUBSIDIARY NAVAL GROUP IN INDIA IS COMMITTED TO SUPPORT INDIAN NAVY THROUGH INDIGENOUS INDUSTRIAL ACTIVITIES AND DEDICATED DESIGN, SERVICES AND MAINTENANCE SUPPORT”

—Rear Admiral Rahul Shrawat
Chairman and Managing Director

NAVAL EQUIPMENT

Naval Group also offers state-of-art equipment for naval platforms. Among others are sea water heat exchangers, which guarantee cooling performance for inboard systems such as propulsion plants and power generation. The system is shock proof and possesses an embedded leakage detection mechanism. Naval Group’s heat exchanger has been chosen by eight navies around the world and over two hundred units were manufactured for key naval platforms. Naval Group’s SYLVER® Vertical Launching System can accommodate a wide range of missiles and contributes to provide a powerful air defence capability. SYLVER® A70 can fire MdCN missile allowing the warship to carry on deep strike missions. Naval Group also offers long-lasting innovative stealth and shock resistant gearboxes for frontline war ships. Naval Group’s gearboxes are optimised according to a ship’s propulsion system characteristics, thus guaranteeing vessel performances while easing the ship’s general arrangement.



Indigenously Designed & Developed

**Secure, Reliable & Trusted
Terrestrial & Satcom Systems**

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Award-winning SDR chipsets from**

Saankhya Labs 

MARITIME: CAPACITY BUILDING



P-8I: A BOOST TO MARITIME DOMAIN AWARENESS

The Indian Navy is to receive four more P8I planes and the planes will be in a position to control Sea Guardian drones when supplied

By **CMDE (RETD) RANJIT B RAI**

Indian Navy marks Navy Day on December 4 every year. It commemorates that night in 1971 when three Osa class missile boats nick named Killers struck Karachi in Op Trident in the opening bell of the war for Bangladesh. The attack was ingeniously planned by then Chief of Navy Staff (CNS) Admiral SM Nanda with Indian Navy's long range Rangout radars and P-15 Styx missiles, and sank PNS Khaibar, PNS Muhafiz and MV Venus Challenger off Karachi harbour.

Since 1971 the Indian Navy has not looked back and acquired over a dozen home made powerful platforms with 130km Klub and 750km radar guided supersonic BrahMos and Barak-8 anti air missiles,

improved the performance of the five long range IL-38 maritime reconnaissance (MR) planes with EW, installed long range sonars on ships and state-of-the-art electronic warfare suites and communication linkages with Indian Space Research Organisation (ISRO) launched GSAT 7 satellite for data transmission. The Kilo class ageing submarines have been upgraded and two HDW-1500 submarines are being fitted out with Harpoon missiles and the first of six Mazagon Docks Shipbuilding Ltd (MDSL) Scorpene submarines INS Kalvari is in service with SM-39 Exocet missiles and SUT-B torpedoes.

P-8I

But The operational readiness of the Indian Navy has been extended in the year 2018 and excellent maritime reconnaissance (MR) was



Indian Navy officers in front of Boeing P-8I

provided by the eight state-of-the-art P-8I Boeing LRM/ASW planes with Mk 84 Harpoons and Mk 48 Torpedoes operating from INS Rajali near Chennai.

The P-8I can scan thousands of square miles of sea space in its four hours at 490 knots

with a 1200 mile radius. The plane can provide the Indian Navy a full Maritime Domain Awareness (MDA) picture and assist the Navy's MDA centre in Gurgaon connected to the Coastal Security Network along the coast of the Indian Coast Guard with the AIS chain in the Indian Ocean. The whole set up and underwater tracking ability of P-8Is with sonobuoys gave confidence to the present day Indian Navy's ability to track ships and submarines of PLA (N) in the Indian Ocean and be the Net Security Provider (NSP).

The P-8I Multi-mission Maritime Aircraft (MMA) is a modified Boeing 737-800ERX, bringing together a highly reliable airframe and high-bypass turbo fan jet engine with a fully connected state-of-the-art open architecture mission system which will allow changes.

It is to the credit of the Indian Navy team that went to see US' Poseidon 737 under construction and tested all equipment and made a wish list of US and Indian equipment made in India to be fitted in P-8Is. This combination, coupled with next-generation sensors, (MDA) dramatically improves anti-submarine warfare (ASW), and anti-surface warfare

(ASuW) capabilities with Mk 84 Harpoons and Mk 48 Torpedoes respectively. The Open Mission System Architecture makes the plane reconfigurable and expandable system facilitating easier, more affordable upgrades.

The Indian Navy P-8Is are brimming and fitted with sensors and has two Safran CFM 56-7. For EW the planes have a Electronica planar phased array antennae with Netuno ECM 4000 and EW sensors, a Raytheon AN/APY-10 radar and active multi-static and passive acoustic sensor system, and Telephonics APY-143 inverse synthetic aperture radar which can detect air targets for direction.

The plane is manned by nine-person crew which includes women Observer officers, a dual-pilot cockpit and has workstations with universal multi-function displays, a small ready accommodation for additional workstation and workload sharing. The crew operate the optical and infrared sensors. The crew control the internal five-station weapons bay, four wing pylons, two centerline pylons, all supported by digital stores management. The plane has an air speed of 490.

The major equipment supplied from India includes the INMARSAT, power capability panel and UHF suite and Link 11 by Bharat Electronics Ltd (BEL). Hindustan Aeronautics Ltd (HAL) has supplied the bomb doors and ECIL has supplied the speech secrecy equipment linked with GSAT 7.

The Indian Navy is to receive four more P8I planes and the planes will be in a position to control Sea Guardian drones when supplied. The future plans of the Navy include more P8Is as they give an ability to the Navy to attack ships and submarines from the air.

Shan Na Varuna. ■

THE P-8I MULTI-MISSION MARITIME AIRCRAFT (MMA) IS A MODIFIED BOEING 737-800ERX, BRINGING TOGETHER A HIGHLY RELIABLE AIRFRAME AND HIGH-BYPASS TURBO FAN JET ENGINE WITH A FULLY CONNECTED STATE-OF-THE-ART OPEN ARCHITECTURE MISSION SYSTEM WHICH WILL ALLOW CHANGES



Indian Navy's P-8I inflight

FIRST 4 CH-47F (I) CHINOOKS FOR INDIAN AIR FORCE ARRIVE IN INDIA

Advanced multi-mission helicopter will provide the Indian armed forces with unmatched strategic airlift capability across the full spectrum of combat and humanitarian missions



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ew Delhi. American aerospace major Boeing on February 10 announced the arrival of the first four CH-47F (I) Chinooks for the Indian Air Force (IAF) at the Mundra Port in Gujarat. The CH-47F (I) Chinooks will be ferried to Chandigarh, where it would be formally inducted in the IAF later this year.

The CH-47F (I) Chinook is an advanced multi-mission helicopter that will provide the Indian armed forces with unmatched strategic airlift capability across the full spectrum of combat and humanitarian missions.

The IAF currently has 15 Chinook helicopters on order. The arrival of the Chinooks ahead of schedule validates Boeing's commitment to delivering on

its promise of modernising India's defence forces. Through its current partnerships with the IAF and Indian Navy, Boeing has ensured high rate of mission readiness and increased operational capabilities.

This helicopter's distinctive "flying banana" twin-rotor design stems from the brilliant work of aviation pioneer Frank Piasecki. It gives Chinooks the ability to adjust their positioning very

precisely, while carrying a large airframe whose load capacity has made it the world's most popular heavy-lift helicopter. The US expects to be operating Chinooks in their heavy-lift role past 2030.

The CH-47F looks similar to earlier models but offers a wide range of improvements in almost every aspect of design and performance.

International orders or formal requests for the helicopter have come in from Australia, the UK, Canada, Italy, the Netherlands, Turkey, and the UAE, with India and other countries expected to follow. Boeing has exported the helicopter to the military and commercial

operators in Argentina, Australia, Canada, Japan, Norway, Spain and the UK, as well as three countries in the Far East.

The Chinook helicopter transports troops, artillery, supplies and equipment to the battlefield. Other applications include medical evacuation, aircraft recovery, parachute drop, search-and-rescue, disaster relief, firefighting and heavy construction.

There are more than 1,179 Chinooks operational worldwide. Boeing has delivered more than 480 CH-47D Chinooks to the US Army and National Guard. The US Army Chinooks are currently undergoing digital improvements to keep the aircraft active for a further 20 years at least. The 100th Chinook CH 47F was delivered to the US Army in August 2010.

A total of 397 US Army CH-47D helicopters are being upgraded to CH-47F standard. In May 2011, the US Army placed a \$23.7 million contract with Boeing for specialised avionics and airframe modifications to 49 CH-47F helicopters by April 2012. In January 2012, the army ordered 14 CH-47F Chinook helicopters worth \$370 million. L-3 Avionics Systems, a company based in the US, was awarded an \$18.6 million



contract in March 2013 to provide avionics displays for upgraded CH-47s for the US Army.

Boeing was awarded a contract from the Netherlands Ministry of Defence to modernise six Chinook helicopters of the Royal Netherlands Air Force (RNLAf) to CH-47F standard in December 2017. The upgraded helicopters are scheduled to be delivered by 2021.

Boeing received a contract to upgrade approximately 500 US Army Chinook helicopters under the Block II upgrade programme in July 2017. The programme entered into the final assembly stage in June 2018. UTC Aerospace System introduced a new lightweight ballistic protection system for

the CH-47 Chinook's cargo on/off loading system (COOLS) in October 2018.

The CH-47F design features alterations to the airframe structure to reduce the effects of vibration, as well as other structural enhancements to the cockpit, cabin, aft section, pylon and ramp.

The US Army special operations forces operate 36 special operations Chinooks, designated as MH-47D and MH-47E. These aircraft are being upgraded to MH-47G standard with a fully integrated digital common avionics architecture system (CAAS). The first was delivered in May 2004.

The US Army Special Operations Aviation Command awarded a \$139.8m contract to Boeing in July 2018 for four MH-47G Block II Chinook helicopters with Chinook Block II upgrades for enhanced performance. The deliveries are scheduled for 2020.

Boeing has strengthened its supply chain with over 160 partners in India, and a JV to manufacture fuselages for Apache helicopters. Annual sourcing from India stands at \$1 billion. Boeing currently employs 2,200 people in India, and more than 7,000 people work with its supply chain partners.

BOEING HAS STRENGTHENED ITS SUPPLY CHAIN WITH OVER 160 PARTNERS IN INDIA, AND A JV TO MANUFACTURE FUSELAGES FOR APACHE HELICOPTERS. ANNUAL SOURCING FROM INDIA STANDS AT \$1 BILLION





AERO INDIA 2019: RUNWAY TO BILLION OPPORTUNITIES

Five-day biennial Aero India 2019 begins on February 20 in Bengaluru to showcase the latest technology and products of the global and Indian aerospace and defence companies. The show includes static and flying display of the military and civil aircraft including fighter jets, helicopters and air weapons

By **DEVENDRA SINGH**



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engaluru: Preparations are in full swing at Bengaluru's Yelahanka Air Force station for Aero India 2019, which is being held between February 20 and 24. The theme of this year's air show is "The Runway to a Billion Opportunities."

The 12th edition of the five-day biennial event showcases the latest technology and products of the global and Indian aerospace and defence companies with static and flying display of the military and civil aircraft, including fighter jets, helicopters and air weapons.

"Besides global leaders and investors in the aerospace industry, think-tanks from the world over will participate in the show, providing an opportunity to exchange information, ideas and new developments in the industry," says Ministry of Defence (MoD). "The air show will also give fillip to the domestic aviation and further the cause of 'Make in India'. The Department of Defence Production is committed to ensure a

result-oriented air show," adds the Defence Ministry.

Renowned astronaut Sunita Williams is expected to attend the event, which is likely to be bigger and better than the previous Aero India shows. The event is not limited to just an air show. Several competitions such as Drone Olympics and photography contests are being conducted during the event.

Besides that seminars, CEO Roundtables, Webinars on various topics including

'Indian drone regulatory regime-innovative business opportunities', 'Creating a globally competitive ecosystem for fighter manufacturing in India' etc. are being conducted before and during the Aero India 2019.

Of the many jets that would soar in the Bengaluru sky during the show, two Rafale jets are said to have confirmed their participation. While one would display its skills in the sky, the other would remain static on the ground for exhibition. The air shows of latest aircraft of different countries have been arranged for the visitors at the venue during each day of the show.

The Aero India witnesses participation of a host of companies from different countries. In 2017, it saw participation of the exhibitors from 213 companies from 22 countries along with 234



domestic companies. Aero India 2017 also witnessed 500 official delegates from 46 countries. More than 60,000 business visitors and 100,000 general visitors attended the show in 2017.

NEW SPIRIT, FRESH OPENINGS

The logo for Aero India 2019 is inspired by HAL-built Light Combat Aircraft (LCA) Tejas, which is the smallest and lightest multi-role supersonic fighter aircraft of its class. This single engine, compound-delta-wing, tailless aircraft is designed and developed to meet diverse needs of the Indian Air Force and Indian Navy. The LCA Tejas programme has achieved the rare distinction of completing over 4,000 successful test flights.

The tri-coloured silhouette of LCA Tejas with Ashok Chakra in the centre is the core motif of this logo, reminiscent of



the spirit of a new India. The defined outlines of the 'A' in Aero is symbolic of a fighter jet while conveying that Aero India is a premier global aerospace exhibition.

The tagline for Aero India 2019 is "The Runway to a Billion Opportunities." It is created to communicate India's value

proposition in addressing the immense opportunities in the aerospace and aviation sectors in the country today. The tagline underlines India's status as an emerging hub for the global aerospace industry and draws attention to the investment opportunities under 'Make in India'.



AERO INDIA

RENOWNED ASTRONAUT SUNITA WILLIAMS IS LIKELY TO ATTEND THE EVENT. BESIDES GLOBAL LEADERS AND INVESTORS IN THE AEROSPACE INDUSTRY, THINK-TANKS FROM THE WORLD OVER WILL PARTICIPATE IN THE SHOW, PROVIDING AN OPPORTUNITY TO EXCHANGE INFORMATION, IDEAS AND NEW DEVELOPMENTS IN THE INDUSTRY

CURTAIN RAISER




THERE WILL BE A MOBILE APPLICATION FOR AERO INDIA 2019, WHICH WILL GUIDE THE USERS ABOUT THE EVENT. TICKETS FOR BUSINESS DAYS, FEBRUARY 20, 21 AND 22, WILL COST ₹2,750 EACH. TICKETS FOR GENERAL VISITORS WILL COST ₹1,800. ₹600 WILL BE CHARGED FOR AIR DISPLAY. ON-THE-SPOT TICKETS WILL COST ₹250 MORE.

THE EVENT IS NOT LIMITED TO JUST AN AIR SHOW. SEVERAL COMPETITIONS SUCH AS DRONE OLYMPICS AND PHOTOGRAPHY CONTESTS WILL BE CONDUCTED DURING THE EVENT

The tagline was also created while keeping in mind that the civil aviation industry in India has emerged as one of the fastest growing industries in the country. With passenger traffic in India likely to increase to 350 million in 2020, India is poised to become the third largest aviation market in the world. Similarly, India's fleet of 430 civil aircraft will double in the next five to seven years

PLATFORM FOR BUSINESS OPPORTUNITIES

Aero India 2019 provides a significant platform for business opportunities in the international aviation sector.

A rapidly-growing economy and an opening up of defence production to the private sector have given a major boost to the defence industry in India. It has also become a hub for defence businesses in the world.

The United Kingdom is soon expected to invite the IAF to co-develop a sixth-generation fighter called the Tempest. "We are looking for international partners to access the best-assured capability (for developing the Tempest)," said Nik Khanna, who heads BAE Systems India. Executives of the British defence giant BAE Systems would be part of the UK delegation, which also includes the Ministry of Defence (MoD)

officials, is expected to arrive in India on February 18 for Aero India 2019.

As part of its Indo-Pacific strategy, the US now seems to be more than inclined to let India procure its missile defence system with talks between the two countries having already started. Under Secretary of Defence for Policy John Rood has said the US has discussed a potential missile defence collaboration with India as the US wants to build a "much deeper and broader relationship" with India. There have been reports that India is interested in purchasing the Terminal High Altitude Area Defence System popular as THAAD from the US.

"We are cooperating across the board in practically every sector. The best part of it is that we are forging ahead very very quickly and the opportunities remain significant to take this relationship forward not just incrementally but exponentially," said India's ambassador to the US Harsh V Shringla. The US partnership pavilion, being organised at Aero India 2019 to help US exhibitors capitalise on stronger alliances, market trends and the concentration of buyers, would be surrounded by the largest and most influential Indian aerospace companies, ensuring high visitor traffic and the extra interest of local leaders.

India is perhaps the world's most competitive aerospace and defence market today with plans to spend billions in defence acquisitions over the next several years and a civil aviation industry projected to reach third largest in the world by 2020. Having tripled its exhibitor list in the last ten years, Aero India has become a must-attend event for the global companies interested in doing business with India. ■

FUTURE TECHNOLOGY SOLUTIONS ANCHORS BAE SYSTEMS' PRESENCE AT AERO INDIA



by Mahindra Defence Systems Ltd under an arrangement designed to support defence industrial cooperation.

Leading the Company's participation at the Show will be Dave Armstrong, Group Business Development Director, and Nik Khanna, India, Managing Director.

Dave Armstrong, Group Business Development Director, said "Aero India is an important event on our international calendar, providing an excellent platform to engage with customers, partners, suppliers, and other key stakeholders, in this strategic market. With these future focused displays, our emphasis at the Show will be to explore opportunities to collaborate with the entire breadth of our Indian partner spectrum, including the MSME sector."

Nik Khanna, Managing Director, India, commented "We are unveiling some of our finest future-tech solutions to the Indian Armed Forces at Aero India this year. The Show serves as a fertile ground for us to expand our efforts in expanding MSMEs into our global supply chain ecosystem whilst engaging with our key stakeholders, providing both direction and momentum in our plans. Developing an in country supply chain is key to our India commitment and we are delighted to see this being galvanised through the commencement of the Make-in-India M777 programme." BAE Systems at Aero India 2019

With India as the largest operator of the Hawk advanced jet trainer with 123 aircraft ordered to date by the Indian Air Force (106) and the Indian Navy (17), the Make-in-India Hawk will find position of pride on the Stand. ■

New Delhi, India: Signalling its continued intent to collaborate with Indian industry in the country's requirements for futuristic defence systems and develop technology and platforms for India, BAE Systems' participation at the 12th edition of the biennial Aero India will be anchored in its next generation advanced technology, products and services.

On the stand will be: information on BAE Systems' participation in Team Tempest, the UK's technology development programme being delivered by the Royal Air Force and industry partners to ensure a future international combat air system is at the very forefront of combat air capability. Team Tempest brings together the UK's world leading industry and sovereign capabilities across future combat air's four key technology areas: combat air systems and integration; power and propulsion systems; sensors, electronics and avionics; and weapon systems. Team Tempest was first revealed at the 2018 Farnborough International Air Show in July last year.

Also featured on the Stand will be the Eurofighter Typhoon; advanced electronic systems (APKWS laser-guided rocket); augmented reality technology (Striker II head-mounted

display (HMD); and the Make-in-India Hawk132, of which 123 are in service with the Indian Air Force and the Indian Navy.

The Show follows shortly after the Company has marked several delivery milestones in the US Government's sale of 145 M777 Ultra Lightweight Howitzers (ULH) to the Indian Army. Most recently, the M777 ULH was inducted into the Indian Army, and consequently made its debut at the Republic Day Parade. Earlier in 2018, the Company delivered the first spares and other logistics including tooling, technical publications and training materials, to support the Indian Army as it brings the new M777 ULHs into service. BAE Systems is building and delivering the first 25 M777 ULHs fully assembled, and then to promote local economic growth in India, the remaining 120 systems will be assembled in India

WEAPON SYSTEM: MISSILES

BRAHMOS - A WORLD CLASS WEAPON SYSTEM



BRAHMOS Missile fitted under the fuselage of IAF's SU-30 MKI

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oday BrahMos Aerospace enjoys a unique place in the world of defence. Many warships of Indian Navy and artillery regiments of Indian Army are equipped with BRAHMOS missiles. Inclusion of such versatile weapons like BRAHMOS in the arsenal, a hallmark for 'Make In India', play a significant role in modern-day conflicts and wars as it supersedes the most popular cruise missiles in the world by three times in terms of velocity, flight range and nine times the kill energy range.

The potential BRAHMOS, developed as a fusion of great scientific minds from India and Russia, has grown from strength to strength over the years and added new capabilities to meet divergent war scenarios. The successful Joint Venture between India's Defence Research and Development Organisation (DRDO) and Russia's JSC MIC NPO Mashinostroyeniya (NPOM) has made impressive advancements in joint design, development and production of the high-technology BRAHMOS. The supersonic cruise missile is

a unique example of the strong partnership between India & Russia in critical areas of research and development.

BRAHMOS is the leading supersonic cruise missile capable of hitting sea based targets beyond radar horizons. The missile with pinpoint accuracy can be launched as far as 290 kms from the target at the speed of Mach 2.8. The missile has successfully demonstrated its speed, precision and power a number of times from naval ships and Mobile Autonomous Launcher (MAL). The launches

have been carried out in sea-to-sea, sea-to-land, land-to-land and land-to-sea configurations.

The missile has been successfully inducted in the Indian Army and Indian Navy. The Indian Navy was the first to place order for BRAHMOS. The missile system is inducted in a majority of existing naval platforms and will be deployed in other future surface ships. The Indian Army is the only armed force in the world to have land-attack supersonic cruise missile capability. The air launched version was test-fired for the first time in 2017 from a modified Su-30MKI fighter aircraft of the Indian Air Force.

In terms of futuristic developments, the hypersonic BRAHMOS is being envisioned to travel at a speed of Mach 5 to 7 (five to seven times the speed of sound). The hypersonic BRAHMOS cruising at Mach 7 will be the ultimate game changer in network centric war scenario. The new missile would

be called BRAHMOS-II (K). Both Indian-Russian governments are also keen to develop mini, next-generation BRAHMOS, being termed as BRAHMOS-NG.

BrahMos has set precedence by successfully establishing a robust Missile Industrial Complex in both India and Russia. The public and private sector Indian defence firms have been actively involved in designing, developing and producing various components of the missile. 100 per cent of integration of the missile systems are accomplished in India and 60 per cent of component production are realised in India. It is, therefore, the contribution of more than 20,000 Specialists, Engineers & Technicians in more than 200 large and medium industries that has made BRAHMOS a formidable, world-class system today. The supersonic cruise missile has thus played a crucial role in redefining public-private partnership in Indian defence sector.

Regarding export of missiles to foreign countries, a number of countries have shown keen interest in procurement of the system. The missile has the potential of becoming India's major weapon export in the coming decades once its internal requirements are fulfilled giving India a share of the global arms business. There are several countries across continents which have strongly wished to acquire BRAHMOS for their military. Decision on Export of weapons is a prerogative of the Government. Any decision on export will be taken by the two Governments jointly however BrahMos is ready to fulfill all export related deliveries.



BRAHMOS missile fight tested from the Su-30MKI Aircraft

BRAHMOS is unique with its higher weapon effectiveness, reliability, multi-platform, multi-mission and multi target capability. It is the leader in cruise missile family.

BrahMos Aerospace will be

the major attraction at the 12th edition of the Aero India 2019, to be held at Air Force station Yelahanka, Bengaluru from February 20-24.

BrahMos Aerospace will be showcasing the BRAHMOS missile

in various configurations, including the BRAHMOS Coastal Defence System consisting of the land-attack variant, BRAHMOS Land Mobile Complex and BRAHMOS Ship-based Weapon Complex consisting the ship-to-land, ship-to-ship and underwater variant of the 290-kms range missile. The major emphasis during the exhibition will be the BRAHMOS Air-Version supersonic cruise missile system. The replica of BRAHMOS on Su-30MKI along with the BRAHMOS air-borne launcher and equipment manufactured by BrahMos Aerospace Thiruvananthapuram Ltd (BATL) for Defence and Space applications including systems and sub-systems manufactured by Indian industries associated with BrahMos will be the key focus during the airshow.

THE MISSILE HAS BEEN SUCCESSFULLY INDUCTED IN THE INDIAN ARMY AND INDIAN NAVY. THE INDIAN NAVY WAS THE FIRST TO PLACE ORDER FOR BRAHMOS. THE MISSILE SYSTEM IS INDUCTED IN A MAJORITY OF EXISTING NAVAL PLATFORMS AND WILL BE DEPLOYED IN OTHER FUTURE SURFACE SHIPS. THE INDIAN ARMY IS THE ONLY ARMED FORCE IN THE WORLD TO HAVE LAND-ATTACK SUPERSONIC CRUISE MISSILE CAPABILITY. THE AIR LAUNCHED VERSION WAS TEST-FIRED FOR THE FIRST TIME IN 2017 FROM A MODIFIED SU-30MKI FIGHTER AIRCRAFT OF THE INDIAN AIR FORCE



Dr Sudhir Mishra, Distinguished Scientist and Director General (BrahMos), DRDO, and MD & CEO, BrahMos Aerospace

GOVERNMENT LAUNCHES AERO INDIA WEBSITE TO FACILITATE EXHIBITORS, VISITORS AND MEDIA



New Delhi. A newly designed website has been launched on October 10 for Aero India 2019 (<https://aeroindia.gov.in>) for registration of exhibitors and visitors.

The portal facilitated payment of registration fee online and thereafter book space/stall of their choice at the venue through the portal. Business visitors would also be able to purchase tickets on the portal by paying

required fee online. The Aero India website has been integrated with multi-currency Payment Gateway where Indian companies would be able to pay in Indian Rupees using Credit Card/Debit Card/Net Banking/UPI/NEFT/RTGS and foreign companies would be able to pay in US dollars using credit card/debit card.

The registration of media representatives will be opened shortly.

The website will be hosting latest information about the various events like seminars, CEO's Round Table, etc. to be held during the Aero India 2019 show and other important information to facilitate the exhibitors and visitors to plan their trip for the show.

India is hosting the 12th edition of "Aero India

2019" at Air Force Station, Yelahanka, Bengaluru, (Karnataka) from 20 to 24 February. This five-day event will combine a major trade exhibition of the aerospace and defence industries with public air shows. Besides global leaders and big investors in aerospace industry, the show will also see participation by think-tanks from across the world.

Aero India will provide an unique opportunity for exchange of information, ideas and new developments in the aviation industry. Besides giving a fillip to the domestic aviation industry it would further the cause of Make in India.

In Aero India, close to 500 companies both Indian and Foreign are expected to participate. ■

DEFENCE MINISTER LAUNCHES WEB PAGE ON 'DRONE OLYMPICS' EVENT AT AERO INDIA - 2019

New Delhi. Defence Minister Nirmala Sitharaman launched a newly designed web page in New Delhi on December 28 for 'Drone Olympics' (<https://aeroindia.gov.in/Drone>), scheduled to be held at Aero India - 2019 at Air Force Station, Yelahanka, Bengaluru.

The web page is open for registration of UAV players interested in taking part in the maiden event of the Aero India. It will not only encourage the UAV manufacturing in the country but also provide an opportunity to the

Armed Forces to assess the capabilities that exist in the world.

The UAV market is one of the fastest growing fields in the world. Role of UAVs in defence sector is ever-increasing on account of new additionalities being added to them making them fit for intelligence, surveillance, reconnaissance, electronic warfare and strike missions.

'Drone Olympics' is open to both Indian and international players. Three categories of the event, planned during

the competition are Surveillance Challenge with four sub-categories which will determine the surveillance capability of the UAVs. Supply Drop Challenge to assess weight dropping capability and Formation Flying Challenge demonstrating different shapes with group of UAVs. The winners will be honoured with medals and a cash prize of Rs 38 lakhs to top three winners of each competition. Last date of registration to participate in event is January 26, 2019. ■



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engaluru. SAAB is proud to participate in the 12th edition of Aero India in Bengaluru, organized by Indian Ministry of Defence. For decades, Saab has been an active partner with Indian businesses and we are committed to the Make in India programme.

Saab showcases its world-leading capabilities in air-power, aircraft and surveillance systems, as well as digital air traffic management solutions.

Explore a formidable range of products: Gripen E and Weapon systems: Gripen combines exceptional operational performance, highly advanced net-centric warfare capability, sensor fusion, unique BVR capability, cost efficiency, with true transfer of technology and comprehensive industrial partnership. Weapon Systems on display include the MBDA Meteor, the RBS-15 long range ASM and Taurus, the long-range air-to-surface precision cruise missile along with other weapons and sensors. Also on display is a Full Scale Replica model of Gripen E, apart from the Gripen E Mission Simulator.

Gripen Maritime: Saab will showcase its Gripen Maritime version to share its capabilities and performance.

Integrated Defensive Aids Suite (IDAS): IDAS is a fully integrated warning system and includes radar warning (RWC), missile approach warning (MAWS) and laser warning

sensors (LWS). In India, IDAS is integrated on the ALH Dhruv and ready for LCH.

Digital Tower Management Solutions: Remote Tower solutions provide a smarter approach to air traffic control by digitizing and integrating airport functions. Whether that airport is an international hub, a small regional airport or a new airport, we offer effective solutions that improve safety and operational efficiency.

Ground Combat Systems: include the Carl Gustaf M4, a man-portable multi-role weapon system that provides high tactical flexibility through its wide range of ammunition types. It is extremely light (less than 7 KGs), and has an intelligent sight, improved ergonomics and reduced action time. The Carl Gustaf AT4, enhanced to deliver extended range (ER) performance and improved high explosive (HE) effects, will also be present. Land Electronic Defence System (LEDS) 50 Mk2 a cost effective,

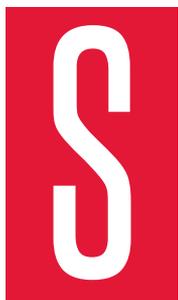
integrated, modular, Active Protection System consisting of Laser Warning Sensors, an Active Defence Controller, Human Machine Interface and an Effector Control Segment, providing combat personnel with vital situational awareness on laser threats and manual or fully automatic responses against threats.

Next-Generation Radar systems, include the GaN based (Gallium Nitride) Saab AESA Fighter Radar, and the truly multi-role Globaleye AEW & C aircraft with ERIEYE-ER radar. It automatically detects and tracks air and surface targets over a huge area, and can track very low-observable air and sea targets, including 'stealthy' aircraft, cruise missiles or submarine periscopes, even in heavy clutter and jamming environments.

Saab's GIRAFFE 1X is based on over 50 years of radar development. The GIRAFFE 1X is a multi-purpose, light weight AESA 3D radar system solution in the X-band with outstanding performance in its class of radars. GIRAFFE 1X is characterized by its low weight and small physical footprint that allows for integration in vehicles without affecting mobility and agility.

Saab's portfolio of Signature Management Systems includes the Mobile Camouflage System, a tailor-made, multi-spectral (Visual, Near IR, Short Wave IR, Thermal IR and Radar from 1 GHz to 100 GHz), multi-purpose system for mobile fighting platforms that enhances survivability and sustainability in the battlefield. It also has various Multi-Spectral Camouflage Nets (MSCN) including the ARCAS (Advanced Reversible Camouflage Screen) and C-90 Net, designed to protect all kinds of vehicles and other static military equipment. ■

LEADING US-BASED ADVANCED COMPOSITES COMPANY HEXCEL TO START INDIA OPERATIONS, EXHIBITS AT AERO INDIA 2019



TAMFORD, Connecticut. A US-based leading advanced composites company Hexcel is exhibiting at the Aero India show for the sixth time, continuing to support customers in the Indian subcontinent and throughout Asia, a company press statement on January 29 said. To coincide with the show, Hexcel is announcing the opening of its new sales office, Hexcel Composites India LLP. The office is located in Bangalore and will be fully operational in March 2019. Vijay Sharma, Sales Manager, and Ram Kumar, Technical

Representative, will manage the sales activities and support key customers in the region.

This year's show takes place at Yelahanka Air Force Station in Bangalore from February 20-24 to promote a range of carbon fibers and composites that are benefiting Indian aerospace manufacturers for commercial aircraft, helicopters and space programs. Hexcel is exhibiting at Stand AB2.5D, Hall AB.

Hexcel has supplied carbon and glass fiber fabrics, prepregs, honeycombs and adhesives to

Indian aerospace companies for more than 28 years, including Hindustan Aeronautics Ltd (HAL), National Aerospace Lab (NAL), Indian Space Research Organisation (ISRO), Vikram Sarabhai Space Centre (VSSC) and TATA Advanced Materials.

Hexcel's high strength and intermediate modulus carbon fiber range has been augmented by the launch of HexTow® HM63, a high modulus carbon fiber that has the highest tensile strength of any existing HM fiber.

HexTow® HM63 provides outstanding translation of fiber properties in a composite, including superior inter-laminar shear and compression shear strength. It is therefore ideal for any high stiffness and strength-critical applications including space, satellites, UAV, commercial aerospace and helicopters.

Resin Transfer Moulding (RTM) is a composite manufacturing process that allows high quality components to be produced with good surface quality and without using autoclaves. Hexcel has recently launched HexFlow® RTM6-2 to provide the industry with a bi-component version of its highly successful RTM6 resin, making it easier to transport by air or sea outside Europe.

With the same chemical composition as RTM6, HexFlow®

RTM6-2 provides the same high mechanical properties from a short cure cycle, including high Tg. An added advantage is that HexFlow® RTM6-2 can be stored at +5°C for 12 months.

Hexcel will also promote HexPly M56 out-of-autoclave (OOA) prepreg for aircraft secondary structures. Unlike traditional aerospace prepregs that require an autoclave cure to achieve the required properties, HexPly M56 provides the same quality and performance from a simple oven cure under vacuum. This avoids capital investment in autoclave equipment and on-going processing costs.

The easy handling of HexPly® M56 for hand lay-up and ATL applications is also a benefit, along with the 30-day tack life at room temperature.

HexPly M56 is available with woven carbon, UD carbon tape, woven glass and Metallic mesh reinforcements and is suitable for hand lay-up, Automated Tape Laying (ATL) and Automated Fiber Placement (AFP) processing.

The standard cure temperature is 180°C and an alternative 135°C cure cycle is possible, with potential for reduced tooling costs and composite repair applications.

Hexcel Corporation is a leading advanced composites company. It develops, manufactures and markets lightweight, high-performance structural materials including carbon fibers, specialty reinforcements, prepregs and other fiber-reinforced matrix materials, honeycomb, adhesives, engineered core and composite structures for use in commercial aerospace, space and defense and industrial applications.

AIRBUS PREPARES FOR LARGE SCALE PRESENCE AT AERO INDIA

New Delhi. From flying and static displays of its best-in-class products to showcasing its cutting-edge aerospace services, Airbus has planned one of its biggest-ever participation at Aero India to be held in Bengaluru from February 20 to 24.

STATIC & FLYING DISPLAYS: The centrepiece of the flying displays would be the A330neo – the latest addition to the leading Airbus widebody family featuring advanced materials, new optimised wings, composite sharklets and highly efficient engines that together deliver 25 per cent reduced fuel burn and CO2 emissions. Demonstration flights would be performed by the new generation tactical airlifter C295 which can perform multi-role operations under all weather conditions.



On static display would be Airbus' most versatile twin-engine rotorcraft – the H135 & H145. The H135 is known for its endurance, compact build, low sound levels, reliability, versatility and cost-competitiveness. The H145 is a member of Airbus' 4-tonne-class twin-engine rotorcraft product range – with designed-in mission capability and flexibility, especially in high and hot operating conditions.

Visitors at the Airbus exhibit – Hall E 2.8 & 2.10 – can witness the company's continued commitment to supporting the growth of India's aviation, defence and space sectors, particularly in the areas of 'Make in India' and 'Startup India'. Aerospace fans can also savour interactive virtual and augmented reality experiences at the Airbus stand.

"Aero India is the jewel in the crown of the world's largest defence and third-largest commercial aviation market," said Anand E Stanley, President and Managing Director of Airbus India & South Asia. "Airbus' large-scale commitment to the show demonstrates that India is more than a market, it's a core base for us."

On display would be scale models of the C295 – medium transport aircraft; the A330 MRTT – Multi-Role Tanker Transport aircraft; the A400M – the most versatile airlifter currently available; the SES-12 – a geostationary communications satellite and a holographic display of the Hybrid SAR Earth observation radar satellite. In helicopters, scale models of the H225M – the military version of Airbus' H225 Super helicopter; the AS565 MBe – the all-weather, multi-role force multiplier; along with the H135 and H145 to be on display. Commercial aircraft scale models include A330-900, the member of Airbus' A330neo new generation widebody, the A321neo and ATR 72-600.

Airbus also demonstrates a wide range of service offerings, including through its fully owned subsidiaries Satair and Navblue, with particular focus and demonstrations of Skywise-based digital services. Also, on display would be Airbus' Advanced Inspection Drone which accelerates and facilitates visual checks, considerably reducing aircraft downtime and increasing the quality of inspection reports.



It is Airbus' firm belief that technology and talent are the key to unlocking the enormous potential of the region. In India, it has sought to foster innovation and entrepreneurial spirit through Airbus BizLab, which would be present at Hall E 2.9. Visitors to get a first glance of the opportunities that the startup accelerator has created in the Indian innovation ecosystem. Airbus Bizlab also to partner with Invest India to organise the 'Startup Day' at Aero India.

TALENT ACQUISITION: Airbus is to leverage the event to acquire talent. On February 23 and 24, it would offer members of the public the opportunity to explore career prospects with Airbus India in Avionics Software, Aircraft System Simulation and Airframe Structures as well as in API Development, Full Stack Development, Big Data, Cloud and DevOps.

ROHDE & SCHWARZ PRESENTS NEW MEMBER OF THE SOVERON SOFTWARE DEFINED RADIO FAMILY

Rohde & Schwarz is expanding its successful family of airborne radios with another high-end radio. SOVERON AR offers secure, high data rate communications, flexible deployment and true independence for the customer. In addition, Rohde & Schwarz is the only provider to offer an airborne radio that can be certified for civil and military use

Bengaluru. The SOVERON AR from Rohde & Schwarz takes the latest generation software defined radios (SDR) and network enabled waveforms to the skies. It combines the advantages of a high data rate, IP-based radio with the excellent technical performance customers have come to expect from the successful R&S M3AR family of airborne radios. More than 7,000 airborne radios from the independent European vendor

are in use worldwide on over 70 different airborne platforms. The first customer contracts for the new SOVERON AR are already implemented. That was made possible by working closely with government customers and platform manufacturers during development to harmonize requirements.

Bosco Novak, Executive Vice President, Secure Communications Division, comments: "We are proud to launch the most advanced airborne radio for

secure military communications. With its outstanding technological features, the SOVERON AR offers many advantages for integrators and users. For Rohde & Schwarz, enabling our government customers to maintain sovereignty in the digital information space is at the core of the concept."

Stefan Pleyer, Vice President, Market Segment Avionics, adds: "At the technological level, the SOVERON AR stands for information superiority in network centric operations and utmost flexibility

in deployment. A unique feature is the fact that Rohde & Schwarz airborne radios can be certified for civil use."

Rohde & Schwarz is the only vendor to meet the civil certification regulations of the European Aviation Safety Agency (EASA). Military aircraft can only be certified and deployed without restrictions, if they meet both military and civil standards. Two radios must usually be carried on board an aircraft to ensure failsafe performance. The SOVERON AR airborne radio can be used in both applications, delivering unprecedented efficiency in terms of logistics, integration, maintenance and training. It also simplifies integration and saves space and weight in the aircraft.

As a state-of-the-art software defined radio, the SOVERON AR supports the porting of waveforms independent of the manufacturer to give customers additional flexibility. The SOVERON AR has been designed as an open platform based on the international Software Communications Architecture (SCA) standard, with a strict separation between the radio's hardware and software, the waveforms. That makes it possible to port SCA-based waveforms,



including those from other manufacturers, as well as legacy waveforms to the radio, providing safety of investment along with backward compatibility with legacy radio systems. It also enables customers to create and modify embedded encryption along with the waveforms. That allows secure communications channels to be set up to provide interoperability between different branches of a country's armed forces and between different nations. National data is protected, and information superiority in joint operations and combined missions can be achieved.

Rohde & Schwarz has created a family of network enabled, high data rate waveforms to handle diverse mission requirements. The waveforms of SOVERON WAVE can transmit data and up to two voice channels in parallel, at high speed and with different priorities. Users can select the waveform that best suits a given communications scenario in terms of range, data rate and jamming resistance. In addition, SOVERON WAVE integrate highly secure encryption algorithms to protect military communications.

The SOVERON VR vehicular radio and the SOVERON HR handheld radio already incorporate latest generation of software defined radio technology with SOVERON WAVE. The SOVERON AR adds airborne communications capability to ground-based radio networks.

Rohde & Schwarz will showcase the SOVERON AR software defined airborne radio at Aero India Show Bengaluru from February 20 to 24, 2019, in hall at F Stalls; F2.11, F2.12, F2.19, F2.20. ■

IAI PRESENTING VARIETY OF SYSTEMS AT AERO INDIA

New Delhi. Israel Aerospace Industries (IAI) is participating in Aero India 2019 Exhibition in Bengaluru from February 20-24. The company expects to expand collaboration with local leaders in integrating strategic state-of-the-art systems for the Ministry of Defence (MoD) in a number of areas and in accordance with the Indian Government's 'Make in India' policy. These collaborations are a direct continuation of IAI's business deals in India which totaled some 1.9B\$ in 2018.



IAI has been working with India's defence industries and armed forces for the past 27 years under strategic collaboration spanning many fields. The company collaborates with local companies and works with India's defence agencies, as well as with the Navy, Air Force, Army and Coast Guard. Joint development projects include the MRSAM Air defence system, in both its maritime and land-based versions; mission aircraft; various radar systems and UAVs. Collaboration agreements are based on transfer of technology for the benefit of local production as part of the Indian Government's 'Make in India' policy.

Nimrod Shefer, IAI's President and CEO, said: "India is one of IAI's main partner. This important partner is characterized by long-term collaboration, joint development and production, technology transfer and technical support over many years. We are working to nurture this relationship in the future



despite growing competition. The excellent reputation that IAI has earned among its Indian partners is vitally important to continuing this tradition of successful cooperation."

At the exhibition, IAI to present a wide variety of strategic defence systems with an emphasis on MRSAM, TecSar Satellite, TopGun, in the

loitering-munition category, featuring the Green Dragon, Mini Harpy and Rotem.

Moreover, in the Unmanned Aerial Systems area IAI would display the Heron TP and the Bird Eye 650D, which enable a broad range of intelligence gathering capabilities for various operations and NRUAV.

IAI also exhibits strategic radar systems, satellite communication systems, new electro-optical systems using the new Ultra-POP high definition technology. Additional developments on display include modular and compact command and surveillance systems with stabilized gyros for nighttime and daytime observation at a competitive price. In addition, IAI would present a selection of mission aircraft for intelligence missions, aerial control and naval surveillance on different platforms, such as AEW&C (Airborne Early Warning and Control), ELW 2090, ISTAR and ASIS mission aircrafts. Over the Past Year, IAI has Generated Hundreds of Millions of Dollars of Sales in the Indian Partner; Expected to Expand Collaboration with Local Companies in Defence Systems Integration. ■

BEL SHOWCASING WIDE-RANGING CAPABILITIES

Bengaluru. Navratna Defence PSU Bharat Electronics Limited (BEL) is showcasing its wide range of capabilities at Aero India 2019, including the state-of-the-art products and systems spanning every domain of its business – military communication, radar systems, missile systems, naval systems, C4I Systems, electronic warfare systems, avionics, anti-submarine warfare systems, tank electronics, electro optics, gun/weapon system upgrade shelters, unmanned systems, homeland

security, life support systems (atmospheric water generator), cyber security and professional electronic components.

BEL is also showcasing its R&D capabilities by launching/demonstrating some of its new products /technologies.

BEL's display in the area of radar includes products/models/panels of active electronically

scanned array radar, quick reaction surface-to-air missile radar and other state-of-the-art radars for automatic detection of first-round location of artillery weapons (weapon locating radar), border surveillance and detection of low flying targets (BFSR-XR and Aslesha).

BEL's display in the area of military communication

includes products for data and voice communication between systems, Missile Data Link Unit to provide reliable uplink and downlink data from ground station to missile, high capacity radio relay, software defined radio – airborne, data diode used to create a physically-secure one-way communication channel from one network to another, secured tactical computer, rugged panel-PC, Data Link Radio Frequency Unit for exchanging information at a much higher data rate and indigenised Ku Band Satcom for wideband satellite communications from vehicles in motion over rugged terrain.

Electronic warfare and avionic products on display include head-up display for Light Combat Aircraft (LCA), Identification Friend or Foe for aircraft and helicopters, drone interception & countermeasure system, Satellite-AIT, EW Suite for fighter aircraft, self-protection suite for helicopters, data link for onboard communication on aircraft, VSAT monitoring system, Aerostat: Aerostat Balloon and Ground Control Station, LRUs for UAV, various avionic and flight control systems for LCA and Directed Infrared Counter Measure to intercept and counter threats.

Network centric solutions on display include C4I systems for the Army, Navy and Air Force, compact sensor integration system to enable command centre to integrate with variety of sensors and weapon systems, Scrambler Unit, Radio Interface Unit, Integrated VoIP System Suite for seamless voice and video connectivity for ground-to-





Replay Operator System, Image Analytic Engine, Linear Variable Differential Transducer, Comprehensive Integrated Border Management System, Smart City solutions, Atmospheric Water Generator (AWG), Mine Field Recording System, Chemical Agent Monitor, etc.

The L70 Upgraded Gun model is also being showcased at the exhibition.

The highlight of BEL's outdoor display is the Comprehensive Integrated Border Management System, X Band Active Phase Array Radar, Advance Landing Ground Communication Terminal, Gun Shot Detection System, enclosures made from Composite, Atmospheric Water Generator (AWG), Compact Multipurpose Advance Stabilised System for day and night surveillance,

THE HIGHLIGHT OF BEL'S OUTDOOR DISPLAY IS THE COMPREHENSIVE INTEGRATED BORDER MANAGEMENT SYSTEM, X BAND ACTIVE PHASE ARRAY RADAR, ADVANCE LANDING GROUND COMMUNICATION TERMINAL, GUN SHOT DETECTION SYSTEM, ENCLOSURES MADE FROM COMPOSITE, AWG, COMPACT MULTIPURPOSE ADVANCE STABILISED SYSTEM FOR DAY AND NIGHT SURVEILLANCE

ground and ground-to-air communication, Image Analytic Engine, Integrated Data Centre, Air Traffic Management and mobile application for secure communication.

Also on display are complete range of Electro Optics, including EO solutions and Laser Range Finders such as Electro Optics for Coastal Surveillance, Pan & Tilt – Electro Optical Director for long-range surveillance applications like coastal surveillance, border surveillance etc, Multipurpose Reflex Weapon Sight, LRF Eye Safe-10 PPM, Hand Held Laser Range Finder and LRF Module.

BEL is showcasing its naval systems capability through Coastal Situational Awareness Radar, Diver Detection Sonar and Low Frequency Dunking Sonar. Components/technology modules on display include ZnS Dome for missiles, TR modules



for radar application, batteries, electronic fuses for artillery, etc.

Other innovative solutions on display are Data Radio for Distributed Power Wireless Control System, Real-Time Train Information System, Air Borne Server, Record

reconnaissance and target tracking application.

The entire set of state-of-art equipment on offer is a force multiplier for any defence force and will make their "Observe Orient Decide Act" (OODA) cycle seamless and efficient. ■

NEWS ROUND UP



INDIAN NAVY INDUCTS FIRST FLYAWAY DEEP SEA SUBMARINE RESCUE SYSTEM

The Deep Sea rescue system would have a global footprint and can be mobilised from the Naval base at Mumbai to the nearest mobilisation port by air/land or sea to provide rapid rescue to the Submarines in distress

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umbai. Indian Navy inducted first flyaway Deep Sea Submarine Rescue System in a glittering ceremony held at the Naval Dockyard in Mumbai on December 12. The submarine rescue system was formally inducted by Chief of Naval Staff (CNS) Admiral Sunil Lanba, who is also Chairman Chiefs of Staff Committee (COSC). Vice Admiral Girish Luthra, Flag Officer Commanding-in-Chief, Western Naval Command, former CNS/ Cs-in-C as well as the senior management of the Original Equipment Manufacturer M/s James Fisher and Sons Pvt Ltd, UK were present during the induction ceremony.

Aquisition of this capability is a significant and pioneering jump in

the Indian Navy’s capability in deep submarine rescue.

The Indian Navy currently operates submarines of the Sindhughosh, Shishumar, Kalvari Classes as well as nuclear powered submarines. The operating medium and the nature of operations undertaken

by submarines expose them to high degree of inherent risk. In such an eventuality, traditional methods of search and rescue at sea are ineffective for a disabled submarine. To overcome this capability gap the Navy has acquired a third generation, advanced Submarine Rescue



System considering of a Non-tethered Deep Submergence Rescue Vehicle (DSRV) and its associated equipment.

The Indian Navy now joins a select league of Nations worldwide with the sovereign capability, in fly away configuration, to search, locate and rescue crew from a disabled Submarine.

The Deep Sea rescue system would have a global footprint and can be mobilised from the Naval base at Mumbai to the nearest mobilisation port by air/land or sea to provide rapid rescue to the Submarines in distress. The newly acquired capability would be operated and deployed by the crew of Indian Navy's newly formed Submarine Rescue Unit (West) from its base in Mumbai.

The Indian Navy's Deep Sea Submarine Rescue System considered to be the most advanced system currently in operation globally, is capable of undertaking rescue from a disabled Submarine up to 650 m depth. The DSRV, which is operated by a crew of three, can rescue 14 personnel from a disabled Submarine at one time and can operate in extreme sea conditions (upto Sea State 6). ■



DSRV in operation in the sea

IIT MADRAS MULLS PARTNERING WITH THALES TO DESIGN SHAKTI PROCESSORS

Thales and IIT Madras to take up joint research programs in the areas such as aerospace, space, transportation, security and defence

CHENNAI. Indian Institute of Technology Madras (IITM) is partnering with Thales to design a SHAKTI RISC-V processor compatible with the highest Safety Critical standards. The collaboration will result in defining and prototyping a SHAKTI RISC-V based processor suitable for mix-criticality applications, including Safety Critical applications.

As a result of this tie up, a fault-tolerant SHAKTI framework would be developed and will undergo evaluation by the world's top experts in Safety Critical Standards. Pursuant to their approval, it can be used in sensitive equipment used in defence, aerospace, space, and transportation sectors.

Thales and IIT Madras are going to take up joint research programs in many areas including aerospace, space, transportation, security and defence.

Thales, an international group, designs and builds electronic systems for aerospace, space, transportation, security and defence. Thales will draw on its expertise in the security and dependability of critical embedded systems to establish security best practices for hardware development.

The ultimate objective is to improve the security and dependability of Internet of Things (IoT) devices, embedded systems and machine learning implementations. IIT Madras Researchers had recently designed, fabricated and booted up India's first Indigenously-developed RISC V Microprocessor – 'Shakti'.

The Shakti family of processors are targeted for mobile computing devices, embedded low power wireless systems and networking systems besides reducing reliance on imported microprocessors in Communications and Defence Sectors. The Microprocessor can be used by others as it is on par with International Standards.

"After the two successful fabrication and booting of SHAKTI with two technology nodes, 22nm (Intel Fab, Orgeon USA) and 180nm (SCL Chandigarh fab, India), this tie-up with Thales is very exciting and certainly is a big step towards taking SHAKTI family to the global technology ecosystem"

Speaking about the significance of this development, Lead Researcher Prof. Kamakoti Veezhinathan, Reconfigurable Intelligent Systems Engineering (RISE) Laboratory, Department of Computer Science and Engineering, IIT Madras, said, "After the two successful fabrication and booting of SHAKTI with two technology nodes, 22nm (Intel Fab, Orgeon USA) and 180nm (SCL Chandigarh fab, India), this tie-up with Thales is very exciting and certainly is a big step towards taking SHAKTI family to the global technology ecosystem."

"With the advent of more and more safety critical systems adopting electronics hardware for intricate control and monitoring, fault-tolerance and security features are of prime importance in next generation processors. This tie-up with Thales, I am sure, will result in a detailed analysis of these features resulting in a framework that could be adopted for designing the next generation Shakti-based safety-critical systems," Prof Veezhinathan added. ■

NEWS ROUND UP

New Delhi. Rostec has supplied a secondary mirror for the telescope of the Indian Mount Abu InfraRed Observatory (MIRO). The mirror was produced at Lytkarino Optical Glass Factory (LZOS), one of the plants of a high-tech Holding Shvabe, at the request of the Belgian manufacturer of the telescope. The manufacturing process lasted a year and a half.

The key component of the telescope is made of Astrosital. The production process comprises several stages, including milling, aspherization, computer-controlled polishing, as well as automated finishing. The mirror was certified and accepted by the customer in early November. To transport it to India, the LZOS specialists also created a special container, a cargo handling device and auxiliary equipment.

“Every suchlike mirror has its own characteristics. The distinctive features of the mirror for the Indian telescope are its special shape and surface quality. With every new contract, mathematical processing of monitoring results used for this purpose is improving and becoming more complex, as astronomers want to obtain an increasingly high-quality image and minimize scattering from the mirror,” said Alexey Patrikeev, CEO of Shvabe.

ROSTEC DEVELOPS COOPERATION WITH INDIA IN SPACE SECTOR

India and Russia are traditional and long-standing partners and have been expanding the cooperation, including the space sector





“EVERY SUCHLIKE MIRROR HAS ITS OWN CHARACTERISTICS. THE DISTINCTIVE FEATURES OF THE MIRROR FOR THE INDIAN TELESCOPE ARE ITS SPECIAL SHAPE AND SURFACE QUALITY. WITH EVERY NEW CONTRACT, MATHEMATICAL PROCESSING OF MONITORING RESULTS USED FOR THIS PURPOSE IS IMPROVING AND BECOMING MORE COMPLEX, AS ASTRONOMERS WANT TO OBTAIN AN INCREASINGLY HIGH-QUALITY IMAGE AND MINIMIZE SCATTERING FROM THE MIRROR”

“Every suchlike mirror has its own characteristics. The distinctive features of the mirror for the Indian telescope are its special shape and surface quality. With every new contract, mathematical processing of monitoring results used for this purpose is improving and becoming more complex, as astronomers want to obtain an increasingly high-quality image and minimize scattering from the mirror” LZOS, an enterprise controlled by Rostec, is a top producer of optical glass, sital, large astronomical mirrors and space lenses in Russia. Its share on the Russian and global market for optical materials totals 98 per cent and seven per cent respectively.

“India is our traditional and long-standing partner, and we confidently expect to expand and enhance our cooperation, including in the space sector. New Delhi continues to scale up space exploration, the country’s spending in this area exceeds USD

1.2 billion per year. Today, India ranks fifth among space nations and intends to strengthen its position. In turn, Rostec is ready to offer products and technologies that our Indian customers need,” said Victor Kladoy, Director for International Cooperation and Regional Policy at Rostec.

Rostec continues to implement its ambitious program to develop and promote radio-electronic products in accordance with the approved 2025 Strategy, whose main objectives are to enhance the operational efficiency, increase the share of civilian products in revenue to 50% and enter fast-growing global markets.

Rostec is a Russian State Corporation established in 2007 with the purpose of facilitating the development, manufacture and export of high-tech industrial products for both civil and military purposes. It incorporates over 700 entities that currently form 11 holdings operating in the military-

industrial complex and 4 holdings active in civil industries, as well as over 80 directly supervised organizations.

Rostec’s portfolio includes such well-known brands as AVTOVAZ, KAMAZ, Kalashnikov Concern, Russian Helicopters, VSMPO-AVISMA, Uralvagonzavod, and others. Rostec companies are located in 60 regions of the Russian Federation and supply products to the markets of over 100 countries. In 2017, Rostec’s consolidated revenue reached RUR 1.589 trillion, its consolidated net profit was RUR 121 billion, and EBITDA – RUR 305 billion.

According to Rostec’s Development Strategy, the mission of the Corporation is to ensure Russia’s technological advantage on highly competitive international markets. One of Rostec’s key goals is to implement new technological way of living and to promote digitalization of Russia’s economy. ■

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aint Cloud, France. Dassault Aviation has welcomed the decision of the Supreme Court of India rendered on December 14 dismissing all petitions filed on the Rafale Contract signed on September 23, 2016 in the frame of an Inter-Governmental Agreement (IGA) between India and France.

Dassault Aviation took note of the Supreme Court conclusions establishing the absence of any irregularities in the decision-making process to purchase 36 Rafale, pricing of Rafale jets and selection of Indian offset partners including Anil Ambani owned Reliance Defence by Dassault Aviation.

It may be noted here that soon after the verdict given by the Supreme Court, Union Finance Minister Arun Jaitley and Defence Minister Nirmala Sitharaman in a combined press conference on December 14 welcomed the decision of the Apex Court. Dassault Aviation has proudly supported the needs of the Government of India and the Indian Air Force

since 1953 and the induction of the Toofani aircraft.

Fully committed in a strong relationship of mutual trust with India for over 65 years now, all resources of Dassault Aviation are entirely mobilized to make the Rafale, chosen by India in 2012 following a very complete competitive bidding process and evaluation, the spearhead of



DASSAULT AVIATION WELCOMES SUPREME COURT DECISION ON INDIA-FRANCE RAFALE DEAL

The company reaffirms full commitment to India and Indian people



the Indian Air Force.

“The deal is absolutely clean in accordance with Indian laws and regulations, as I have stated before, and the first Falcon part is currently under delivery out of our facility in Nagpur” stated Eric Trappier, Chairman and CEO of Dassault Aviation.

Dassault Aviation is dedicated to establishing successfully the Make in India as promoted by Prime Minister Modi.

It will ensure successful production in the country through the Dassault Reliance Joint Venture in Nagpur as well as through a full-fledged supply chain network involving already 30 companies with which Dassault Aviation signed contracts and additional 60 companies currently under discussions.

The company stands committed to continuing its dedication to

bringing full support to the needs of India in the future.

DASSAULT AVIATION AND INDIA

Dassault Aviation aircraft have been an integral part of Indian defence forces for over six decades. The first Dassault Aviation aircraft, Toofani was supplied to India in 1953, followed by the Mystere IV, the naval Alize, the Jaguar (manufactured under license by HAL) and the Mirage 2000.

These aircraft have contributed to Indian sovereignty all along and the Mirage 2000 fighter aircraft continues to be the IAF’s “cutting edge” till date. 36 Rafales fighter aircraft has been acquired as per the IGA signed on September 23, 2016 to equip the Indian Air Force. ■



“THE DEAL IS ABSOLUTELY CLEAN IN ACCORDANCE WITH INDIAN LAWS AND REGULATIONS, AS I HAVE STATED BEFORE, AND THE FIRST FALCON PART IS CURRENTLY UNDER DELIVERY OUT OF OUR FACILITY IN NAGPUR”

ERIC TRAPPIER
Chairman and CEO of
Dassault Aviation

INDIA'S FIRST MANNED MISSION GAGANYAAN CAPABLE OF CARRYING 3 ASTRONAUTS: ISRO CHIEF

Bengaluru. Indian Space Research Organisation (ISRO) Chairman Dr K Sivan has said India's first manned mission flight Gaganyaan will be capable of carrying three Indian astronauts and will orbit the Earth for seven days. It is a major expansion in ISRO's Programme and a new Centre – Human Space Flight Centre is formed which will be the lead Centre for the overall management and realisation of Gaganyaan, the ISRO Chief noted.

Dr K Sivan said this while addressing over hundred media persons from Bengaluru and other parts of the country in a Press Meet organised at the ISRO Headquarters, Bengaluru on January 11.

He highlighted ISRO's achievements in 2018 related to launch vehicles, satellites and their applications towards nation building. On this occasion, Dr Sivan also touched upon the challenging missions envisaged during this year including the Chandrayaan-2 mission. Several new technologies such as Small Satellite Launch Vehicle, Reusable Launch Vehicle and in-flight connectivity (with launch of GSAT-20) are planned to be demonstrated this year, he added. “Enhanced industry interface for production of PSLV by industry will be a major milestone and the efforts in this regard are initiated” Dr. K Sivan remarked. Very other initiatives are being taken up to enhance ISRO's outreach activities.

The extensive briefing by Chairman, ISRO was followed by interactive session with the media. Specific areas of interaction included Chandrayaan-2 mission, Gaganyaan mission, Reusable Launch Vehicle, Small Satellite Launch Vehicle and other upcoming missions. ■



INDIA-US AGREE TO DEEPEN BILATERAL DEFENCE COOPERATION

Defence Minister Nirmala Sitharaman's visit to US signified the enhanced momentum in bilateral defence cooperation between the two countries

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ashington. India and the United States have agreed to further deepen bilateral defence cooperation building on the discussions and outcomes of the '2 + 2 Dialogue' held in New Delhi in September 2018.

The agreement to this effect came during a meeting between Defence Minister Nirmala Sitharaman and her US counterpart Secretary of Defense James N Mattis.

It may be noted here that Sitharaman is

on an official visit to the US from December 2-7 at the invitation of Secretary of Defense Mattis. US Defense Secretary Mattis also hosted a dinner in the honour of Defence Minister Sitharaman.

During their meeting, discussions were held on the growing partnership between India and US in the defence sphere. Views were also exchanged on a broad range of bilateral and international issues of mutual interest. The Ministers reviewed ongoing initiatives to further strengthen bilateral defence cooperation as a key pillar of the strategic partnership between India and US.

Prior to the meeting, on her arrival at the Pentagon, she was received by Secretary Mattis and was accorded the Armed Forces Enhanced Honours Cordon welcome.

Sitharaman highlighted the steps taken by Government of India to promote defence sector manufacturing under Prime Minister Narendra Modi's 'Make in India' flag-ship programme.

Sitharaman visited the US Department of State on December 3, where she signed condolence book

for former US President George HW Bush. She also paid respects at the 'Tomb of the Unknown Soldier' by laying a wreath at the Arlington National Cemetery Memorial.

Following her engagements in Washington DC, the Defence Minister would be visiting Reno on December 4, where she would hold interactions with select leaders of Indian community in the US.

Sitharaman would also visit San Francisco where she would address a roundtable meeting at Stanford. She will also visit the Defence Innovation Unit (DIU) of the US Department of Defence and interact with start-ups and venture capitalists associated with this unit.

From December 5-7, the Defence Minister was scheduled to visit Honolulu, which is the headquarters of the US Pacific Command (PACOM) recently renamed as INDO-PACOM. She would hold meetings with Commander of INDO-PACOM Admiral Philip S Davidson and visit Joint Base Pearl Harbour Hickam, where she would board a US Guided Missile Destroyer and will be briefed on INDO-PACOM activities.





BEL-BANGALORE WINS CII EXIM BANK BUSINESS EXCELLENCE AWARD

With this achievement BEL becomes the first PSU to be recognised as Role Model Organisation

Bengaluru. The Bangalore Complex of Navratna Defence PSU Bharat Electronics Ltd (BEL) has won the twin honour of CII EXIM Bank Business Excellence Award (2018) and the Jury's Commendation for Role Model Organisation, a company press statement said on November 24. The Award is the highest level of recognition in the CII-EXIM Bank Award for Business Excellence, established by the Confederation of Indian Industry (CII) and Export Import Bank of India with the aim of enhancing the competitiveness of India Inc.

Mr Gowtama M V, CMD, BEL, along with senior officers Mr Girish

Kumar, Officer on Special Duty, Mrs Rani Vergis, ED (Finance)/BEL-Bangalore, Mr Mohanraj S, GM (Quality)/BEL-Corporate Office, and Mr Ramakumar, AGM (Standards)/BEL-Bangalore, received the prestigious Award for BEL at the Quality Summit organised by CII in Bengaluru on November 23, 2018.

The CII recognises organisations at three levels: Gold Plus (First Level), Platinum (Second Level) and Award (Highest Level). One of the Award winning organisations is

declared as Role Model Organisation based on the highest levels of excellence demonstrated by it in certain key parameters.

BEL's Bangalore Complex is the first PSU to be recognised as Role Model Organisation by the CII in the history of the CII EXIM Bank Business Excellence Awards. In addition to Bangalore Complex, three other Units of BEL — Ghaziabad, Chennai and Machilipatnam — have received the Platinum level recognition for

Business Excellence from CII. These four Units, which have won the Award and recognitions, account for around 80 per cent of the Company's business and people.

Some of the salient achievements of BEL-Bangalore considered by the Jury in selecting BEL-Bangalore for the Award and Role Model recognition, as highlighted in the award citation, were: the Unit's Customer First approach to business, Delivering Value to its stakeholders, Never-say-Never Attitude in pro-actively investing in technology and infrastructure, building key partnerships and developing competencies in the work force.

A prudent mix of robust strategies and implementation of good management practices has enabled the Bangalore Unit to attain an enviable position in the market, build financial resilience and maintain commendable levels of performance in several critical areas, the citation pointed out.

In his acceptance speech, Mr Gowtama M V, CMD, said he was happy that four Units of BEL had received this prestigious Award and recognitions for excellence. He thanked the customers of BEL for reposing their trust in the Company and extending unstinted support in all its endeavors. He also thanked BEL's founding fathers who had put in place a set of robust standards, systems and procedures which had helped the Company to sustain its performance over the years.

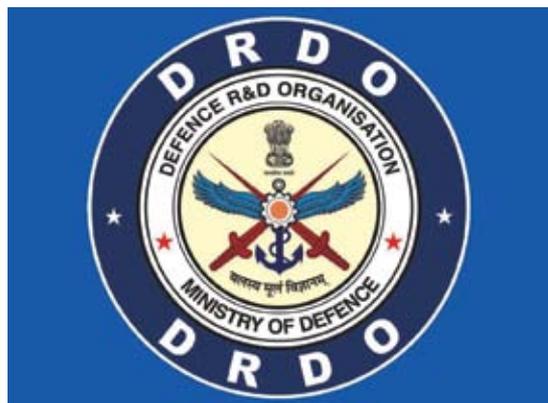
"While it is a great honour to receive this recognition, it also brings in the added responsibility of living up to the expectation of our stakeholders. I am sure this award will infuse enthusiasm into our employees and increase their resolve to continue on the path of excellence," Mr Gowtama added. ■

DRDO RECEIVES EXHIBITOR OF THE YEAR AWARD

DRDO's pavilion narrated the saga of self-reliance and national pride with the 'Make in India' spirit. A big attraction among people, especially students visiting the pavilion, providing them with the unique opportunity to interact with DRDO scientists

New Delhi. The Defence Research and Development Organisation (DRDO) pavilion received 'Exhibitor of the Year Award' at 106th Indian Science Congress held at Lovely Professional University (LPU), Phagwara, Punjab on January 7. The pavilion narrated the saga of self-reliance and national pride with the 'Make in India' spirit was a big attraction among people, especially students visiting the pavilion and getting opportunity to interact with DRDO scientists.

The DRDO Pavilion at the mega science expo was inaugurated on



January 3, by Governor of Punjab VP Singh Badnore and Union Science and Technology Minister Dr Harsh Vardhan.

They took keen interest in DRDO products and technologies displayed. Secretary, Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy was present during the inaugural function.

On this occasion, a special address on the present and future technologies in defence systems and opportunities for the young researchers was delivered by Dr G Satheesh Reddy.

Director General (Naval Systems & Materials) Dr Samir V Kamat and Director General (Life Sciences) Dr AK Singh delivered lectures on 'Materials Technologies for Future Defence Systems' and 'Evolving Landscape in Life Sciences' respectively. Director General (Production Coordination & Services Interaction) Dr S Guruprasad was also present.

DRDO's outdoor exhibits included surface-to-air missile system – Akash, model of BrahMos missile, remotely operated vehicle – Daksh, heavy weight torpedo – Varunastra, Laser Ordnance Disposal System (LORDS) and Vehicle Mounted Dazzler etc.

Indoor exhibits of DRDO included models of various missile systems including Prithvi, Astra, Nag, HELINA and LRSAM; Rustom UAV, MBT Arjun Mk 1A, Armoured Engineer Recce Vehicle, 155mm Advanced Towed Artillery Gun System, PINAKA- Multi Barrel Rocket Launcher, Plastic Bullet, Multi-

Mode Hand Grenades, SONAR systems, Radars, Night Vision Devices, Bullet Proof jackets and Helmets, Micro Wave Power Module, Integrated Multi-Function Sight. Life Sciences Products included Portable Chemical Agent Detector, Individual Underwater Breathing Apparatus for T-90 tank crew, Full body protector for female, Bukhari, Alocal Cream, Ready-to-Eat Packaged Foods etc.

DRDO pavilion also had a dedicated stall on Technology Development Fund (TDF) Scheme for promoting public/private industries especially MSMEs so as to create an eco-system for enhancing cutting edge technology capability for defence application. Details of the same are available on <https://tdf.drdo.gov.in>.

The pavilion also provided information on 'Kalam's vision: Dare to Dream' the pan India online contest for engaging young minds in emerging technologies namely Artificial intelligence, Cyber security, Robotics, Autonomous Systems, etc.

The objective is to unearth disruptive ideas and concepts in emerging technologies identified by DRDO for enhancing defence capabilities. The scheme will facilitate open competition for students and Startups. Details of the same are available on DRDO website. ■

NEW YEAR SPACE BONANZA: ISRO LAUNCHES SAMWAD WITH STUDENTS

Indian Space Agency ISRO launched a new platform SAMWAD to interact with young students across the country to capture their scientific temperament



Bengaluru. In a new year space bonanza and part of its enhanced outreach programme, Indian Space Research Organisation (ISRO) launched a new platform named “Samwad with Students” (SwS) in Bengaluru on January 1. Through the SwS initiative, the Indian space agency aims to constantly engage youngsters across India to capture their scientific temperament. The new conversation mission will inspire students cutting across schools and colleges. The first SwS event saw 40 wards and 10 teachers

from select schools interact with ISRO Chairman Dr K Sivan at the Antariksh Bhavan in Bengaluru.

During the three-hour stay at ISRO HQ, the students were first briefed about Indian space programme and their benefits to the common man.

In his opening remarks, Dr Sivan said the SwS aims at drawing inspiration and motivation from young India. “All of you with your boundless energy and endless curiosity are going to be my biggest source of inspiration and motivation. With so many challenging on hand this year, I thought it is important to seek the well wishes of students who are the future of this country,” the

ISRO Chairman added.

The Q&A session that followed saw Dr Sivan engaging students on a series of topics ranging from rockets, satellites, Chandrayaan, Gaganyaan and various space applications. Asked whether ISRO was his first choice as a youngster by a Eighth (8th) Standard student, Dr Sivan replied: “I was very shy when I was young. And, as far as college and career goes, I was always denied my first choice. After high school, I wanted to study Engineering but ended up studying B.Sc Mathematics. Later, I got into Engineering and wanted to join ISAC (now URSC) Bengaluru, instead joined VSSC at Thiruvananthapuram. At VSSC, I

wanted to join the Aerodynamics group, but was part of PSLV project instead.”

To another query from a 10th Standard student – How scientists cope up with failures, Dr Sivan said the biggest lessons in life are often derived when the plans go astray. “Space missions are very complex in nature and totally different from terrestrial systems. They have to work in extreme environments more often. Our forefathers have shown us path to take failures in our stride and take on the challenges with a positive mindset,” he said.

When a student was keen to know how they could contribute to ISRO’s missions, Dr Sivan said: “When you complete your studies with focus on fundamentals of science, you could get back to us and help us solve our problems. We need solutions to many complex problems and you could be giving us answers to them in future.”

Dr Sivan explained to the students the importance of Indian space programme and its benefits to the society at large. He wanted them to take up science and mathematics with absolute seriousness which would enable them to take up challenging careers.

“Whenever, we are short of ideas or inspiration, we will look for you. We will be ever ready to answer your questions related to India’s space missions,” Dr Sivan added. On the sidelines, the students and teachers also interacted with ISRO scientists and engineers. ■

BIG BOOST TO INDIA'S SPACE PROGRAMME, GOVERNMENT OKAYS RS 10,000 CR GAGANYAAN MISSION

With government backing to Gaganyaan mission, Indian space sector gets a major fillip to take a giant leap in to the future

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ew Delhi. As promised in his Independence Day speech, Prime Minister Narendra Modi-headed Union Cabinet on December 28 approved the Gaganyaan Programme with demonstration of Indian Human Spaceflight capability to low earth orbit for a mission duration ranging from one orbital period to a maximum of seven days.

A human rated GSLV Mk-III will be used to carry the orbital module which will have necessary provisions for sustaining a 3-member crew for the duration of the mission. The necessary infrastructure for crew training, realization of flight systems and ground infrastructure will be established to support the Gaganyaan Programme. The country's space agency Indian Space Research Organisation (ISRO) will collaborate extensively with National agencies, laboratories, academia and industry to accomplish the Gaganyaan Programme objectives.

EXPENDITURE

The total fund requirement for the Gaganyaan Programme is within Rs.10,000 crore and includes cost of technology development, flight hardware realization and essential infrastructure elements. Two unmanned flights and one manned flight will be undertaken as part



of Gaganyaan Programme.

BENEFITS

Gaganyaan Programme will establish a broader framework for collaboration between ISRO, academia, industry, national agencies and other scientific organisations. This will allow pooling in of diverse technological and industrial capabilities and enable broader participation in research opportunities and technology development benefitting large number of students and researchers.

The flight system realisation will be through Industry. It is expected to generate employment and train human resources in advanced technologies. It will inspire large number of young students to take up science and technology careers for national development.

Gaganyaan Programme is a national effort and will involve the participation of the Industry, Academia and National Agencies spread across the length and breadth of the country.

IMPLEMENTATION STRATEGY AND TARGETS

Gaganyaan Programme will be a national effort in collaboration with Industry, Academia and other scientific agencies and laboratories as stake holders along with ISRO. ISRO will be responsible for realizing the flight hardware through Industry. National agencies, laboratories and Academia will participate in crew training, human life science technology development initiatives as well as design reviews.

First human space flight demonstration is targeted to be completed within 40 months



from the date of sanction. Prior to this, two unmanned flights in full complement will be carried out to gain confidence on the technology and mission management aspects.

IMPACT

The programme is expected to spur research and development within the country in niche science and technology domains. Huge potential for technology spinoffs in areas such as medicine, agriculture, industrial safety, pollution, waste management, water and food resource management etc.

Human spaceflight programme will provide a unique micro-gravity platform in space for conducting experiments and test bed for future technologies. The programme is expected to give impetus to economic activities within the country in terms of employment generation, human resource development and enhanced industrial capabilities.

Human Spaceflight capability will enable India to participate as a collaborating partner in future Global space exploration

initiatives with long term national benefits.

BACKGROUND

ISRO has completed the development of launch vehicle GSLV Mk-III which has the necessary payload capability to launch a 3-member crew module in low earth orbit. ISRO has also tested the crew escape system which is an essential technology for human space flight. The aerodynamic characterization of crew module has been completed as part of GSLV Mk-III X mission flight. Elements of life support system and Space suit also have been realized and tested.

In addition, the orbital & re-entry mission and recovery operations have been flight demonstrated in Space Capsule Re-entry experiment (SRE) mission. ISRO has developed and demonstrated most of the baseline technologies essential for undertaking human spaceflight mission. Globally also, there is a renewed interest in undertaking manned exploration initiatives. ■

FOR THE FIRST TIME IN HISTORY, HAL LCH ACHIEVES MILESTONE; FIRES AIR TO AIR MISSILE

The Light Combat Helicopter (LCH) achieved a unique milestone of successfully carrying out air to air missile firing on a moving aerial target



already been completed last year.

LCH is the only attack helicopter in the world capable of operating at altitudes as high as Siachen glacier. Designed and developed by Rotary Wing Research & Design Centre (RWRDC) of HAL in response to the operational needs of Indian Armed Forces and its capabilities far exceed that of contemporary attack helicopters of its class.

Equipped with Helmet mounted sight and a forward looking infrared sighting system, LCH pilots can now detect and destroy any target on ground or in the air. Using these sights, pilots can now launch a missile onto any target without having to turn the helicopter.

The fire and forget missile is effective against all types of aerial threat, including UAVs and

Bengaluru. For the first time ever the Light Combat Helicopter (LCH) achieved a unique milestone of successfully carrying out air to air missile firing on a moving aerial target, a press statement issued by Hindustan Aeronautics Ltd (HAL) said on January 17. The LCH is indigenously designed and developed by the Defence Public Sector Unit (DPSU) HAL.

During the tests conducted in integrated test range at Chandipur, Odisha recently, Wg Cdr Subash P John, VM (Retd), test pilot; Col Ranjit Chitale, (Retd), Flight Test Engineer from HAL and Gp Capt Rajeev Dubey, test pilot from IAF executed a flawless mission and achieved a direct hit on the aerial target, destroying it completely.

Speaking on the new development, HAL CMD R Madhavan said this is the first time in the country that a helicopter has carried out air to



air missile engagement. None of the helicopters with the military services in the country has demonstrated such a capability.

With this, LCH has successfully completed all weapon integration tests and is ready for operational induction, he observed. Other weapons on LCH include a 20mm Turret gun and 70 mm Rockets, the firing trials of which have

microlight aircraft. Capable of operating from dispersed locations and flying at ultra low levels, LCH can now effectively provide a protective umbrella from all aerial threats.

It may be noted here that the Defence Acquisition Council (DAC) has accorded approval for procurement of initial batch of 15 LCHs, 10 for Indian Air Force and five for Indian Army.

"THIS IS THE FIRST TIME IN THE COUNTRY THAT A HELICOPTER HAS CARRIED OUT AIR TO AIR MISSILE ENGAGEMENT. NONE OF THE HELICOPTERS WITH THE MILITARY SERVICES IN THE COUNTRY HAS DEMONSTRATED SUCH A CAPABILITY"

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NEWS ROUND UP

PEL: SERVING THE NATION FOR DECADES

As a leading Hi-Tech Small-Medium Enterprise, PEL has been offering design solutions, product manufacturing and supply services to its customers across a wide spectrum of sectors and is on course to strengthen its footprint



P

recision Electronics Limited (PEL), founded in 1979 and publicly listed on the Bombay Stock Exchange, is one of the leading Hi-Tech Small-Medium Enterprises in India. It is engaged in design, manufacturing and supply of products & solutions to customers in Telecom, Aerospace & Defence, Oil & Gas, Medical and Hi-Tech sectors. On the manufacturing side, PEL undertakes turnkey electro-mechanical assemblies including box builds, integrated racks



“WE ALWAYS KNOW WHO WE ARE WORKING FOR!”

and motorized assemblies. PEL manages the production of PCBA, wire harnesses, transformers, sheet metal assemblies, machined assemblies and other specialized mechanical assemblies. Qualified for AS9100, IPC, CE and UL, PEL’s knowledge and experience ranges from designing of customized assemblies (Tier-II) all the way to integration of complex systems (Tier-I) as required by its customers.

As for Services, PEL undertakes turnkey Project implementation and Support services including MRO and Civil Infrastructure services. Its footprint spans a large number of military and civilian airfields, newly built warships of the Indian Navy, military and civilian harbours, Indian Army Commands and every circle of the National Telecom Service Provider (BSNL).

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- PST-155M: Secure HCLOS Radio for Tactical and Strategic Networks
- DCH – Tank Intercom System and Control Harness for Armored Vehicles
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- Telescopic Mast
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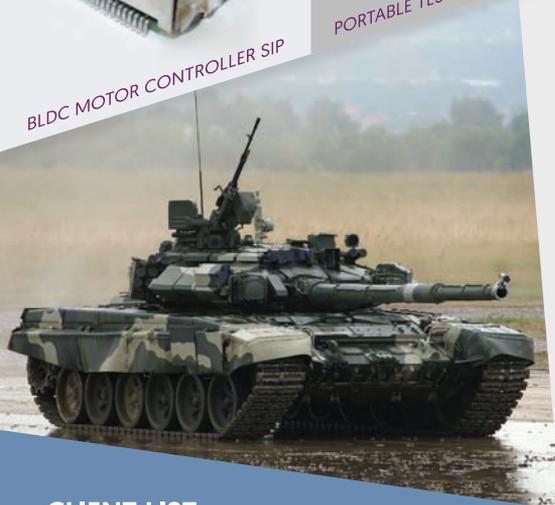
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