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raksha ANIRVEDA

PURSUING SELF RELIANCE IN DEFENCE

COVID-19 AFTERMATH

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RESPONSE

'Raksha Anirveda' editorial team looks forward to receive comments and views from the readers on the content of the magazine.

Editorial

LET THE LIGHT SHINE ON INDIA AND THE WORLD!!

The world is currently experiencing an apocalyptic moment due to the pandemic COVID-19. The impact has been severe, widespread and has almost affected every sphere of the global order. Panic driven, the global response to tackle the pandemic crisis due to novel Coronavirus has been more like a reaction instead of approaching it proactively. Hence, uncertainty has made the fight to control and eliminate the pandemic more prolonged.

For India, already reeling under the pressure of economic slowdown, the pandemic crisis has hit it hard and the after effects of it will be experienced for a longer duration. Caught unaware and being sluggish in response initially, India has shown the resilience to fight back amid its inherent shortcomings on many counts. The collaborative efforts of the administration, armed forces, research organisations and industry in quick time helped India regain the control on sound footing and reaping the benefits while battling the pandemic. And, so far the result has been encouraging.

The overwhelming response from the people of India to PM Modi's call showcased his political capital. One hopes that in near future, when India and the world hit the restart button, albeit slowly to surge again, the combined force of great leadership on top and the exceptional leadership on the frontline will bring in the much needed substantial measures. And these measures would set in motion the path to faster recovery, overcome the losses incurred during the existential crisis by a large section of the society and economy and finally emerge a winner.

Amid the current gloomy scenario and unprecedented pause in global development, it was heartening to observe Mother Earth's positive vibration and the nature regaining its beauty once again. Fast forward, one will witness a brand new world emerge that works in unison to achieve humanitarian goals.

For India, it's the perfect time to focus with intense depth, visualise the future, and prepare itself to overcome the pitfalls and shortcomings that have been derailing its potential growth story. It needs to explore the opportunities and scale up its economic strength along with its indigenous defence market and move ahead of competition. Post Covid-19, the revamped focus should be on expanding the indigenous defence market by creating diversified platforms for domestic requirement and exports, optimisation of dual technologies as well as innovations.

The newly formed defence corridors, well equipped with one-stop facilitation centres (with key role play from both DRDO and private sectors) can act as a catalyst. The Project 75 (I) can be the springboard to realise the self-reliance goal through implementation of a unique model (private public partnership) and set a benchmark. Similarly, there is a need to bring in fresh perspective and out-of-the-box thinking while taking a final call for the procurement of 114 fighter jets, 111 NUH helicopters and others to meet the armed forces' requirements and position India as an emerging defence export hub.

Jai Hind!!.

Ajit Kumar Thakur
Editor & Business Director

Contents

RAKSHA ANIRVEDA VOLUME 2 | ISSUE 9 | APRIL - JUNE 2020

INDIA'S SUBMARINE SURGE IN THE INDIAN OCEAN

Given the increase in sub-surface activity by the Chinese PLA Navy and its nexus with the Pakistan Navy, India is fast tracking the expansion of its undersea fleet. The scratching of the third aircraft carrier means the Navy can now fast track the expansion of its submarine fleet

By **RAKESH KRISHNAN SIMHA**

With the Indian Navy's plan for a third aircraft carrier not likely to materialise, the biggest gainer could be the submarine fleet. The Chief of Defence Staff (CDS) General Bipin Rawat has been quoted as saying, "When we know that there would be two aircraft carriers, and if the submarine force is dwindling then our priority should be for submarines."

Budgetary emergencies force you to prioritise and currently the focus needs to be on fast-moving and rapidly deployable assets such as submarines rather than a large carrier battle group (CBG) that may become rudderless each time the carrier goes for maintenance or a refit. India's newest flat top, the INS Vikramaditya, is at port at least six month a year.

While nothing spells deterrence like an aircraft carrier with its ability to hit hard and far, in the current geopolitical situation, stealthy submarines can play an equally meaty role. The Indian Ocean Region (IOR) is becoming an area of intense rivalry between India and China. The People's Liberation Army Navy (PLA Navy or PLAN) now has a near permanent presence in the area with a growing fleet that allows it to rotate warships with ease. The spearheads of the PLA Navy are its new and upgraded submarines which have been frequently spotted in Gwadar port, underlining China's naval nexus with its client state Pakistan.

According to a report by the US Office of Naval Intelligence, China's submarine force is part of what Beijing calls "non-contact warfare" – the use of weapons and platforms capable of conducting long-range, precision attacks from outside an enemy's defended zone.

In alignment with that doctrine, the PLA Navy is adding nuclear attack submarines (SSNs) and nuclear ballistic missile subs (SSBN) at an alarming rate. As per estimates, China currently possesses 53 conventional submarines, five SSNs and four SSBNs.

In comparison India has 15 conventional, one functional SSN, the Akula class Chakra, and the first indigenously built SSBN, INS Arihant. The majority of the conventional submarines are over 25 years old, and 13 of these vessels are between 17 and 32 years old, according to a parliamentary panel report on defence.

In just three more years, the Chinese submarine strength is expected to reach 79. Even as older noisier subs are being upgraded, the introduction of new submarines armed either with nuclear or cruise missiles will make the PLA Navy more lethal.

The number of attack submarines that can launch anti-ship cruise missile is also increasing significantly. Since the 1990s, China has built 13 Song-class attack submarines and 17 Yuan-class ones with diesel-electric air-independent power attack submarines. Three more Yuans are slated for deployment in 2020.

Strategic missile submarines include four new Jin-class ones outfitted with the JL-2, a new submarine-launched ballistic missile with intercontinental range. Also in the works are the Type 096 and Type 093B, both new classes of missile submarines that will enter the fleet in the 2020s.

While China's frenetic submarine building activity is primarily dictated by the US Navy's pivot into the Pacific, the PLA Navy is also focusing on the IOR through which 70 per cent of Beijing's maritime trade as well as its oil and gas supplies from the Persian Gulf passes. For years, China has been building a network of port facilities for its nuclear submarines operating in the Indian Ocean. Sri Lanka, Pakistan, Myanmar, Bangladesh and Djibouti now offer R&R facilities or bases for Chinese subs. "Ultimately, China's submarine operations in the South Asian littorals portend greater Chinese force projection in the Indian Ocean," says the Pentagon.


INS Arihant

PAKISTANI FLEET: SMALL BUT GROWING

Of growing concern to India is the expected spike in Pakistan's sub-surface fleet which currently stands at five French built Agosta class submarine. After nearly two years of negotiating prices and terms, in 2016, Islamabad confirmed the purchase of eight Chinese S20 diesel-electric submarines. Four of these will be built in China while at the same time Chinese personnel will assist Pakistan in building another four vessels in Pakistan. The first sub is expected to be handed over by end-2023 and the rest will be ready by 2028.

The S20 is an export version of the Chinese Type 41, which is an illegal clone of the late model Russian Kilo, which is one of the world's quietest submarines.


INS Vikramaditya

"This is a remarkable feat achieved by India, and MDL has indeed grown to be among the rarest of shipyards around the world to have mastered the unique competence of submarine building. We are glad to partner with such a shipyard, which can boast of competence and infrastructure which allows them to build 12 submarines at a time..."

Naval Group's Senior Executive Vice President Alain Guillou


Boeing P-8I

MARITIME STRATEGY

Submarines are critical for sea-denial – refusing the enemy space to navigate and dominate the deep blue. They are the killer wolves of the ocean that can decimate enemy fleets without warning and disappear as stealthily as they surface.
The Indian Navy is fast tracking its submarine programme in the following context:

- India's great power ambitions.
- Prime Minister Narendra Modi's assertion that the Indian Navy is the net security provider in the IOR; the responsibility of maintaining security and stability in the region falls on India's shoulder.
- The increasing size of the PLA Navy submarine fleet – both conventional and nuclear armed.
- China's development of modern and increasingly stealthy submarines.
- Pakistan's plan to more than double its submarine fleet with Chinese technology stolen from Russia's super silent submarines.

According to Strategy Page, "China considers it an 'improved Kilo' while the Russians consider it IP (intellectual property) theft and an inferior copy of the original." However, Western and South East Asian navies report that the Kilo and most of the Chinese clones are quiet and apparently effective subs. The highly automated sub – which has an endurance of 60 days – can be operated by a small crew of 38 and can fire 16 torpedoes or cruise missiles, giving Pakistan good value for money.

While Pakistan cannot afford to purchase – let alone build – a nuclear powered submarine, in January 2017 it tested the Babur-3 nuclear-tipped cruise missile that can be launched from a submarine, giving it a rudimentary nuclear second strike deterrent.

MONITORING UNDERSEA MOVEMENTS

In order to keep an eye on Chinese fleets, the Navy has deployed eight warships around the entry points into the IOR. "All the choke and entry points for the Chinese into the IOR are being monitored by our ships, along with the eastern and western fleets, which are deployed on both sides of the country. Any area not directly monitored is scanned regularly by the P-8Is operating in the region," an Indian Navy officer told the media recently.

According to a report by the Centre for Land Warfare Studies (CLAWS), India's Boeing P-8Is have a good idea of Chinese submarines from the moment they enter the Indian Ocean till they leave. "We fairly know when they come in and go. We have mastered operation of the aircraft (P-8I). We have a very good idea of the route they take."

While aircraft are useful anti-submarine warfare tools, having a strong sub-surface fleet is the most reliable weapon in the arsenal to maintain the upper hand in the IOR.

INDIA'S BOLD NEW UNDERSEA PUSH

The Indian Navy's fleet of 17 submarines is in contrast to the 21 subs it had during the 1980s. Historically, India had played catch-up – it was Pakistan that acquired South Asia's first submarine, in 1963, while India took the plunge only in 1967.

However, after years of neglect, the Indian Navy's submarine arm is in expansion mode. The 30-year submarine construction plan launched in 1999 envisaged building of 24 conventional submarines but suffered numerous delays. The current plan is to build 24 subs, including six nuclear attack SSNs. These will give the Indian Navy the same number of nuclear attack submarines as France.

Six new generation attack submarines being built in Mumbai in collaboration with French firm Naval Group, previously known as DCNS, are part of the Scorpene 75I project. The Navy intends to use them for missions such as area surveillance, intelligence gathering, anti-submarine warfare, anti-surface warfare and minelaying operations.

The first Scorpene class sub, named INS Kalvari, was undocked in April 2015 – after a three year delay. In March 2018, Mazagon Dock Limited (MDL) launched the third Scorpene, with the rest expected to be built by 2020. The launch highlights the remarkable success of indigenous submarines totally built by MDL through technology transfer in line with the Government's Make in India policy.

The Ministry of Defence stated: "The state-of-the-art technology utilised for construction of the Scorpene class submarines has ensured superior stealth features such as advanced acoustic silencing techniques, low radiated noise levels, hydro-dynamically optimised shape and the ability to launch a crippling attack on the enemy using precision guided weapons."

Adding a touch of hyperbole, the Naval Group's Senior Executive Vice President Alain Guillou said: "This is a remarkable feat achieved by India, and MDL has indeed grown to be among the rarest of shipyards around the world to have mastered the unique competence of submarine building. We are glad to partner with such a shipyard, which can boast of competence and infrastructure which allows them to build 12 submarines at a time..."

BOOMERS FOR DETERRENCE

While conventional submarines are cheaper and quieter than their nuclear analogues, the latter are far superior in every other aspect. They are faster, more powerful, and more versatile and have a wider range since they can stay underwater for much longer without needing to resurface and refuel or recharge. Their additional range and power will allow the Navy to monitor Chinese and Pakistani naval activity 24/7 the year round.

Nuclear submarines also assume greater importance as India has dropped its plan to build a nuclear-powered aircraft carrier for the foreseeable future. In this backdrop, nuclear-powered submarines will allow the Indian Navy to undertake long range patrols outside the IOR.

After going through a long-learning curve, the country has built the INS Arihant SSBN with secret Russian assistance. Four follow-on boats are now shaping up and the second boomer INS Aridhaman is all set to be launched for sea trials. This shows that a certain level of technology has been mastered and expertise gained.

The baseline design is capable of holding up to 12 K-15 Sagarika short-range nuclear-tipped ballistic missiles, three of which can be packed into each of the submarine's four vertical launch tubes. Each

ANOTHER IMPORTANT DEVELOPMENT COMES IN THE FORM OF PROJECT VARSHA, WHICH INVOLVES THE CONSTRUCTION OF A NUCLEAR SUBMARINE BASE REPORTEDLY AT A COST OF RS 30,000 CRORE. THE BASE, WHICH IS EXPECTED TO BE READY BY 2022, WILL HAVE CONCRETE PENS THAT WILL OFFER A SAFE HAVEN FOR THE CROWN JEWELS OF INDIA'S UNDERSEA ASSETS


Chief of Defence Staff General Bipin Rawat

ABSOLUTE POWER


Chinese PLA Navy

THE NEW ADVANCED SSNS, SSBNS AND THE P75I BOATS ARE CRITICAL COMPONENTS OF INDIA'S DEFENSIVE AND OFFENSIVE STRIKE OPTIONS THAT WILL PROTECT ITS AREAS OF NATIONAL INTEREST, PARTICULARLY THE IOR

missile is thought to be highly accurate but has a relatively short range of around 750 km.

A larger missile is under development for the class as well— the intermediate-range K-4 SLBM. When this missile is ready to be deployed, the Arihant will be able to accommodate four of them. This number will expand to eight missiles in the vessels to follow.

The K-4, which has a range of around 3,500 km, will be followed by the K-5 missile, a 5,000 km SLBM. Work on the fourth missile in this series, the K-6, began at the DRDO's Hyderabad-based Advanced Naval Systems in February. The missile is reported to have a range of 6,000 km.

The slightly larger and more capable INS Aridhaman is nearing completion and it will also feature other improvements as well, including upgrades in reactor power, new indigenously-built sonar and integrated combat systems and enhanced communications.

Together the five boomers will serve as the backbone of India's survivable nuclear deterrent, and allow India to achieve strategic invulnerability.

Another important development comes in the form of Project Varsha, which involves the construction of a nuclear submarine base reportedly at a cost of Rs 30,000 crore. The base, which is expected to be ready by 2022, will have concrete pens that will offer a safe haven for the crown jewels of India's undersea assets.

SECURING THE SEAS

The value of submarines as strategic assets is indispensable. During the 1999 Kargil War, the Indian Navy had deployed the INS Sindhurakshak off Karachi and was hours away from peppering the port with land attack cruise missiles. Had the war last another day, the Navy would have made a bonfire of Karachi like it did in the opening hours of the 1971 War.

The new advanced SSNs, SSBNs and the P75I boats are critical components of India's defensive and offensive strike options that will protect its areas of national interest, particularly the IOR.

The Indian Navy is aiming for a fleet of 24 subs, but there's no reason why a country of India's geopolitical clout and economic heft cannot build twice that number which will enable the Navy to target every task force in the Indian Ocean. It would also allow patrols even beyond – into the dragon's backyard in the South China Sea or the Western Pacific. If North Korea, which can barely feed its population, can build a fleet of 70 submarines, there's no reason why India with a GDP nearly 200 times greater than North Korea cannot build more. The tyranny of low expectations that plagues Indian strategic thinking needs to be discarded.

Building a submarine fleet takes time. Unlike capital equipment deployed by the Air Force and Army, the Navy's ships and submarines are long-gestation projects. Delays are common when such projects are undertaken by newly industrialised countries like India. Also, on an average for every two to three vessel inducted, one from the existing lot retires due to age, underlining the fact that navies cannot be created overnight. In this backdrop, it could take a lot longer than projected for the Indian Navy's submarine fleet to reach optimum levels. ■

– The author is a New Zealand based defence analyst. His work has been quoted extensively by leading think tanks, Universities and publications world wide

INDIAN NAVY'S SSN STRATEGIC PROGRAMME MOVES AHEAD IN TANDEM WITH TIME?

Project SSN is anticipated to be designed on the lines of a modern SSN and construction to be similar to that of the INS Arihant with an improved BARC designed nuclear reactor at DRDO's SBC in Visakhapatnam under the Advanced Technology Project (ATV) of the strategic Public Private Partnership (PPP)

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

The historical progression of submarines in the world has traversed from conventionally propelled diesel electric boats, which run underwater on batteries and need to surface (for air) for charging batteries, to the era of nuclear propelled submarines led by USS Nautilus in 1954. A submarine on surface is perforce susceptible to detection and attacked from ships and the air.

Since long, Air Independent Propulsion (AIP) systems are fitted in conventional submarines to stay underwater for longer durations. Nuclear submarines can operate underwater for months, and their endurance is limited by the crew's endurance. US nuclear submarines have two crews for year-long operations on patrol.

The Indian Navy was a late starter to induct its first Foxtrot class conventional submarine INS Kalvari (S23) with CET/TEST torpedoes with forward and aft torpedo tubes in 1968 from the Soviet Union. This was good five years after Pakistan got a Tench class submarine PNS Ghazi (USS Diablo) from US on lease in 1963, which took part in the 1965 Indo-Pak war.

But, Today India operates both classes viz. 15 conventional submarines (Nine Kilos, four HDW-1400 and two Scorpenes) with torpedoes (SET and SUT-B) and ship attack missiles (KLUB, Exocet SM-39 and Harpoons), and two nuclear submarines. In submarines, torpedoes and missiles are launched from standard 21 inch torpedo tubes world over.

Nuclear submarines have two standard hull classifications - one is called a SSN which is a nuclear propelled attack submarine like the two Indian Navy operated INS Chakra with torpedoes and missiles which were on lease from Russia, and other is called SSBN which is a nuclear propelled submarine equipped with torpedoes and vertical launch long range nuclear ballistic missiles. The home built INS Arihant (S2) is an SSBN which has 750 km K-5/B-05 nuclear tipped missiles, and is part of India's Triad for nuclear deterrence. India's second SSBN Arighat (S3) and the third S4 (yet to be named) are in advanced stage of construction with long range K-4 nuclear missiles at Vishakhapatnam.

In February 2015, the Defence Acquisition Council (DAC) under the Ministry of Defence (MoD) approved the construction of six new nuclear powered attack submarines (SSNs) for the Indian Navy. The estimated cost of the project is pegged at 1.2 lakh crores (US$5 billion).

It is anticipated the design would be as for a modern SSN and the construction would be on lines similar to that of the INS Arihant with an improved Bhabha Atomic Research Centre (BARC) designed nuclear reactor at Defence Research and Development Organisation's (DRDO) Ship Building Centre (SBC) in Vishakhapatnam under the Advanced Technology Project (ATV) under a strategic Public Private Partnership (PPP). The project is being worked out under a Naval Vice Admiral. Larsen & Toubro (L&T) is the PPP construction partner for INS Arihant and successive submarines.

For the Arihant, Rubin vetted the modifications made to the design by the Navy's in-house Directorate of Naval Design and L&T. Both organizations have since become more adept in designing with advanced software and virtual design centres. Since the Indian Navy is a traditional user of Russian nuclear submarines (with two INS Chakra on lease), the new domestically built submarines would be the third class of SSNs operated by Indian Navy after the leased Charlie I (1987-91) and currently operates Akula II-class submarine. Both were named INS Chakra. L&T is the choice for the DRDO unless India chooses Naval Group which it is reported offering the Barracuda class.

In June 2019, a report stated that Submarine Design Group of the Directorate of Naval Design assisted by DRDO will now start working on the detailed design


SSN Astute Royal Navy


SSN Type 093B Shang-III-Class PLA(N)

ACTIVE AND FUTURE SSN CLASSES

BRAZILIAN NAVY
- *Álvaro Alberto*-class submarine - 1 under construction

CHINA NAVY

People's Liberation Army Navy (PLAN) of the People's Republic of China
- *Han*-class submarine (Type 091) - 3 in service
- *Type 093 submarine* - 5 in service, 6 planned in total
- *Type 095 submarine* - 2 complete, 5 planned in total

FRENCH NAVY
- *Rubis*-class submarine - 6 in service
- *Barracuda*-class submarine - 1 complete, 6 planned in total

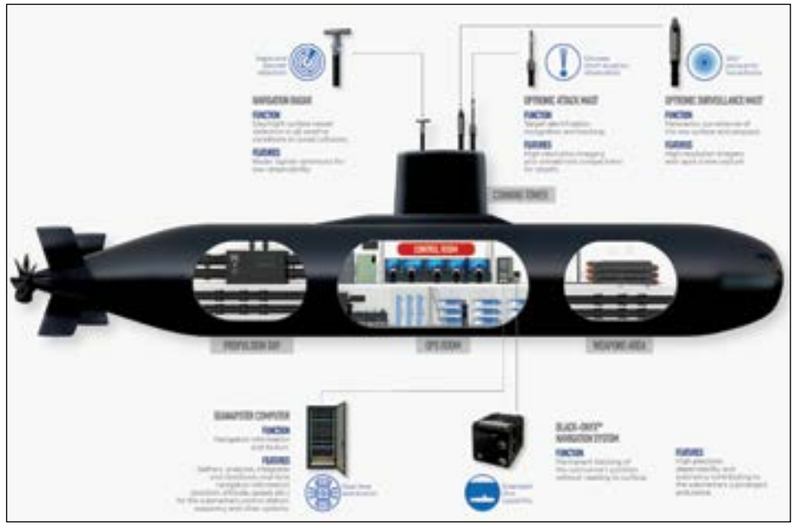
INDIAN NAVY
- *Akula*-class submarine - 1 in service, 1 more submarine leased to be delivered by 2025
- *SSN programme* - 6 planned in total

RUSSIAN NAVY
- *Victor III*-class submarine - 4 in service
- *Sierra I and Sierra II*-class submarine - 3 in service
- *Akula-class submarine* - 8 in service
- *Yasen-class submarine* - 1 in service, 4 under construction, 12 planned in total

UNITED KINGDOM NAVY (UK)
- *Trafalgar*-class submarine - 4 in service, 3 retired
- *Astute*-class submarine - 3 in service, 3 under construction, 1 ordered (HMS Astute, an Astute-class submarine, known as "fleet submarines" in the Royal Navy of the United Kingdom)

UNITED STATES NAVY
- *Los Angeles*-class submarine - 32 in service, 30 retired
- *Seawolf*-class submarine - 3 in service
- *Virginia*-class submarine - 14 in service, 5 under construction, 48 planned in total


SSN Barracuda Nuclear Attack Suffren



SINCE LONG AIR INDEPENDENT PROPULSION SYSTEMS ARE FITTED IN CONVENTIONAL SUBMARINES TO STAY UNDERWATER FOR LONGER DURATIONS. NUCLEAR SUBMARINES CAN OPERATE UNDERWATER FOR MONTHS, AND THEIR ENDURANCE IS LIMITED BY THE CREW'S ENDURANCE

for construction phase of the six SSN programme, and Rs 100 crore (US$14 million) have been allocated for the initial phase. The development has begun. Mishra Dhatu Nigam (MIDHANI) is developing a new hull material that is expected to allow the submarine to dive into deeper depths than the Arihant class. A scaled down model of the submarine is planned to be tested in the near future.

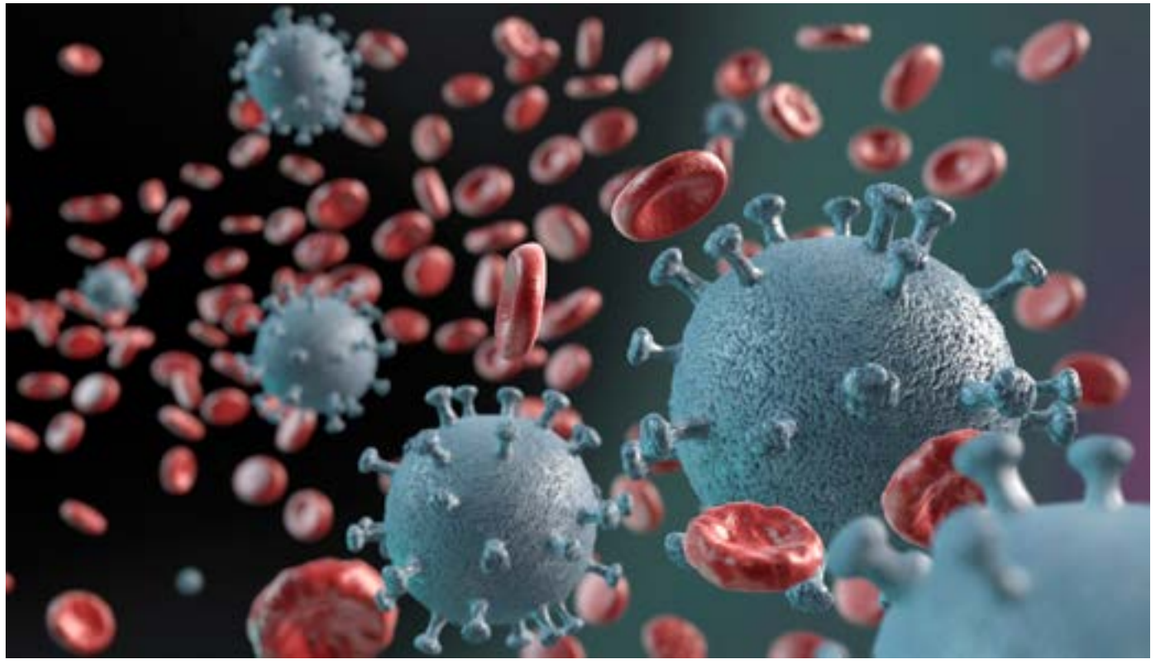
It is also reported that during President Putin's visit in 2018 for the 19th India-Russia bilateral annual summit, India signed an Inter-governmental Agreement (IGA) with Russia to lease another Akula-Class attack nuclear submarine (SSN). This Akula class SSN to join the Indian Navy in 2025 after a major refit of the hull in Russia's Arctic port of Severodvinsk when INS Chakra (Bars 971) will be due for a change of uranium fuel.


SSN USN Virginia Construction


SSN Type 093 Shang Class PLA(N)

India is the only country in the world to have operated a nuclear submarine on loan from a nuclear-weapon state, and Russia is the only such state to have leased one. Moscow has also been a critical supporter in New Delhi's indigenous nuclear submarine programme. The history of their cooperation on nuclear submarines is, however, shrouded in secrecy.

–The author is former DNI and DNO. His latest Novel 'An Underhand Affair' (Addhyan ISBN 9789388644167 Variety Books) includes intrigues in the world of Naval Intelligence



GLOBAL DEFENCE INDUSTRY IN THE FALLOUT OF COVID-19

The COVID-19 outbreak world over has virtually brought the industry and business to a halt. For some businesses the effect of the pandemic will be very pronounced in the short term, but for defence industry it may take some more time to manifest the COVID-19 effect

By **SRI KRISHNA**

As the world reels under the impact of novel Coronavirus COVID-19 pandemic, the industry and business activities virtually have come to a halt. It has badly affected the nations with strong defence industry base like US, Italy, France, Spain, Germany and UK to name a few. According to a report US aerospace industry alone lost approximately $200 billion of market value. Since January 1, the S&P Aerospace and Defence Select Industry Index, which includes industry leaders such as Boeing, Lockheed Martin, and Northrop Grumman, were down by above 40 per cent.

According to Paul Sharre of the Center for a New American Security, the supply chain's future is challenging and that government money is likely to keep coming for defence companies. The State Department warned that as a result of staff teleworking for the foreseeable future, the Directorate of Defence Trade Controls (DDTC) might be slow in responding to the industry needs, which will result in delays in the US defence industry exports. The major impact points on the defence industry because of the spread of COVID-19:

The Production and manufacturing facilities and supply chains as also business development efforts could be affected – some will lose, some may win. The demand for defence equipment and related services could decline with companies having to make tough choices impacting finances and competencies.

The effects of each of these will differ based on the company size, nature of business, product portfolios, supply chain dependencies and business plans.

Some of the main impact factors are supply side shocks which would be the most visible effects on the defence sector. Companies located in countries badly affected by the virus or those that are dependent on supply chains located in affected countries would be immediate victims. A case in point is Fincantieri of Italy, which suspended its ship building operations until March 29, 2020. The company builds warships of complex design. It is contracted to deliver four corvettes to the Qatari navy with one delivered earlier this year and others could be pushed back if the company would extend the close down of its facilities – a probable course of action if Italy is not able to flatten its COVID-19 growth curve soon.

With COVID-19 cases on the rise in Western Europe, operations of many other defence firms in Europe, such as Navantia and Indra in Spain, Thales in France may be affected by partial or complete shutdowns or regulated functioning, thus affecting production queues and deliveries.

"You might see those delivery delays crop up this April, May, June, July. That's conceivable, but I think we're talking about slight changes, nothing in the order of magnitude you're seeing in airlines and then by virtue, in commercial aerospace," says Byron Callan of Capital Alpha Partners. Analysts forecast that in the long term, the Coronavirus outbreak will result in a complete rethink of whether supply chains are vital to security. Martijn Rasser, a senior fellow at the Center for a New American Security, said: "A first step once we get through this crisis is a whole-of-government effort, together with private industry, to really dive deep into our current supply chains and then determine which ones we should consider critical for US national security overall."

For some businesses the effect of the pandemic will be very pronounced in the short term, for others the effects may take more time to manifest. The defence industry falls into this category.

It may be too early to forecast whether the industry will be flat, take a major or minor dip, or grow unaffected by the global pandemic. It is of utmost importance that defence companies identify what the major impact points are and assess their potential to affect business development plans, supply chains, and bottom lines. This will help shape preemptive measures, which could help companies weather the storm.

The nature of supply chain and resourcing patterns of the defence technology industry base (DTIB) will also affect production, as production queues with branched-out supply chains are more likely to face supply side constraints. The European DTIB has a fair share of branched-out supply chains, with different components and subsystems from different sources of origin going into a final platform or solution.

Regulation and reprioritisation of production functions of such supply chains could affect defence production. The plausibility of such actions cannot be ruled out, especially if governments divert facilities to medical equipment.

Indian defence industry is one such example where the defence public sector undertakings (DPSUs) like Ordnance Factory Board (OFB) are into making face masks, ventilators, N95 masks for

ACCORDING TO A REPORT US AEROSPACE INDUSTRY ALONE LOST APPROXIMATELY $200 BILLION OF MARKET VALUE. SINCE JANUARY 1, THE S&P AEROSPACE AND DEFENCE SELECT INDUSTRY INDEX, WHICH INCLUDES INDUSTRY LEADERS SUCH AS BOEING, LOCKHEED MARTIN, AND NORTHROP GRUMMAN, WERE DOWN BY ABOVE 40 PER CENT

Construction of Boeing aircraft at halt following COVID-19

WITH BUSINESS DEVELOPMENT IN DEFENCE BEING DIFFERENT FROM OTHERS DUE TO LONG NEGOTIATION PERIODS, PROTRACTED ENGAGEMENTS, HIGH STAKES, GOVERNMENT-TO GOVERNMENT (G2G) LINKAGES, EXTENSIVE TESTING AND EVALUATION, AND FACE-TO-FACE MEETINGS, THE CURRENT SCENARIO DOES NOT BODE WELL FOR BUSINESS DEVELOPMENT IN THIS INDUSTRY

medical personnel.

Technological factors and manufacturing paradigms also have a part to play in understanding the level of impact. For example, defence firms with highly automated plants are likely to be less affected by social distancing. Similarly, those companies that have not completely transitioned into certain manufacturing paradigms such as just-in-time production may have a greater level of inventory, and be able to cope with supply side shocks for a longer period of time.

With business development in defence being different from others due to long negotiation periods, protracted engagements, high stakes, government-to government (G2G) linkages, extensive testing and evaluation, and face-to-face meetings, the current scenario does not bode well for business development in this industry.

Many value procurement programmes are discussed and finalised during defence shows with planned events such as EUROSATORY 2020 (scheduled for June in Paris) now virtually called off, avenues for business development are reduced.

DefExpo 2020 held in Lucknow in February which broke all records of international cooperation and as Defence Minister Rajnath Singh said "this expo is a breakthrough in the field of Indian defence manufacturing, which has broken all records of people's participation, public-private partnership and international cooperation," may see many of the projects put on hold.

The business deals struck at these shows like DefExpo takes time to fructify and meanwhile discussions take place.

Under the current circumstances, meetings and discussions may continue to take place through teleconferencing, but final decisions regarding high-value procurements are unlikely to be made through this method.

Military exercises are another aspect of indirect defence business development and the pandemic has hit this badly since major powers like United States have already suspended all travel, deployments and exercises for troops. If the pandemic worsens, wider cancellations or rescheduling cannot be ruled out.

A cessation or reduction in military exercises will further reduce the time for interaction and informal testing and evaluation of equipment, reducing an exercise's latent business development potential — especially with the recent trend of using exercises to reduce procurement timelines.

A defence production facility at standstill

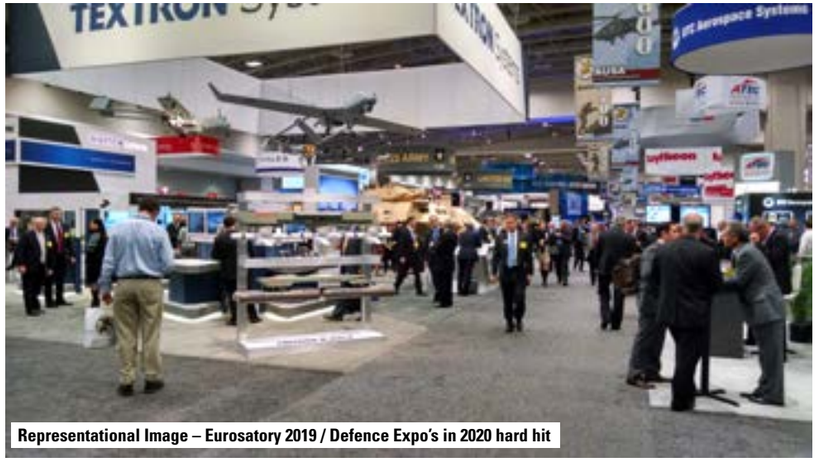
Major defence spenders allocate close to or over two per cent of their GDP, a significant amount, to defence. Whether defence spending may be deprioritised or not will depend on a number of factors, both economic and societal.

If governments are in questionable financial shape with low liquidity, limited reserves, and inadequate avenues for borrowing, eventually the unanticipated spending will have to be met by channelising funds from other high-value budget components – defence included.

While larger defence companies may have some contingency planning in place to wait out the worst-case scenario, local small and medium enterprises that run liquidity risks and have high levels of debt on their balance sheets may not fare too well. These companies will need bailouts or some form of monetary support to continue.

While the defence industry is currently not affected as much as many others, but defence contracts are very high-value contracts and a potential loss of business due to a COVID-19 related worst-case scenario could mean that companies lose out on anticipated sales worth hundreds of millions of dollars. The companies may have to make tough decisions on how the business may be conducted in the future.

Maintaining all assembly lines and an active workforce in the face of reduced sales is a challenging situation defence companies could face. At this point businesses are faced with tough questions: Do they maintain the workforce level or trim it at the risk of losing capable people? Do they delay payments to vendors? Do they turn to governments for help? Do they divert R&D budgets toward paying salaries at the risk of losing technological edge? Do they relocate production sites? How will they maintain shareholder confidence?



Representational Image – Eurosatory 2019 / Defence Expo's in 2020 hard hit

Defence companies must work on future-proofing themselves and must be prepared with answers to such questions in order to deal with the uncertainties stemming from shocks caused by the pandemic.

Another cause of concern in the defence sector is the impact of the pandemic on stocks of defence companies that manifest visible shocks. Since February 10, Lockheed Martin's stock price has fallen by around 28 per cent, Leonardo's by 55 per cent, French company Thales' by 33 per cent, and Fincantieri's by 32 per cent. Shares of some defence companies are currently trading at their lowest prices in the past five years.

While trading in secondary markets does not directly affect incomes of companies, there is cause of concern about its indirect consequences. Companies that planned to issue shares in the primary market to fund capital investments may have to hold off as low share prices are detrimental to successful public offerings. Defence companies may have to resort to share buybacks in order to prevent this from happening, in turn resulting in more expenses and loss of liquidity for the firm, at a time when thriftiness is the need of the hour.

Some contracts, defence events and business development measures may be pushed back, but overall the defence sector may just flatten or even show slight growth because of pent up demand toward the end of the year. Setbacks may be just temporary.

Irrespective of how the COVID-19 scenario may turn out, there are some common lessons for the defence industry. Uncertainty in today's world must be accepted as a norm and the defence industry must explore multiple facets of risk planning. Strategy should not just be focused on growth but must include scenario-based resource planning and material substitution.

– The author is a senior journalist and media consultant

"You might see those delivery delays crop up this April, May, June, July. That's conceivable, but I think we're talking about slight changes, nothing in the order of magnitude you're seeing in airlines and then by virtue, in commercial aerospace"

Byron Callan
Capital Alpha Partners

Prime Minister Narendra Modi with European Council President Donald Tusk and European Commission President Jean Claude Juncker at EU-INDIA Summit

THE CHANGING DYNAMICS OF INDIA-EU RELATIONS

EU Foreign Policy Chief Joseph Barell's preference to attend a summit in India than that being in Davos, Switzerland highlights the fact that India and EU must become more strategic given the importance of Indo-Pacific region

By **DR MATHEW SIMON**

India-European Union (EU) close ties were reflected in a statement made by EU Foreign Policy chief Joseph Barell at Raisina Dialogue, 2020 which was held in New Delhi recently. Barell remarked that his preference to attend a summit in India than that being in Davos, Switzerland highlights the fact that India and EU must become more strategic given the importance of Indo-Pacific region.

INDIA RECENTLY ENABLED TO GARNER SUPPORT OF HER EUROPEAN PARTNERS FRANCE AND POLAND IN DESIGNATING JAISH-E-MOHAMMAD'S MASOOD AZHAR DEEMED AS A TERRORIST UNDER THE UNITED NATIONS SECURITY COUNCIL RESOLUTION 1267

He stated that the multilateral rules-based system was under 'siege' by US-China rivalry, and is providing an opportune moment for India and EU to work together in ensuring the survival of World Trade Organisation (WTO). In other words, India is important for EU in the Indo-Pacific region. EU needs India to offset Sino-American bipolarity in WTO.

Taking stock of India-EU relations, both strategic partners have worked together and continue to provide key deliverables in the areas of security, terrorism, policing, digital connectivity and climate change. India was enabled to get support of her European partners France and Poland in designating Jaish-e-Mohammad's (JeM's) Masood Azhar deemed as a terrorist under the United Nations Security Council Resolution 1267.

However, India-EU ties have faltered in moving forward on Bilateral Trade and Investment Agreement (BTIA) that faced several roadblocks since the start of its negotiations in 2009. While the EU was India's first trading partner with 14 per cent of its total trade in goods in 2017, India was EU's ninth largest trading partner accounting for only 2.2 per cent. Considering the size of the two economies, these figures fall short of the potential of two-way trade between the EU and India. The EU and India need to pursue a proactive approach to enhance their trade and investment relations.

Despite international outcry over the abrogation of Article 370 and the resultant internet clampdown in Kashmir, India accepted the request of the delegation of European Parliamentarians to visit Jammu and Kashmir. External Affairs Minister Dr Subrahmanyam Jaishankar in his trip to Brussels in February 2020 acknowledged that though there are challenges ahead for Kashmir, he keenly opined that Kashmir is moving in the right direction and is in the process of being more aligned with rest of India.

His government was investing heavily in developmental projects including the electrification of 330,000 homes and increasing pension and benefits coverage from 62 to 80 per cent of the population in the state-turned Union Territory. Seven medical colleges are in process of being set up, and three frozen hydroelectric projects have been unfrozen.

India has also taken note of the resolutions passed by European Parliament on the Citizenship Amendment Act (CAA), 2019. Foreign Minister Jaishankar insisted that CAA law had been misunderstood. The CAA law eases citizenship rules for religious minorities such as Hindus and Christians from Muslim-majority Bangladesh, Pakistan and Afghanistan. He compared the CAA rules to immigration and refugee resettlement policies across Europe pointing out that many EU countries also use national or cultural criteria.

PM Modi along with world leaders in a group photo at Raisina Dialogue in New Delhi

Without mentioning Pakistan by name, he said some of India's neighbours have Islam as a state religion, "and there are persecuted religious minorities who came to India because many of them find people have the same faith." Dr Jaishankar said India's new law would reduce statelessness, and pointed to the fierce debates that Europe has also had around immigrations and the "political changes" that have caused.

The United Kingdom (UK) left European Union on January 31, 2020. Brexit has caused a lot of anxiety in India as well with New Delhi asking itself about the shape of its future ties with London and the coherence of the EU. UK is ranked 17th in the list of India's top 25 trading partners with India's merchandise trade with the UK in 2017-18 estimated at US$14.5 billion with an additional US$7 billion trade in services. India enjoys a favourable balance of trade with UK.

When it comes to investments, UK is ranked as the fourth largest inward investor in India,

Mr Modi with French President Emmanuel Macron

after Mauritius, Singapore and Japan with a cumulative equity investment of US$26 billion since April 2000 accounting for around six per cent of all foreign direct investment into India. India also is a major investor in the UK (4th largest). Around 800 Indian companies with total consolidated revenue of 47.5 billion pounds have created over 105,000 jobs in the UK. The technology and

DEFENCE COOPERATION

(Left) PM Modi with German Chancellor Angela Merkel; (Right) External Affairs Minister S Jaishankar with his Belgian counterpart Philippe Goffin

LOOKING AT THE WEST, INDIA NEEDS TO 'ACT EAST' IN EUROPE. THE TIME HAS COME FOR INDIA TO SEIZE THE OPPORTUNITY AND TAP THE POTENTIALITIES IN TERMS OF PROVIDING CONNECTIVITY TO CENTRAL AND EASTERN EUROPE GIVEN THAT CHINA'S POLITICAL INFLUENCE THROUGH 16+1 FRAMEWORK HAS CAUSED DIFFERENCES WITHIN MEMBER STATES OF CEE IN THE REGION

telecom sector account for 31 per cent of these revenues with the pharmaceuticals and chemical sector accounting for 24 per cent.

Brexit will not only impact UK's trade and investments with the EU but also its other trading and investment partners. Indian companies, many of which have invested heavily in the UK, are likely to be quite severely impacted by a no-deal Brexit particularly the companies that use the UK as a gateway to the European Union and Europe. Even companies that do not have a significant exposure to the EU will feel the impact as a no-deal Brexit will lead to a perceptible economic downturn in the UK. Major investors like the TATA group are already hedging their bets and exploring alternatives.

UK has clearly identified India as a major partner, particularly in the post-Brexit era. The focus on India by successive British Prime Ministers and other key ministers is a testimony to the value attached to India as a major trading and investment partner. With the expiry of the Bilateral Investment Treaty in March 2017 and the absence of a Free Trade Treaty, the imperative to conclude an India-UK FTA is apparent particularly after Brexit. Both sides at the highest political level have committed themselves to conclude an FTA as soon as possible.

In the first tenure Prime Minister Narendra Modi visited Western Europe more often than his predecessor. With Paris, New Delhi has renegotiated Rafale deal to purchase 36 aircrafts. Germany's Inter-Governmental Consultative (IGC) format of dealing with India has enabled the deepening of cooperation in traditional sectors such as transport, skill development, and energy, and explores possibilities for cooperation in newer areas like green urban mobility and Artificial Intelligence (AI).

Looking at the West, India needs to 'Act East' in Europe. The time has come for India to seize the opportunity and tap the potentialities in terms of providing connectivity to Central and Eastern Europe (CEE), given that China's political influence through 16+1framework has caused differences within member states of CEE in the region. ■

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PROJECT 75 (I): AN OPPORTUNITY TO CREATE A NATIONAL STRATEGIC ASSET

The submarine Project 75 (I) under strategic partnership model can help in creating a second line of submarine production in the country, progressively build indigenous capabilities, increase efficiencies and facilitate faster and more significant adoption of technology by involving private sector

By **AJIT K THAKUR**

For two decades, the struggle of the Indian Navy to create a second line of submarine production in the country is well known. With Project 75 (I) under the Strategic Partnership (SP) route now on track, stakes and expectations are on the high. The changing world dynamics poses many asymmetrical security and strategic challenges for an aspiring India, be it in the immediate neighbourhood, or Indo-Pacific region or globally. In Asia, a silent trend of submarine arms race is building up that hovers around creation of indigenous capabilities, modernisation and expansion.


Amur 1650

Thus, it is imperative for India to fulfil its maritime security and strategic interest and for this the Indian Navy needs adequate fleet of submarines as an ace and potent weapon platform along with aircraft carriers for power projection as an expanding blue-water Navy with growing responsibilities.

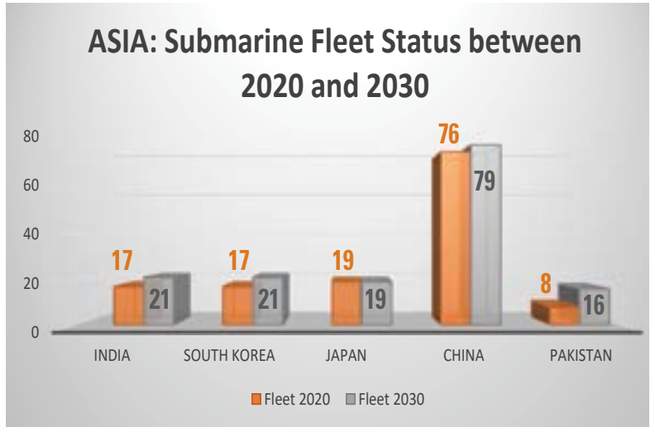
Based on the response to the Request for Information (RFI) and the subsequent criteria-based evaluation, the Navy has shortlisted five foreign Original Equipment Manufacturers (OEMs) and two Indian strategic partners and in all probability it will issue the Request for Proposal (RFP) by mid-2020.

Under the project, indigenous construction of six submarines will be done for the Indian Navy, which will cost around Rs 45,000 crore (US$6.3 billion). The shortlisted foreign OEMs are Naval Group (France), Rubin Design Bureau (Russia), ThyssenKrupp Marine Systems (Germany), Navantia (Spain) and Daewoo Shipbuilding & Marine Engineering (DSME - South Korea) and the two Indian strategic partners are Mazagon Dock Shipbuilders Ltd (MDL) and Larsen & Toubro Limited (L&T).

India currently has an active submarine production line at MDL that has delivered the first two of the six Naval Group Scorpene class submarines to the Indian Navy. The Project 75 (I) is a new programme planned to go along with the existing production line and will choose from five submarine types: Scorpene (Naval Group), Amur 1650 (Rubin Design Bureau), Type 214 (ThyssenKrupp), S80 (Navantia) and an offering (Chang Bogo class) from Daewoo Shipbuilding & Marine Engineering (DSME - South Korea).

Taking into count the Indian Navy's current submarine operations experience, there are three types: Russian Kilo class, German Type 209 conventional submarines and the newly inducted Scorpene class submarines. The P75 (I) shortlisting has not only opened up and expanded the competition; it has also become a huge test of the much-talked Strategic Partnership model. Based on speculations and assumptions, few questions as listed below arise:

- Will the Indian Navy be looking for a new submarine type under the strategic partnership model or choose the one already in service and is in contention with others?
- Will MDL and L&T initially evaluate the competition among shortlisted foreign OEMs and choose their partner before responding to the RFP and provide the Indian Navy with the best options to evaluate and choose from?
- Will strategic partnership model pave way for MDL and L&T to come together and collaborate for the project?
- Will strategic partnership model be able to create a second line of submarine production with futuristic technology solutions and indigenous capabilities?
- Will P75 (I) under strategic partnership model implement the L1 norm change as suggested by Niti Aayog and will take the call based on quality parameters, future technological compatibility and stipulated timeline for completion of the project?



The P75 (I) Project

The P75 (I) project was cleared way back in 2007, but remained dormant for years and underwent numerous changes. It is part of a 30-year submarine building plan that ends in 2030. In its present form, the Project 75(I) envisages the construction of six conventional submarines with advanced detection range, combat management systems, better sensors, weapons and the Air Independent Propulsion (AIP) System.

The P75 (I) project will help in creating second line of submarine building. Currently, India has one operational production line of submarine building at MDL. Success of the project will open up the industry for private sector partnership, assist in realising autonomy in submarine building and will position India as the only country to have two production lines other than US.

L&T's major strength lies in having excellent design and engineering teams. They have made good hulls for strategic boats and also have outfitting experience. But, they lack the building line to manufacture a submarine and L&T will be looking out for a foreign partner that can deliver the necessary infrastructure.

Finding answers to the above is not going to be that easy. It will require lots of efforts for deliberation, discussion and evaluation with a fresh perspective. It will be about moving ahead with a mindset for experimentation. Is the Indian Navy willing to do it despite the numerous challenges being faced currently? Only time will tell depending on how SP model evolves further.

THE P75 (I) SHORTLISTING HAS NOT ONLY OPENED UP AND EXPANDED THE COMPETITION; IT HAS ALSO BECOME A HUGE TEST OF THE MUCH-TALKED STRATEGIC PARTNERSHIP MODEL

The P75 (I) submarines as new generation boats will be different from other operational ones due to its enhanced endurance capability and survivability – derived from the mandatory Air Independent Propulsion (AIP) along with improvised weaponry. It is expected that submarine-

P-75 (I): FOREIGN CONTENDERS IN FRAY

Amur 1650: The Rubin Design Bureau, Russia is offering its Amur class submarine. Considered to be more powerful and silent (acoustic signature of the Amur 1650 submarine is several times lower compared to Kilo class submarines), it offers the capability of firing up to 6 missiles simultaneously against sea and coastal targets, state-of-the-art electronic warfare systems and a sonar with a unique passive antenna to detect silent targets at a large range.

Type 214: ThyssenKrupp, Germany is offering Type 214 submarine which is based on the proven design principles of the HDW Class 209 family with additional incorporation of innovative features of HDW Class 212A. Considered as a matchless, cost-effective solution both for primary operations like anti-surface ship/submarine operations, intelligence and surveillance, reconnaissance tasks and also for Special Forces operations. It is well equipped to operate in littoral waters to deep ocean patrols. The modular design and high degree of automation make the Type 214 submarine a very cost-effective weapon system that is extremely difficult to detect and positions it as an unbeatable solution for future-orientated navies.

KSS- III: The next-generation 3,000-ton KSS-III Changbogo / Chang-ho class submarine has been offered by South Korean company Daewoo Shipbuilding & Marine Engineering Co., Ltd. (DSME). DSME has proven its capability to design and construct submarines independently. It will incorporate upgrades like the developed lithium-ion battery system to enable extended submerged time, improved sonar and combat systems performance.

S-80 Plus: Navantia's S80 Plus is a new generation submarine, technologically very advanced and represents a qualitative leap with respect to conventional submarines. It incorporates the most advanced technology, such as the propulsion system independent of the atmosphere (AIP) and integrates a state-of-the-art system for combat and support for the operations of special forces. It will support operations integrated in the Force, as well as other missions of surveillance, deterrence and confrontation of threats such as minefields, ships of surface and other submarines, both conventional and nuclear.

Scorpene: Naval Group's Scorpene submarine is designed for all types of mission, such as surface vessel warfare, anti-submarine warfare, long-range strikes, special operations or intelligence gathering. It is extremely stealthy and fast, and is equipped with weapon launching tubes, and various weapons (torpedoes, missiles, mines). Scorpenes are amongst most advanced submarines.

INS Kalvari

launched BRAHMOS supersonic cruise missile will be fitted (vertical launch BRAHMOS initially and later BRAHMOS Mini from torpedo tubes) to these boats.

While experts are of the opinion that the real competition will be between Naval Group (France) and Rubin Design Bureau (Russia) and in all probability, L&T/ Rubin (Amur 1650) and MDL/ Naval Group (Scorpene) will go ahead to submit bids. This is just a conjecture and there is no reason to presume any preconceived alignment at the moment.

Interestingly, there will be three designs in fray for evaluation and considering the legacy of the foreign OEMs, formation of consortium partnership (for example: MDL/ Naval Group and Navantia or L&T/ ThyssenKrupp and DSME) and bidding can't be ruled out.

Whosoever wins the Project 75 (I) to build the six submarines, the following goals of SP model should get realised in totality:

a) Progressively build indigenous capabilities along with the creation of a tiered industrial ecosystem
b) Innovation and wider skill-base development
c) Increase efficiencies and facilitate faster and more significant adoption of technology

Air Independent Propulsion

Air Independent Propulsion is marine propulsion technology that allows a non-nuclear submarine to operate without access to atmospheric oxygen (by surfacing or using a snorkel). AIP can augment or replace the diesel-electric propulsion system of non-nuclear vessels.

In October 2019, the operation of the land-based prototype of AIP engineered to the form-and-fit of a submarine was conducted at the Naval Materials Research Laboratory at Ambernath in Maharashtra. With this, the DRDO programme to build a fuel cell-based Air Independent Propulsion system for Indian Naval Submarines crossed several milestones in technology maturity.

Fuel cell-based AIP has a force multiplier effect on the lethality of a diesel-electric submarine as it enhances the submerged endurance of the boat manifolds.

Strategic Partnership Model

Strategic Partnership Model in defence sector was approved by Defence Acquisition Council (DAC) in May, 2017. It aims to revitalise defence industrial ecosystem and progressively build indigenous capabilities in the private sector to design, develop and manufacture complex weapon systems.

Successful implementation of the policy will institutionalise a transparent, objective and functional mechanism to encourage broader participation of the private sector, in addition to DPSUs/ OFB, in the manufacture of defence platforms and equipment such as aircraft, submarines, helicopters and armoured vehicles.

It will serve to enhance competition, increase efficiencies, facilitate faster and more significant adoption of technology, create a tiered industrial ecosystem, ensure development of a wider skill base and trigger innovation, reduce dependence on imports and meet national security objectives through greater self-reliance.

THE P75 (I) SUBMARINES AS NEW GENERATION BOATS WILL BE DIFFERENT FROM OTHER OPERATIONAL ONES DUE TO ITS ENHANCED ENDURANCE CAPABILITY AND SURVIVABILITY – DERIVED FROM THE MANDATORY AIP ALONG WITH IMPROVISED WEAPONRY

It's the opportune time to collaborate, create, innovate and be flexible for compatibility and raise the morale of the private sector by giving them the much awaited opening to either lead from the front or be a project partner to move ahead on the learning curve. Else, reducing dependency on imports and meet national security objectives with greater self-reliance will remain elusive once again for aspirational India. And India can't afford to miss this opportunity now.

UNDERWATER DOMAIN AWARENESS FRAMEWORK: START-UP INDIA HAS WHOLE NEW REALM

The young India needs to intensively engage to figure out innovative ideas for sustainable entrepreneurship, technology based solutions, high end data analytics, underwater robotics and many more to boost Start-up India mission

By **DR (CDR) ARNAB DAS**

The Indian Ocean Region (IOR) has strategically become the most critical sea area in the 21st century, and geopolitics dictates that we in India understand the challenges and opportunities to be on top of the game. The Indo-Pacific strategic construct only amplifies the urgency of the strategic involvement that we need to embark on. The centrality of India in the Indo-Pacific strategic space dictates that we play a critical role in the maritime affairs in the region on all fronts. The safe, secure, sustainable growth model needs to be dissected to be able to facilitate peace and prosperity in true sense.

The safe relates to safety from natural disasters, given the increasing disasters originating from the oceans, the secure relates to the security from state and non-state actors, given the volatile political realities in the IOR. The sustainable growth is not limited to ecology alone but also other aspects.

The contribution of the maritime sector to the GDP has been far from desired since Independence. However, more recently we see massive push for maritime prowess and capability building. The Security and Growth for All in the Region (SAGAR) is a very progressive vision statement and only amplifies our seriousness towards harnessing the maritime potential. The SAGAR not only recognises the security challenges in the IOR, but also the opportunities it offers for India and the nations in the region to boost their economic growth. The SAGAR declaration further recognises the leadership role India is expected to play to be recognised as a global power in the ongoing geopolitical and geostrategic developments. The government on its part has embarked on mega projects like Sagarmala, Inland Water Transport (IWT), multi-modal connectivity and much more to substantiate its SAGAR declaration.

Post the 26/11 incident, the Maritime Domain Awareness (MDA) has gained prominence in the strategic circles more as a security driven exercise, and also remained only a surface level formulation. Massive infrastructure investments and policy changes have been made to bolster our MDA capabilities. Typically following the 9/11 US reaction, the MDA in India remained a security driven formulation. The IOR has multiple unique challenges given the geopolitical and geographical realities. The active non-state actors and also multiple nation states using the non-state actors as regular extension of the state machinery to counter their adversaries make it a very complex security problem to handle by conventional ways. The dimension of the security matrix with increasing underwater drone capabilities being acquired by the subversive groups in the region only adds to the security challenges.

The developing nations in the region need to balance multiple socio-economic priorities before allocating huge budgets for meeting security concerns. The tropical littoral waters in the IOR further complicate the situation due to sub-optimal sonar performance of the order of 60 per cent deterioration. Thus, the import of underwater technology (hardware) in the absence of local site specific R&D has limited the effectiveness of these deployments. Field experimental R&D is highly resource intensive. Thus these developing nations have remained hostage to the western powers. The fragmented approach among the stakeholders, both within the nation and the IOR, has always ensured limited availability of resources for indigenous R&D efforts.

The sea blindness as a nation

NirDhwani Technology Pvt. Ltd.

PRODUCT SHEET # NDT/02
UNDERWATER RADIATED NOISE MANAGEMENT

The Underwater Radiated Noise (URN) Management is a very critical aspects for both military and non-military applications. The noise emitted by the marine platforms (or warships in military terminology) needs to be effectively managed for improved acoustic stealth and also acoustic habitat degradation. The URN management has multiple challenges particularly in the tropical littoral waters of the Indian Ocean Region (IOR). The acoustic capacity building is a critical aspect for effective URN management and the complete dynamics need to be understood. The proposed product provides a very comprehensive solution for effective URN management in the IOR.

Applications

Acoustic Stealth
The warships need to avoid detection by the sonars of the adversary and also acoustic mines. Acoustic stealth has been there since time immemorial, however the domain has remained in secrecy due to obvious reasons. Every navy has to formulate its strategy, develop technologies and also build human resource to effectively manage the acoustic signature.

Acoustic Habitat Degradation
The merchant marine has to also get involved in URN management as global community is aggressively pursuing noise reduction for ensuring sustainable growth with better marine ecosystem. The urgency of the issue is very obvious with the frequent stranding of big whales in the IOR and beyond. The fear of high cost involved is unfounded as mass usage of the available acoustic stealth technologies by the merchant marine will bring down the cost.

Shipbuilding and Design
With high end prediction algorithms and modelling & simulations techniques, it is possible to facilitate enhanced ship design and construction for both acoustic stealth and acoustic habitat degradation. URN management has never been part of the process and has always remained an afterthought. It can bring efficiency and effectiveness, if made part of the entire ship design and building process right from the planning stage.

Unmatched Features

- Automatic report generation with real time measurement and analysis results.
- Application specific analysis tools and signal processing algorithms.
- Comprehensive Database Management System
- Complete Hand-holding right from regime definition to ranging and deployment of MARS. Even Maintain, Repair and Operate (MRO) support can also be provided.
- Policy formulation for effective URN management based on the application.
- State-of-the-art technology support right from site-selection to ground truthing and analysis.
- Accurate signature prediction of the platform at all stages from design to construction and operations across regimes of operation. Capacity and Capability Building Support on all the three fronts from policy, technology & innovation and human resource development.
- Documentation support on strategy, benchmarking, SOPs and analysis reports.

URN Management Process

Regime Definition : The most critical starting point of URN management is the regime definition, so that the measurement is undertaken in a manner that can address all aspects of the analysis requirement. It requires much deeper understanding of the machinery onboard, role of the platform, design issues and also the analysis priority.

Type & Occasion : The type and occasion of the ranging will determine the measurement and analysis details. First of the class, will require benchmarking, so a very detailed ranging is desired, however other subsequent occasions like follow-on ships or event pre & post refit may not require as much details.

Site Selection : The underwater topography in the IOR does not permit effective fixed ranges so portable ranges or Mobile Acoustic Range System (MARS) is the only option. The MARS need to be deployed appropriately that accounts for distortions and other physical conditions, so site selection for the deployment location is extremely critical.

Ground Truthing : The calibration of the ranges is an important pre-condition, however the ground truthing ensures end to end error management right upto the presentation of the results. Multiple signal processing tools can be incorporated to better manage the errors.

Signature Management

Measurement & Analysis : This entails precise measurement of the signatures in-spite of the distortions in the underwater medium and also with distinct & appropriate machinery configuration. The measurement process needs to factor hardware and software errors in addition to the environmental factors. The analysis requirements need to be appropriately defined and planned while finalizing the machinery configurations. Operational, diagnostic, design, maintenance, benchmarking, cavitation, trend analysis, system study, propulsion study and other requirements need to be factored while formalizing the analysis requirements.

Prediction : The signature prediction is another critical requirement given the machinery fit and layout of the platform. It has implications in design, construction, deployment and multiple other applications. Modelling & Simulations tools need to be deployed with deep understanding of the entire radiated noise generation process along with data analytics.

Deception : The deeper understanding of the above two steps will facilitate deception, where the platform can alter its signature and avoid identification by the adversary or even minimise impact on marine species in a specific habitat. In the present times of intelligent acoustic mines, this is a very critical capability critical requirement given the machinery fit and layout of the platform. It has implications in design, construction, deployment and multiple other applications. Modelling & Simulations tools need to be deployed with deep understanding of the entire radiated noise ge eration process along with data analytics.

NirDhwani Technology Pvt. Ltd.

PRODUCT SHEET # NDT/01
PASSIVE SONAR SIMULATOR

The tropical littoral waters have their own challenges and thus the conventional passive sonars are not able to keep pace with the growth complexity in the operational arenas in the Indian Ocean Region (IOR) and the South China Sea (SCS). Real-time prediction of the underwater medium fluctuations and the ambient noise mapping is a critical input for any such effort. The prediction takes online real-time inputs like the sea-surface parameters, sound velocity profile, wind & sea state, bathymetry, shipping traffic inputs from the AUtomatic Identification System (AIS), bottom type & profile and more from online databases. The proposed simulator has unmatched features and high end specifications. The passive sonar simulator will have broadly four blocks:

Unmatched Features

The simulator has primarily four features:

- The conventional training aid for fresh operators, but here it gives a realistic feel of the actual operating environment with real-time environmental parameters.
- The sonar performance evaluation tool to assess the real-time sonar effectiveness, taking into account the diurnal and seasonal fluctuations of the UW medium.
- The deployment tool, where the sonar operator can plan effective deployment site and time based on the spatio-temporal inputs of the UW Channel and the ambient noise.
- The vulnerability assessment tool to evaluate the platform detection range and classification performance of sensors deployment by the adversary.

Specefications

The specifications of the passive sonar simulator pertain to four broad categories:

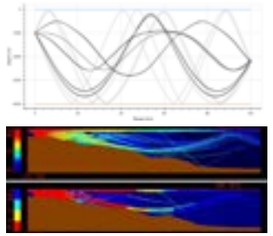
- The frequency range that the simulators operates, is from extreme low frequency to 1 KHz.
- The radiated noise prediction is within +/- 4 dB.
- The UW channel model accuracy is within +/- 4 dB.
- The instanteneous spatio-temporal low frequency ambient noise mapping accuracy is within +/- 6 dB.
- The radiated noise classification performance is of the order of 85 %.

Target Block

The target block will generate multiple predicted acoustic signatures of the potential platforms, it is likely to encounter. State-of-the-art prediction models have been developed to generate the radiated noise at source with inouts of the platforms that are by-and-large available in open source. Machinery inputs, onboard layouts and more have been sourced from open source for a large number of ships.

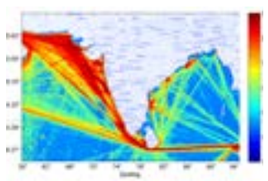
Underwater Channel Characterstics

The Underwater Channel Model provides that real-time medium fluctuations based on the local environmental parameters like the sea surface parameters, sound velocity profile, bathymetry, bottom type & profile, wind & sea state and more. The tropical littoral characteristics are captured from the local paramters and the UW channel model is derived. The data at source is passed through the UW channel model to derive the ground realities.



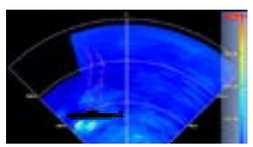
Ambient Noise Mapping

The low frequency spatio-temporal ambient noise mapping in real time will be undertaken and linearly combined with the received signal to generate the actual received signal. The real-time Automatic Identification System (AIS) data feed, is taken and the shipping traffic data derived from it. This gives the radiated noise at source for distant shipping to compute the low frequency ambient noise. The UW channel parameters are also combined wth the same to obtain realistic feel of the ambient noise.



Graphical User Interface

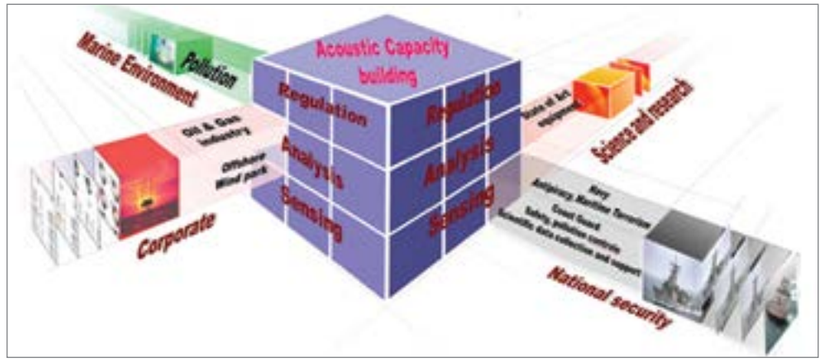
A detailed GUI with all the components of the passive sonar simulator for both the versions, training and operational and also the offensive and defensive versions will be provided. Multi-operator consoles with multi-feature switchable versions will be provided.



The entire simulator will be highly interactive and also provide very high data processing and innovative data analytics capability to make the sonar operator familiar with the underwater condition and facilitate effective deployment of the sonar in real time. The entire solution will be provided in a hand held device to make it accessible to the operator on the go. The onboard operator will require such hand held devices with significant processing capabilities to manage his requirements. Online and offline versions will be made available to manage the backend memory and processing.

since Independence has ensured minimal participation of the academia and corporates in all maritime matters. The participation of young India towards India's pitch for a $5 trillion economy needs to fix this gap. The MDA needs to address the underwater threat that looms in the IOR. Multiple nations in the region are acquiring submarines and given their developing nation status and the political volatility in the region also raises safety concerns of such mindless submarine proliferation. The massive undersea resources in the IOR are waiting to be exploited, but ensuring sustainable growth in the region will require massive investments on science and technology. Effective Underwater Domain Awareness (UDA) that is able to truly facilitate Safe, Secure, Sustainable Growth for all in the region is the need of the hour.

A UDA framework proposed by the Maritime Research Centre (MRC) can possibly encourage pooling of resources and synergising of efforts across stakeholder namely security, blue economy, environmental regulators & disaster management authorities and the science & technology providers. The young India needs to participate to draw out innovative ideas for sustainable entrepreneurship, technology based solutions, high end data analytics, underwater robotics and more for boosting the Start-up India mission. Acoustic Capacity and Capability is the core soft capability that we need to develop. The hardware acquisition is meaningless unless soft acoustic capability is developed and given the aspirational and innovative demographic advantage that we have, it is possible to channelise them towards building effective UDA framework in India. UDA for SAGAR can become our tool for playing a leadership role in the region and keep the extra-regional powers at bay.



Comprehensive Perspective of Undersea Domain Awareness

The UDA on a comprehensive scale needs to be understood in its horizontal and vertical construct. The horizontal construct would be the resource availability in terms of technology, infrastructure, capability and capacity specific to the stakeholders or otherwise. The stakeholders represented by the four faces of the cube will have their specific requirements; however the core will remain the acoustic capacity and capability.

The vertical construct is the hierarchy of establishing a comprehensive UDA. The first level or the ground level would be the sensing of the undersea domain for threats, resources and activities. The second level would be making sense of the data generated to plan security strategies, conservation plans and resource utilisation plans. The next level would be to formulate and monitor regulatory framework at the local, national and global level.

The figure above gives a comprehensive way forward for the stakeholders to engage and interact. The individual cubes represent specific aspects that need to be addressed. The User-Academia-Industry partnership can be seamlessly formulated based on the user requirement, academic inputs and the industry interface represented by the specific cube. It will enable more focused approach and well defined interactive framework. Given the appropriate impetus, the UDA framework can address multiple challenges being faced by the nation today. Meaningful engagement of Young India for Nation Building probably is the most critical aspect that deserves attention. Multi-disciplinary and multi-functional entities can interact and contribute to seamlessly synergise their efforts towards a larger goal.

GIVEN THE ASPIRATIONAL AND INNOVATIVE DEMOGRAPHIC ADVANTAGE THAT WE HAVE, IT IS POSSIBLE TO CHANNELISE THEM TOWARDS BUILDING EFFECTIVE UDA FRAMEWORK IN INDIA. UDA FOR SAGAR CAN BECOME OUR TOOL FOR PLAYING A LEADERSHIP ROLE IN THE REGION AND KEEP THE EXTRA-REGIONAL POWERS AT BAY

The author and his two entities MRC and M/S NirDhwani Technology Pvt Ltd (NDT) will be happy to engage with budding start-ups to formulate innovative ideas to be able to contribute towards the UDA framework. He can be reached at http://nirdhwani.in. Two product sheets are attached to give a glimpse on the massive opportunity that exists.

– The author is founder and director, Maritime Research Centre (MRC), Pune

AMIT COWSHISH

DEFENCE BUDGET 2020-21, INDIGENISATION AND EXPORTS

In the face of the ongoing financial crisis, all this talk about indigenisation, self-reliance and India becoming a defence manufacturing hub sounds a bit incredible. Now, it is to see whether India be able to achieve its goal of indigenisation, self-reliance and exports

In her budget speech last year, Finance Minister Nirmala Sitharaman had flagged defence manufacturing as one of the ten thrust areas in the government's vision for the coming decade. The budget outlay of 2019-20, however, belied that vision as the gap between the requirement projected by the services and the amount allocated to them exceeded Rs 88,000 crore.

About two-thirds of the shortfall was under the capital segment of the budget, which caters for acquisition of new equipment and payment on account of all ongoing capital acquisition contracts. The Standing Committee on Defence (SCoD) considered the allocation to be so scant as to warn that the Ministry of Defence (MoD) may end up defaulting on making contractual payments.

Though MoD somehow managed to avoid that ignominy - albeit at the cost of withholding payment to the state-owned Hindustan Aeronautics Limited (HAL), and probably some other vendors too - no one asked, and the Ministry did not care to explain how this feat was achieved. Even SCoD – never shy of making censorious observations on such issues – avoided asking this inconvenient question.

It is no different this year. There is a gap of more than Rs 1,03,500 crore between the projection and allocation for the FY 2020-21, of which about 58 per cent is on account of capital expenditure. It will not be surprising if MoD manages to scrape through this year also, but the long-term impact of persistent underfunding, both under the revenue and the capital segments of the budget, cannot be glossed over.

> IT WILL NOT BE SURPRISING IF THE MOD MANAGES TO SCRAPE THROUGH THIS YEAR ALSO, BUT THE LONG-TERM IMPACT OF PERSISTENT UNDERFUNDING ON DEFENCE, BOTH UNDER REVENUE AND CAPITAL SEGMENTS OF THE BUDGET, CANNOT BE GLOSSED OVER

While the officials continue to push acquisition proposals for aircraft, helicopters, submarines, guns, drones, armoured vehicles, and the like, where the money is going to come from is the last thing that seems to be on their mind. This, in fact, makes one doubt whether all this talk about insufficiency of funds even for making payments against the on-going contracts is for real.

But, for real, it is. With an increase of just about three per cent in the allocation of capital expenditure over the revised estimates for 2019-20, the financial crisis may be more imminent than ever before. In the circumstances, some of these ambitious capital acquisition programmes could get delayed, or worse, fall through at some stage because of financial constraints.

Shortage of capital budget could also possibly impact development of infrastructure, acquisition of land, and raising of cyber and aerospace agencies as well as the special operations division, just as financial constraints were one of the main factors that put paid to the sanctioned project of raising the mountain strike corps a couple of years ago.

Revenue budget does not present a very different picture. As a matter of fact, inadequacy of funds for revenue expenditure has a more insidious impact. With the rising share of pay and allowances - anywhere between 65 to 70 per cent of the revenue budget 2020-21 of the armed forces - and other obligatory expenses on ration, clothing, etc, there is not much left for meeting the operational requirement.

At Rs 33,142.00 crore, the allocation to the three services for 2020-21 under the 'stores' budget head which, apart from the expenditure on ration and clothing, also caters for procurement of spares, ammunition and maintenance of equipment, etc, is about Rs 2,500 crore less than the allocation for 2019-20. This is also true of the 'works' budget head which caters for the revenue expenditure on repair and maintenance of the existing infrastructure. The implications are self-evident.

The services are probably justified in asking for more funds than what they have been getting, but it is a fact that the successive governments have found it difficult to meet the requirement as they face various constraints, ranging from the inability to generate more revenue through taxation and borrowing to overlooking competing demands from other sectors like health, education, agriculture, internal security and infrastructure – not necessarily in that order.

Finance Minister Nirmala Sitharaman with her deputy MoS Finance Anurag Singh Thakur

> INDIGENISATION IS NOT ABOUT ACQUISITION OF ITEMS FROM INDIAN SOURCES BUT ABOUT THE EXTENT OF INDIGENOUS CONTENT IN AN ITEM, AND DEFENCE BUDGET IS MEANT PRIMARILY FOR EQUIPPING THE ARMED FORCES

All eyes are now set on the Fifteenth Finance Commission (FFC) which was asked by the government in July last year 'to address serious concerns regarding the allocation of adequate, secure and non-lapsable funds for defence and internal security of India'. It was a desperate attempt to postpone taking hard decisions about sustainability of the rising defence expenditure - including the expenditure on defence pensions which has risen from less than Rs 7,500 crore in 1999-2000 to Rs 1,33,825 crore in 2020-21.

It will be naïve, though, to expect the commission to come up with a magical solution, not least because any recommendation that even marginally reduces the states' share in the central revenues to carve out a corpus for defence and internal security could be contested by them, especially in the aftermath of Covid-19, the effects of which on the economy and incomes will unravel in the coming year(s).

In the face of the ongoing financial crisis, all this talk about indigenisation, self-reliance


President Ram Nath Kovind with Fifteenth Finance Commission Chairman NK Singh and others

and India becoming a defence manufacturing hub sounds a bit incredible. Defence is a monopsony with just one major buyer who has limited funds to promote and sustain these efforts. To add to this, there is a lack of clarity about how this goal is to be achieved.

A classic example of this ambivalence is the recommendation made by SCoD in its seventh report submitted to Parliament in March 2020, that the MoD should explore the possibility of 'earmarking some percentage of funds while allocating annual funds for acquisition from (the) Indian sources'.

First, indigenisation is not about acquisition of items from Indian sources but about the extent of indigenous content in an item. Second, defence budget is meant primarily for equipping the armed forces and not for promotion of the indigenous industry by earmarking a portion of already deficient outlay for that purpose. That cannot be the overriding priority.


Defence Minister Rajnath Singh along with Ministry officials in a meeting with FFC

Most importantly, in the environment of competitive tendering, indigenisation depends on commercial viability of the effort. It makes no sense to indigenise if it makes the product costlier than the cost of the imported item, unless a system is put in place under which the buyer absorbs the additional cost incurred by the supplier in the process of indigenising a product. As of now, no such system is in place.

Paradoxically, among all this despondency, India has become the 23rd largest arms exporting country in the world, according to a SIPRI report of December 2019. It would be imprudent, though, to see this as being representative of an irreversible trend.

For one thing, the exports still account for 0.2 per cent of the global arms market and 85 per cent of the export is to Myanmar (46 per cent), Sri Lanka (25 per cent) and Mauritius (14 per cent), which offer a limited potential for any substantial increase in the total volume of exports. In the circumstances, it will take more than repeated expression of intent, to achieve the arms export target of US$5 billion in the next five years.

– The author is Ex-Financial Advisor (Acquisition), Ministry of Defence

'WE UNDERSTAND THAT IAF IS COMMITTED TO A FAST TRACK PROCESS OF RFP FOR ITS REQUIREMENT OF 114 FIGHTER AIRCRAFT AND WE WILL AWAIT THE FUTURE STEPS'

Ola Rignell (OR) as Chairman & Managing Director of Saab India Technology Pvt Ltd (SITPL) has been spearheading the high degree of company activities and its long-term commitment to India. He has long experience of partnership with international armed forces and engagement with their defence and security needs. A former pilot with the Swedish Air Force, Rignell has been deeply involved in Sweden's Gripen programme, with responsibility for testing weapons, avionics, engine performance and human/machine interfaces. Rignell is a member and fellow of the Society of Experimental Test Pilots.

*In a candid conversation with **Ajit K. Thakur**, Editor - **Raksha Anirveda**, Ola Rignell talked at length about Saab's active role in creating a robust and vibrant defence ecosystem and its well defined future plan towards Make in India contribution. An Excerpt:*

Saab Group has more than three decades of presence in India. Tell us about your journey so far and the company's footprint in the present Indian defence system?

OR Saab has been a trusted supplier to the Indian armed forces since 1970s, when India acquired the Carl Gustaf shoulder launched weapon system.

Saab also supplies the Integrated Defence Aid Suite (IDAS) to both the Indian Air Force and Army Aviation Corps variants of the Advanced Light Helicopter (ALH), designed and manufactured by Hindustan Aeronautics Limited (HAL). IDAS is a fully integrated multi spectral warning system designed for self-protection of airborne platforms.

On the ALH, IDAS is integrated with an Indian designed and manufactured CMD system. IDAS is supported by a dedicated mission planning tool known as the Threat Library Management System (TLMS).

Saab has supplied the National Automatic Identification System (NAIS) network to India, which has given the country an AIS maritime picture over the entire Indian coastline. NAIS is one of the largest national AIS-based coastal surveillance systems ever to be deployed.

Saab Barracuda has had a significant presence in India over the years through its Indian subsidiary Barracuda Camouflage (P) Limited (BCL). Indian Army recognises Barracuda for its effective camouflage in battlefield deployment. Saab has supported the Indian Navy P28 Frigate programme by providing superstructures built in carbon-fibre composite material at the Indian shipyard GRSE where on-site support is also being provided by the company.

Our current operational systems in India include among others Ground Combat (Carl Gustaf), EW (IDAS), radio sets, radars, Fiber Optic Gyros (FOG), signature management (Camouflage nets), avionics, underwater products, Saab Kockums Naval super structures, air traffic management and maritime traffic management.


Ola Rignell, Chairman and MD, Saab India Technology Pvt Ltd

The competition has intensified for Indian Air Force's 114 fighter aircraft requirement. The process is on track and expected to reach the final stage in FY 2020-2021. What's your expectation out of it?

OR We have provided a comprehensive response to the Request for Information for fighter aircrafts to the Indian Air Force.

The Saab response delivers the perfect fighter for India's current and future needs. It furthermore supports India's ambition for stronger indigenous capabilities with latest technologies for development and production of future fighters like the AMCA.

Saab's offer will enable Indian companies to take part in the industrial process of the world's most advanced fighter by absorbing state-of-the-art capabilities and technologies with applications in both the military and civilian sectors.

Through the Make in India initiative, a generational shift in full spectrum fighter capabilities will accelerate the defence and industrial ambitions.

We understand that IAF is committed to a fast track process of RFP and we will await the future steps.

In a recent interview you claimed that the price for Saab's Gripen is quite competitive, and is the most modern fighter. Moreover, many experts are also of the opinion that Gripen is the most underestimated fighter jet among its competitors. Do you agree with the experts view? Please elaborate on Gripen's edge in comparison to other fighter jets in competition.


Ola Rignell addressing a Press Conference in Lucknow, the day before Defexpo 2020


Saab's Gripen E aircraft

OR Saab's Gripen E is the most modern multirole fighter aircraft in the world developed to counter and defeat the most advanced threats in the modern battlespace. It has been designed for continuous upgrades so as to counter and defeat new combat challenges; such an approach having been proven many times. The Gripen E's inherent potential and design philosophy as well as the highly efficient manufacturing processes, ease of maintenance and supportability provides significantly lower upgrade, maintenance and operating costs. The aircraft will deliver significant cost savings over the expected 40+ years of operation in comparison with alternative platforms, which

THE GRIPEN E WILL DELIVER SIGNIFICANT COST SAVINGS OVER THE EXPECTED 40+ YEARS OF OPERATION IN COMPARISON WITH ALTERNATIVE PLATFORMS, WHICH ENABLES RELEVANT TRAINING FOR ENHANCING OPERATIONAL CAPABILITIES OF THE INDIAN AIR FORCE

SAAB'S PLANS IN INDIA ARE BASED NOT JUST ON SELLING PRODUCTS BUT ON CREATING A DEFENCE ECO-SYSTEM WHICH WOULD INVOLVE HUNDREDS OF TIER 1, 2 AND 3 PARTNERS, VENDORS AND SUPPLIERS. IT WOULD INCUBATE PARTNERSHIPS BETWEEN ITS GLOBAL SUPPLY CHAIN AND INDIAN SUPPLIERS

enables relevant training for enhancing operational capabilities of the Indian Air Force.

Such an upgradeable design together with transfer of design and upgrade capabilities are pre-requisites and provide the IAF indigenous upgrades and sustainable capability thus continuously meeting evolving operational needs.

Additionally, Saab delivers economic benefits - the Gripen brings skills, technology and shared intellectual property even as the company looks to creating industrial partnerships and long-term relationships.

Saab has filed a definite flight plan for the Indian Air Force and India's aeronautical industry. In aviation parlance, we await 'take off' clearance from the Indian government for a joint journey over the next half a century!

Saab Team in conversation with Indian Army officer at Defexpo 2020

Ola Rignell, Chairman and Managing Director, Saab India in conversation with the Chief of the Naval Staff Admiral Karambir Singh

Saab, in collaboration with Tech Mahindra, formed Saab India Tech Centre (SITC) in Hyderabad for the development of among other products, Gripen. The company also has a joint venture tie-up with Aequs in Belgaum for subassemblies. How are these tie-ups contributing to Make in India?

OR Our plans in India are based not just on selling products but on creating a defence eco-system which would involve hundreds of Tier 1, 2 and 3 partners, vendors and suppliers. Saab would incubate partnerships between its global supply chain and Indian suppliers. It would also foster R&D partnerships for next-generation platform, system and sub-system design and development across the industry.

Saab is working with many suppliers in India, including CIM Tools, Tata Advanced Material Limited and Aequs (former QUEST Global Manufacturing).These companies play a very valuable role in helping Saab develop, industrialise and manufacture complex airframe assemblies for major international aircraft manufactures. Aequs manufactures and supplies assemblies for the global commercial aero structures market.

How does Saab see its role in India's aerospace needs with regards to Make in India?

OR India will be an important market for the aerospace industry in the next half a century. Not merely for military aircraft but for virtually every category of aerospace: military and civilian helicopters and aircraft; UAV for military and homeland security purposes and so forth.

Saab's Gripen E

We are equally convinced that in the decade ahead, India will be propelled to have its own home-grown large aerospace company.

We fully support India's ambitions and we are willing to partner and share our own experience of trial and error to expedite the progress we expect to see in India on this front.

The speed and success of this major shift will depend on the ability to deal with three major aspects:

First, the systems that it develops need to account for top performance in future battlefields. Second, technologies need to be cutting edge, efficient and sustainable, as low life cycle cost and availability are key to India's aviation ambitions given the sheer scale of requirements.

Third, there needs to be a seamless transition from design and development to manufacturing for any complex aeronautic programme to become successful.

Share your experiences about the participation at the 11th edition of DefExpo in Lucknow? How do you visualise the Indian defence and aerospace market in the backdrop of India's aspiration to become US$5 trillion economy by 2024-25 in general, and US$26 billion defence industry by 2025?

OR Saab was proud to attend the 11th edition of DefExpo India at Vrindavan Yojana, Lucknow from February 5-8. It was a great place to showcase Saab's ambition to contribute to India's vision of building a larger indigenous defence industry, and help build capability that will enable India to design and build its own next-generation defence systems.

We showcased our latest technologies which are changing the defence and security planning, deployment and future force readiness. Some of the key products on display were Gripen E, Skeldar (VTOL UAV), our latest ground-based radar the Giraffe 1X, Carl Gustaf M4, AT4CS AST, next-generation Light Anti-tank Weapon (NLAW), Signature Management Systems, AUV-62-MR, Double Eagle SAROV, and Saab Light Weight Torpedo.

It was a very well organised show with fantastic infrastructure and it was great to see such an informed audience who were really appreciative of the products we displayed.

THE BLUE DOT NETWORK IMPACT

The Blue Dot Network initiative took concrete shape behind the scene during US President Trump's visit to India despite being missed by media and observers amid the high decibel optics and glitz

THE ORIGIN

- Published in June 2019, the 'Indo-Pacific Strategy Report' of Department of Defense (DoD) – USA made some 91 references to China and dedicated one section on the newly set up 'US International Development Finance Corporation' (DFC) with the mandate to mobilise private finance for infrastructure investment in small countries.
- The DFC advances American foreign policy and American commercial competitiveness; also helps American businesses gain footholds in many of the world's fastest-growing markets. It has put together $60 billion of private money with Congressional support and doesn't use taxpayers' money. Its budget for 2021 is a mere $800 million.
- Blue Dot Network can be well defined as an "a multi-stakeholder initiative that will bring governments, the private sector, and civil society together to promote high-quality trusted standards for global infrastructure development".

PARTNERING FOCUS IN THE REGION

- More details are emerging on the 'development' scaffolding that supports the Asia Pacific security strategy - sincethe January 2020 briefing by officials from the East Asia and Pacific Affairs, and the South and Central Asia desks, just weeks ahead of President Trump's visit to India. It included additional US initiatives to provide legal and technical services to help Indo-Pacific countries evaluate contracts and debt sustainability. This also includes a project in Maldives, reeling under Chinese debt, through the United States Agency for International Development.
- Earlier, advice from an unnamed group of US experts led to Myanmar renegotiating a deal with China on the deep-water Kyaukpyu port much to Beijing's annoyance.
- The US-India joint statement states that the USAID is now to partner with India's Development Partnership Administration for cooperation in third countries.

MAKING CHINA SEE THE RED, FEEL THE UNEASE AND KNOW THE DANGER

- The whole effort towards BDN is being undertaken by a multitude of US departments with separate budgets, and acronyms and the objective is clear: to push back on Chinese influence in the region.
- The objective for India's security managers is similar, but with its own set of limitations. The officials have preferred to keep the door open on the Belt and Road Initiative (BRI) given the reality of proximate Chinese power,even while going ahead with as much regional connectivity as possible under a limited budget. Indian enterprise has not stepped up to take the slack either.
- The new initiative (BDN) delivers on two fronts. First, in pushing back rising Chinese influence; and second, it addresses India's grouse that the 'Indo-Pacific' thrust is far too focussed on security. This initiative is about development, to harness what US officials estimate at about $70 trillion of potential investment waiting in the wings.
- The US-India joint statement will get scrutinised closely by Beijing for anti-China content. The unease factor has crept in and has compelledChinato sense the dangers. It can hardly oppose a private sector thrust to put a red dot in the neighbourhood, even if there's a blue one hovering alongside.

THE X-FACTOR

- As per the Asian Development Bank (ADB) expectations the worth of infrastructure development needs in the Indo-Pacific alone is around $1.7 trillion per year through 2030. A huge market size for business and the influence that goes with it. Thus, everyone including China wants a slice of the pie.

MAKING IT WORK

- The Indo-US joint statement centres on a 'Comprehensive Global Strategic Partnership' tick boxing the expected military, space, and energy cooperation, as well as concern about the high debt situation in developing countries and the need for "responsible, transparent and sustainable financing practises". Diplomatically, it referred to the dire situation faced by countries like Sri Lanka and the Maldives due to heavy debts to China.
- The Blue Dot Network (BDN) was formally launched three months ago by the US, Australia and Japan – all part of the 'Quad' where India is the fourth member – and is an across-the-board certification process for all aspects related to an infrastructure project and centred on transparency and sustainability.
- The BDN model is already in action and the effort will involve 'regional partners', including India among others as those championing free choice in the region.
- In November, 2019, a US-Japan statement announced a $10 billion investment in LNG, involving expediting private money. Another project deals with 'smart cities' in ASEAN countries.
- Under the initiative, India is receiving investment in education. Yet another provides training to procurement professionals from Maharashtra. With DFC going to have a permanent presence in the country, US expects India to be a partner, shed its reluctance to become a formal US ally.

Note: Adapted from Dr. Tara Kartha's article - Counter to BRI? Why India-US Thrust on Blue Dot Network will make China see Red? published earlier in The Print.

Dr. Tara Kartha is former director, National Security Council Secretariat.

'WE ARE MOVING TOWARDS LIGHT WEIGHT HIGHER CAPACITY TECHNOLOGY IN PROVIDING TACTICAL COMMUNICATION SOLUTIONS'

Sandeep Agarwal (SA) is Founder and CMD of Exicom Technologies India LLP and Brij Systems Limited. Mr Agarwal received his school education from Don Bosco School in Patna, Bihar. Exicom Technologies India LLP is a Mumbai-based global company which deals in Static and Tactical Wired and Wireless Communications, Satcom, Security for defence forces among others.

Close to four years ago, the Exicom founder shifted his base from New Zealand to Mumbai in India following the announcement of various policies by the Government of India. In an interview to ***PK Ghosh*** *of* ***Raksha Anirveda****, Mr Agarwal spoke about his company business. An excerpt:*

Sandeep Agarwal, Founder and CMD, Exicom Technologies India LLP

What prompted Exicom shift its base from New Zealand to India in 2016? Please explain?

SA There were two reasons, first New Zealand government was not liberal towards non-New Zealanders owned businesses and borrowing from banks was becoming a challenge in spite of a good business records. Meanwhile in India newly elected government (in 2014) and appointed Prime Minister Narendra Modi gave a call for 'Make in India' foreseeing the dream to propel India into next level as global manufacturing hub including in defence sector. Government announced multiple policies to support the call which was a big motivator to move our facilities to India.

The next step was to identify the core technology and the products that we wanted to indigenise. Our experience of over 25 years in providing Information and Communication Technology (ICT) solutions to the Indian Armed Forces, Paramilitary Forces, DPSUs, Police and private industry was of great help in identifying the technology voids in ICT, primarily wireless (RF) infrastructure. We realised that substantial progress had been made by Indian industry in indigenising WiFi, LTE/ 4G and SDR (HF/ VHF up to 512 MHz). SDR Make in India programme has made considerable progress and SDR Mesh/Mobile Ad Hoc Network (MANET) with through puts of 1 to 2 (Mbps) Mega Bits Per Sec with 16 to 32 nodes was the stated objective of this initiative.

We wanted to take Mesh MANET into a different orbit altogether. We came up with the idea of full Mesh MANET with a through put of initially 32Mbps with 16 Nodes, a fully addon-to-addon network fully secure. Incidentally we are now targeting 80 Mbps and 64 Nodes. We realised the operational potential of such a wireless infrastructure for military and all security forces (Civil or government). Just imagine, having a true Infrastructure less wireless network with such high capacities. It would launch SDR into a different plane altogether. We entered into a Technology Partnership with Domo Tactical Communications (DTC), UK. To give clients instant exploitation of this technology we also went into the manufacture of COFDM based Tactical Video Systems and Data/ Control/ Telemetry links for UAVs, Robotics and any Variant of Unmanned Surface Vehicles. The objective is to offer solutions with no or very little infrastructure and zero recurring cost for land, air, sea and space applications.

Exicom Technologies main role is manufacturing and its subsidiary Brij Systems provides customised solutions as a system integrator to the clients, who need reliable and dependable solutions for covert operations, surveillance and security etc. How does this help in context of product quality, operations and providing efficient service to the customer?

SA You will appreciate that both video and audio are two important ingredients in any operations, covert operations are no different. Telemetry, Command Line Interface etc., which have negligible bandwidth requirements pose no technology challenge. Covert operations have one more dimension and that is miniaturisation. Once we achieve these basic characteristics the same in varying form factor (primarily Wattage and Range) could be deployed as communication infrastructure less (sic)-infrastructure for all kinds of surveillance / security scenarios like; drones, drone swarms, snipper-spotter. The list is endless.

(L-R) Ashish Padte, Sandeep Agarwal and Maj Gen Luv Chand (Retd)

Since only the core technology module is imported from our technology partners-DTC the customisation, installation, maintenance training and even joint operations in initial stages in even the remotest parts of India is supported by us. The apprehension of armed forces to quote a very senior General "Vendors Sell what they have and Not what we Want" is thus dispelled. Since, we can guarantee this quality control, reliability/ availability; which is inherent in our system/ process is automatically guaranteed. All repairs field level to base level and after sale service and modifications are done within India.

Exicom entered in OEM technology tie-up with Domo Tactical Communications (DTC) UK, a leader in the world of COFDM based secure military tactical communications solutions. Exicom now builds end products based on DTC technology core. How much indigenous content is there in producing such solutions?

SA Currently most products have 55 per cent plus Indian content however we foresee increasing this in coming time. We are fully aware of the focus of Government of India in indigenisation both for defence equipment and other central and state government departments' requirements. The policies laid down in Defence Procurement Procedure (including DPP 2020) and the provisions of Preferential Market Access

"The clarion call of 'Make in India' by Prime Minister Narendra Modi substantiated by multiple policy initiatives taken by the government was the big motivator to move our facilities from New Zealand to India"

Sandeep Agarwal*, Founder and CMD of Exicom Technologies India LLP and Brij Systems Limited*

Ensemble Display of Product offerings @ Exicom Technologies Stall, DefExpo 2020

(PMA) are being adhered to. The Indigenous Content (IC) is far below the maximum laid down limits. As a ballpark figure, I can state that Foreign Content would be below 40 per cent of the overall project cost. Despite the provisions of 50 per cent IC in DPP 2020, our target is to have 100 per cent IC. But you will appreciate that this is all dependent upon the indigenisation of PCBs/ wafers and components.

Exicom has the capability to produce solutions for Special Forces of military as well as civil including integrated surveillance solution. It is into producing solutions for land, sea and air. Categorise the solutions for Army, Navy and Air Force?

SA We currently offer Tactical Mesh in various form factors and Video Streaming Solution in various form factors starting from a covert operation

WE ARE FULLY AWARE OF THE FOCUS OF GOVERNMENT OF INDIA IN INDIGENISATION BOTH FOR DEFENCE EQUIPMENT AND OTHER CENTRAL AND STATE GOVERNMENT DEPARTMENTS' REQUIREMENTS. THE POLICIES LAID DOWN IN DEFENCE PROCUREMENT PROCEDURE (INCLUDING DPP 2020) AND THE PROVISIONS OF PREFERENTIAL MARKET ACCESS (PMA) ARE BEING ADHERED TO

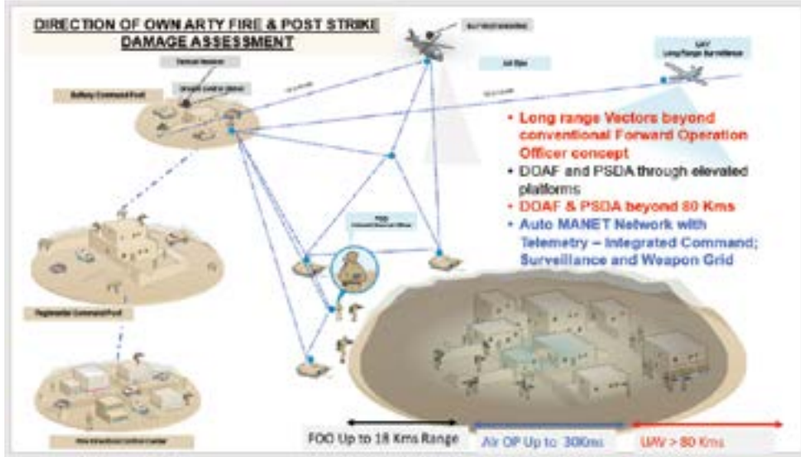
to a battlefield for land. We offer complete range of Mesh Manet IP Radios for both boarding application to the needs of Special Forces and we offer video downlink from choppers and fixed wing aircraft to the ship in deep sea. We also offer video downlink and Mesh Manet solution from air to air and air to ground applications as well as solutions for the missile applications, Robotics application to disaster management.

As mentioned above, our system is so versatile that the core SDR module with a wattage of 100 mWatts and 100 grams, yes 100 grams weight can be provisioned with wattage of 1 Watt, 2 W, 5W, 10 W. The Multiple Inputs Multiple Output (MIMO), versatile RF and Antennae solution and above all COFDM Wave form with NLOS (penetrated the two feet walls of Mint Nasik), addon-to-addon-Full Mesh MANET makes suitable for its employability in land, air, sea. We can provide insanely stable and reliable high capacity (80 Mbps) Mesh MANET for SWARM, Mechanised Forces, Ship Fleets, Infantry Digital Soldier. We in true sense provide an ideal flexible solution for Digital Battlefield and even USVs. All these concepts have been verified by many militaries using this system.

Since its inception, the company is committed to the manufacturing of radio communication equipment. How is it complementary/ contributory to tactical communication in today's defence and security scenario?

SA In today's time, most defence applications are moving towards light weight more capacity radios and that where we add value to our defence needs, we are moving towards light weight higher capacity technology.

This aspect has been adequately answered in previous questions. So, let me elucidate this by a self-explanatory diagram:



How far your company has been able to contribute towards Make in India, indigenisation and self-reliance? What makes your product offering and solution stand out among competition?

SA Most products in our competition are offered fully built imported items where service support is a big challenge. We are able to manufacture most of our products in India and are in position to provide quickest service to our demanding customers. Besides, most customers have their different needs, there is some kind of customisation requirement for most customers for their applications. At Exicom we have complete flexibility to offer even a single unit customised to customer need.

As stated earlier we have less than 40 per cent Foreign Content. We can further reduce this with collective support from the Indian component manufacturers. What makes our product special is its capability of High BW and the platforms moving at Sub-Sonic Speeds. Worldwide there are only three OEMs providing this niche capability. And above all our mutual trust with the armed forces and security forces of over two decades.

Your company participated in DefExpo 2020. Kindly provide an account of your experience and the major take away from the event. Final comment, if any?

SA The experience was exciting and furthered our resolve to proceed with our initiatives of indigenisation. The interest shown by various high-level delegations of almost all friendly foreign countries, that participated in DefExpo 2020, and our esteemed Indian end-users in our solutions was overwhelming. In a way it validated our approach towards providing state-of-the-art High

WE ARE ABLE TO MANUFACTURE MOST OF OUR PRODUCTS IN INDIA AND ARE IN POSITION TO PROVIDE QUICKEST SERVICE TO OUR DEMANDING CUSTOMERS. BESIDES, MOST CUSTOMERS HAVE THEIR DIFFERENT NEEDS THERE IS SOME KIND OF CUSTOMISATION REQUIREMENT FOR MOST CUSTOMERS FOR THEIR APPLICATIONS. AT EXICOM WE HAVE COMPLETE FLEXIBILITY TO OFFER EVEN A SINGLE UNIT CUSTOMISED TO CUSTOMER NEED

BW Mesh MANET and tactical video systems solutions for K9 solutions, Anti-Terror Operations, UAVs, Robotics, USVs, SWARM etc. We thank Defence Minister Rajnath Singh and Ministry of Defence (MoD) for giving us this opportunity. We thank Defence Minister Rajnath Singh, Minister of State for Road Transport and Highways Gen V K Singh, dignitaries from many foreign countries and top officials of armed forces, homeland security, industry champions for their visit to our stalls. We are carrying the engagement forward.

3D PRINTING: A REVOLUTIONARY TECHNOLOGY FOR THE MAKE IN INDIA ENABLED INDIAN ARMED FORCES

3D printing can revolutionise the Indian defence sector, allowing creating complicated components on an urgent basis with low turnaround time. The application of 3D printing technology in the defence industry can help the defence forces fight obsolescence

"A man will be imprisoned in a room with a door that's unlocked and opens inwards; as long as it does not occur to him to pull rather than push." - Ludwig Wittgenstein"

— Aaron Council, 3D Printing: Rise of the Third Industrial Revolution

By **GP CAPT ASHOK K SINGH (RETD)**

3D printing, also termed as additive manufacturing (AM) or rapid prototyping is a revolutionary technology. Today, there is no field or industry where 3D printing has not impacted. NASA has placed a 3D printer on board its space station in 2014, and an object which was 3D printed in space was to be brought on to the earth in 2015. It was for comparing it to a similar part printed on ground. In the space, the printing was in microgravity conditions, while at ground it is the normal gravity which is all around. This 3D printer will enable fulfilling the needs of a part on demand while in space! Digital inventory put to such an awesome use! Thus a 3D printer, a la a space workshop, got operational way back in 2014. In 2020, one needs to take a cue from this. The application of 3D printing be adapted post haste and the capabilities be enhanced by its unlimited potential. The military, today, needs to bring a 3D printing environment; it will be akin to the IT revolution! Everyone carrying a smart cell phone in their palms; more capable than desktop computers three decades back.

This paper aims at familiarising all, especially military practitioners, with 3D printing. Like a cell phone which has become a life line, 3D printing will be a household gadget in the near future. It will find its place in every facet of military.

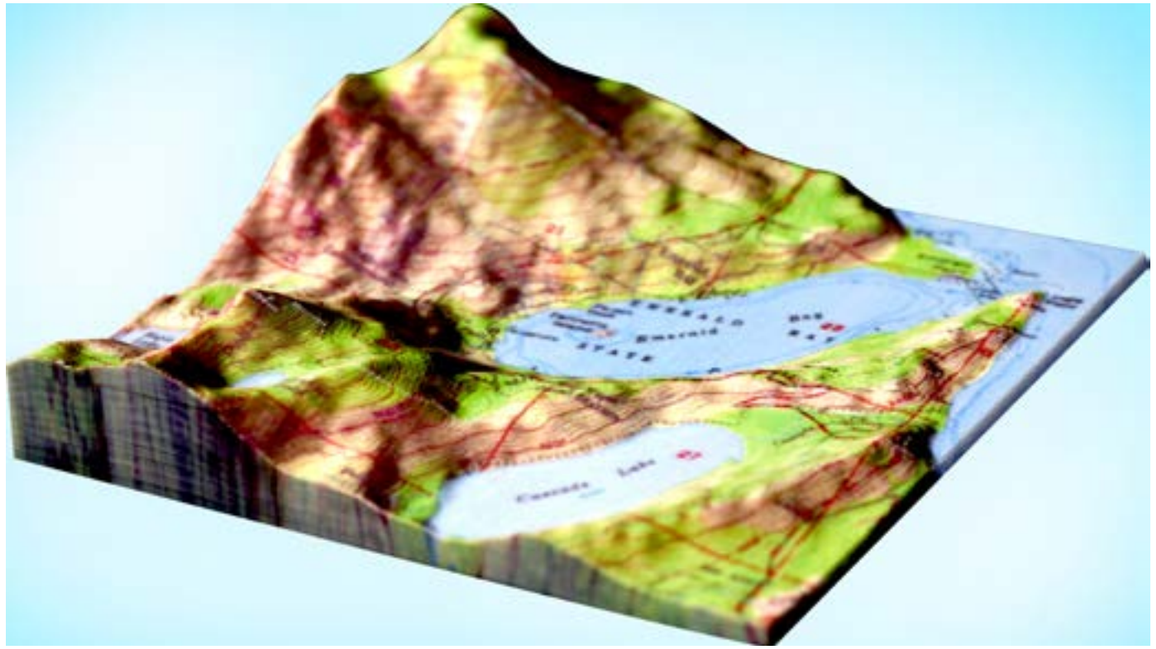
A military practitioner can obtain any desired information from the open source on 3D printing. This article would have done justice if military practitioners are able to think and visualise about 3D printing, and know ways how to apply it to make the military more operational and war ready!

A historical perspective: Everyone seems to have heard about 3D printing already. Yet many do not appreciate the technology and are unable to differentiate a 3D printer from a conventional paper printer. Many still due to the nomenclature in vogue; i.e. 3D printing, consider it similar to a conventional printer from where one gets a hard copy or printed copy of a digital document.

A 3D printer is a computer-aided manufacturing (CAM) device that creates three dimensional objects. Like a traditional printer, a 3D printer receives digital data as input. However, instead of printing the output on paper, a 3D printer builds a three-dimensional model out of a customised material. It is called 'additive manufacturing', as it involves building up of the object by deposition of the material, layer by layer in horizontal cross-sections.

In 1859, a French 'photosculptor' named François Willème demonstrated the world's first "3D scanning" technology by using 24 cameras to simultaneously photograph subjects from different angles. 3D scanners today prove to be very useful in creating 3D digital files, which serve to be the input file for the 3D printer. Thus, any object could be scanned and replicated physically. The size of the replica can be customised depending on the needs! Therefore it does not demand special skills or qualifications and can be used by anyone and everyone.

In 1892, inventor Joseph E. Blanther was awarded a patent for a method of creating 3D topographical maps using a layering method — similar in concept to today's 3D printers. Thus, the topographical



A typical 3D printed map (Courtesy: http://rize3d.com/printers)

depictions used for military tactical planning and training can be 3D printed with the accuracy of a Google Earth depiction. This use, which was invented more than a century ago, has matured today. A company like Rize USA , has the technology to 3D replicate a given topography with all kinds of labelling and marking. Such 3D printed maps to scale will prove of great value for military tacticians and planners in war, and for training and exercises in peace time.

The earliest record of 3D printing through the additive process was the Japanese inventor Hideo Kodama in 1981. He created a product that used ultraviolet lights to harden polymers and create solid objects. This was the stepping stone to stereolithography.

It is going to be almost four decades! Chuck Hull then invented a process called "stereo lithography" (SLA)! Here, UV laser was used to solidify photopolymer where 3D printed parts were created layer by layer.

In 1987, Carl Deckard at University of Texas pioneered an alternative method of 3D printing, which turns loose powder into a solid, instead of Chuck Hall's liquid resin process. The process is termed as Selective Laser Sintering (SLS). It involved using a laser to bind the powder together as a solid. It took until 2006 for the first SLS printer becoming commercially viable, thereby opening up new opportunities in manufacturing.

In1989, S. Scott Crump, along with his wife and fellow inventor Lisa Crump, invented and patented a new additive manufacturing method called Fused Deposition Modelling

3D PRINTING HAS IMPACTED THE AEROSPACE AND DEFENCE INDUSTRY IN A PHENOMENAL MANNER. IT IS PRO-FOUND. THE INDIAN ARMED FORCES, DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION (DRDO), DEFENCE PUBLIC SECTOR UNDERTAKINGS (DPSUS), AND SEVERAL FACTORIES UNDER THE UMBRELLA OF ORDNANCE FACTORY BOARD AND THE INDIAN COAST GUARD REQUIRE TO SERIOUSLY LOOK INTO THIS TECHNOLOGY

(FDM). This technique involves melting a polymer filament and depositing it onto a substrate, layer by layer, to create a 3D object.

The 3D printing has now come off age in metals as well. The same was triggered by Carl Deckhard in 1987 with introduction of SLS technology. By 2018-2019, the desktop metal printing got commercial. Today the metal 3D printing has entered into

Display of serial numbers and QR codes into end use parts to provide detailed digital information

THE MILITARY TALENT POOL HERE HAS A CHANCE TO HARNESS THE 3D PRINTING CAPABILITIES TOWARDS ON DEMAND SUPPLY OF PARTS. THEY COULD EASILY TRANSLATE THE KNOWLEDGE AND EXPERIENCE TO ADVANCE AND IMPROVE THE PLATFORMS AND AT THE SAME TIME IMPROVE THE MAINTENANCE EFFECTIVENESS AND EFFICIENCY

every industry!

3D Printing has impacted the aerospace and defence industry in a phenomenal manner. It is profound. The Indian armed forces, Defence Research and Development Organisation (DRDO), Defence Public Sector Undertakings (DPSUs), and several factories under the umbrella of Ordnance Factory Board and the Indian Coast Guard require to seriously look into this technology. The need is to look at it incisively, for not getting integrated to this technology is going to prove detrimental. It is of immense significance when the mantra chanted all across the nation is "Make In India"! 3D printing is a brilliant technology, but even more a versatile tool for the tech savvy as well as one who has no technological exposure. Therefore, this will be loved by every corps of the army, branches of the Air Force and the Navy. The DPSUs, ordnance factories, and labs of the DRDO in their own interest adapt to this 3D printing technology; earlier the better as all would realise the opportunity lost due to not embracing the technology.

3D printing in aerospace & defence sector globally: 3D printing serves "Just In Time" (JIT) as well as "On Demand" availability of a part; could be of an aircraft, a tank, a gun, a ship or a submarine.

The 3D printing has found its way into the armies across the globe. US Army Armament Research, Development and Engineering Centre (ARDEC) have acquired a Rize Inc. 3D printer recently for spare parts printing on demand. Digitally augmented parts capability adds traceability and an extra layer of confidence in parts. This enables personnel to embed serial numbers and QR codes into end use parts that tie back to detailed digital information about the part.

For the Navy, the technology will lead to an inventory from the physical world to the digital one. A ship might carry 3D printers and input material, and download the design files needed and print items as necessary. A company with one of the largest number of commercial vessels deployed across the seas, Maersk, has placed a 3D printer onboard in almost all of their vessels. This they did long back. These lines will amplify this. "The idea is that we send the blueprint to the crew on board the tanker vessel, they will push 'print' and in a matter of hours get the part," is the statement of Märtha Josefine Rehnberg, a category manager at Maersk Procurement. In December 2018, US' Naval Sea Systems Command (NAVSEA) approved placement of a 3D printer on board on USS Harry S Truman, an aircraft carrier. The aim is to obtain parts as "On demand' basis. The US Navy has been actively using 3D printing for several years in the past. The Indian Navy can look at the endeavours of the University of Maine. They got into Guinness World Record on 10 October 2019 for the production of the 3D printed 25 ft, 5,000 pounds boat. This was achieved in mere 72 hours. 3D printing will serve and surpass the expectations at the Naval dockyards, by enhanced and on demand availability of spare parts. This will prove its efficacy on board naval vessels and aircraft carrier.

The 3D printing has been used for ship and submarine design, interior design and proto-typing and testing.

The Israeli Air Force's aerial maintenance unit (AMU) has extensively used 3D printing to maintain old aircraft and helicopter fleets. They use 3D printing to print drone components. AMU is using 3D printing towards maintenance of 1980 vintage F-15s. This is an ideal case to exemplify the application of 3D printing in obsolescence management.

3D printing can enhance operational readiness. At the same time it has proven to help in saving a great deal of money. At the Yokota Air Base in Japan, Air Force service members have found a way to potentially save millions of dollars, not to mention improving air crew safety, by using 3D printing to modify a standard issue gas mask into an aircraft oxygen system.

The preceding paragraphs are few examples of applications of 3D printing in the military forces; i.e. army, navy and the air force. The use and applications are overwhelming and huge.

The military talent pool here has a chance to harness the 3D printing capabilities towards on demand supply of parts. They could easily translate the knowledge and experience to advance and improve the platforms and at the same time improve the maintenance effectiveness and efficiency. The technology is very well ingrained in the education industry. It thus has a vast potential for training of talent in peace. The military talent working on the 3D printing platforms would gain potentially by getting abreast with the cutting edge revolutionary technology. Thus the ways in which they would be able to use it will be simply fascinating. 3D printing has reached the active battlefield where a part can be produced on the fly and thus enable a mission success. An aircraft for a small component could be rendered unfit to fly; a tank for a leaking pipe line would be standing still, while a ship in the high seas would have to suffer in want of a part. All these can be obviated by 3D printing where inventory is digital.

The base workshops of the Indian Army, the Indian Naval Dockyards, and the base repair depots of the Indian Air Force can leapfrog their indigenisation endeavour by ingenuous use of the 3D printing. Each one of them will find adapting this technology to a great advantage. It would accelerate proto-typing, reverse engineering and design process by faster iterations. Ordnance factories could consider starting a 3D printing Centre of Excellence to service the needs of all the factories. It will prove extremely beneficial in various projects at hand and envisage manufacturing, design and obsolescence management of products, which have been out of production. Hindustan Aeronautics Ltd, Bharat Electronics Ltd and Bharat Earth Movers Ltd will find it of great use in their day to day operations, and even more significant for firefighting activities, where meeting deadlines is at a premium.

3D Experience World (formerly Solid Works World) in Nashville TN, February 10-12, 2020, Courtesy: RIZE3D, RIZE Inc

Overseas, and as much in India, 3D printing labs have come up even in schools! The military fraternity across the echelons in India, will benefit tremendously from 3D printing. The need of the hour to get 3D printing enabled military ecosystem is an imperative!

According to Tech. Sgt. Eric Lundeen of the USAF, the airmen 3D printed a dozen parts before coming up with a working prototype, said, "3D printing is something new. There are only a dozen bases out there with 3D printers." The airmen are planning to send the design to Air Force's technology experts and hope that it will send 3D printers to bases all over the world. "This is going to affect every pilot in the Air Force," Lundeen said. "It gives them a lot more flexibility and mobility, increases safety and saves a ton of money." Worth noting here is the airman envisioning the need of having a 3D printer in all the USAF bases across the globe! This is going to be the case in the very near future. Indian Air Force will in the near future replicate the idea of having 3D printing at all its bases in India and abroad.

3D printing has proven extremely valuable for the military medical practitioners. Take the case of a wounded soldier in war or peace, who loses a limb. In order to get the prosthetic, it becomes a challenge to reconstruct the limb. 3D scanned archive of the personnel, which if maintained along with the medical documents of the individual, will come handy. Prosthetics can thus be easily reconstructed. Reconstruction of skin especially for disfigured faces is being achieved through 3D printing. US Army has come up with 3D printed food. They are working at provisioning of nutritional 3D printed food for a warfighter right in the war zone. 3D printing of food will be printed with the balanced mix of nutritional constituents to serve soldiers' needs.

3D printing taskforce: The technology is easy to assimilate and apply. Thus a pool of trained manpower will be needed. The way forward could be to get a set of personnel trained, who would identify areas suitable for the technology; and get started. Once started, the next step should be to sustain it followed by its growth and expansion.

Training institutions of the armed forces, defence public sector undertakings and the Ordnance Factory Board will be ideally suited for the introduction of 3D printing by setting up a lab. The training institutions like National Defence Academy, Indian Military Academy, Indian Naval Academy, Air Force Academy and Officers Training Academy will do a great service to the services by incorporating 3D printing in their curriculum. Establishments like College of Combat, Infantry School, Military College of Telecommunication Engineering, College of Military Engineering, Defence Institute of Armament Technology, Military Institute of Technology and the likes can start with acquiring and exploiting the technology. College of Defence Management and College of Air Warfare, if initiate a study of the technology and take up study projects on applications of 3D printing for military purposes; will do a yeoman service for the forces and the nation as well.

RIZE Inc: Andy Kalambi, an American Indian, has made an impact globally, standing as a vanguard of the digital revolution. He is the CEO and President of Rize Inc. Andy Kalambi was nominated as the top innovator of 3D printing in 2018 by IDC (International Data Corporation). Rize Inc. 3D printers have already found its way into the US Army and Navy. Rize Inc. 3D printers are niche and Industry 4.0 enabled, where one gets full colour spectrum for the products, which can be labelled as well as barcoded. Andy Kalambi has taken an initiative to bring the state-of-the-art 3D printing technology to India.

Andy Kalambi, President & CEO of RIZE3D, RIZE Inc. at 3D Experience World (formerly Solid Works World) in Nashville TN, February 10-12, 2020

(Top) Rize Inc. team at the Massachusetts, US with their Indian counterpart; (Below) ANH advert displaying the product range (http://www.anhespl.com/)

Challenges: The 3D printing technology integration has its inherent challenges; the biggest is to be aware of it. Trained manpower availability is another challenge. Design and development of a prototype or a reverse engineered 3D printed part will need different certifications. The stringent aerospace quality certifications will call for material certifications, design validation as well as the printed part to undergo functional tests for operational use validation. The process is daunting especially for aerospace applications. A hurdle will be when one looks at the cost factor and compare with the conventional processes. This will be a vital consideration for commercial organisations, but for military, the operational needs take precedence over the rest. The designers, military personnel, along with certification agencies, i.e. DGQA, DGAQA, CEMILAC need to jointly make an endeavour towards making the forces march towards Make In India, leading to self-reliance by harnessing the vast potential of the 3D printing technology. Indian armed forces will stand to gain with bringing on board 3D printing technology, which can be used by any one irrespective of his/her qualifications or experience. It will serve as a boon to the indigenisation group across the three services and R&D fraternity.

Conclusion: The applications of 3D printing for the military will be limited only to the limits of the imagination of the one using it! It has the potential to impact every nook and corner of the fighting forces, be it operations, maintenance, research & development, indigenisation, education, training, obsolescence management, food, clothing, transportation, packaging, medical & dental health care, or any which could be thought out.

It is the right time, where the services initiate a beginning of forming a digital inventory to be judiciously carved out of the physical inventory in vogue, in existence since time immemorial. Let 3D printing enable and enhance the operational readiness and effectiveness of the Indian fighting forces. Last but not certainly the least, all the above on 3D printing is as apt and applicable to the police forces, central armed police forces, intelligence agencies and special forces pan India. The 3D printing is a force behind the forces!.

The author is a veteran of the IAF and well versed with procurement, cutting edge technologies for aerospace & defence applications. He can be contacted at akneel_an@yahoo.co.uk

WHY MOSCOW IS UNFAZED BY NEW DELHI'S GROWING ARMS TRADE WITH WASHINGTON?

Over US$3 billion defence deals including procurement of 24 MH-60 Romeo helicopters for Indian Navy and contract to acquire six AH-64E Apache helicopters were signed during US President Donald Trump's two-day visit to India from February 24-25

By **VINAY SHUKLA**

On his speech on February 24 at the packed Motera Stadium in Ahmedabad on his arrival on a two-day India visit, the US President Donald Trump vowed to continue defence cooperation with India and boasted that his country looks forward to providing New Delhi with some of the "best and most feared" military equipment on the planet. "We make the greatest weapons ever made: planes, missiles, rockets, ships. We make the best. And we're dealing now with India. But this includes advanced air defence systems and armed and unarmed aerial vehicles," Trump declared.


Prime Minister Narendra Modi welcomes US President Donald Trump at Motera Stadium in Ahmedabad

Over US$3 billion defence deals including procurement of 24 MH-60 Romeo helicopters for the Indian Navy at a cost of US$2.6 billion and the contract to acquire six AH-64E Apache helicopters for US$800 million were signed during his visit.

Interestingly, during the Trump visit, the issue of threat of US sanctions against India under the Countering America's Adversaries Through Sanctions Act (CAATSA) for USD 5.43 billion deal for the purchase of S-400 air defence missile system from Russia was not, at least publicly, discussed.

Naturally Russia, currently India's biggest arms supplier, was keenly watching but seemed unfazed by theatrics of the Trump visit. One of the reasons was that Prime Minister Narendra Modi has cleared the haze about relations with Moscow which had downed during decade long rule of UPA government in New Delhi, that only saw Russia as an arms seller, although diplomats and experts dealing with the successor of ex-USSR cautioned against myopic vision of the world's largest and mineral rich nation and warned not to take it for granted.

However, this trend continued in the initial period of PM Modi's first inning. In December 2014 a group of Russian defence experts visiting New Delhi was told at a prominent, government funded think-tank, that India will soon get a nuclear submarine and other lethal platforms from the US, and Moscow needs to behave itself.

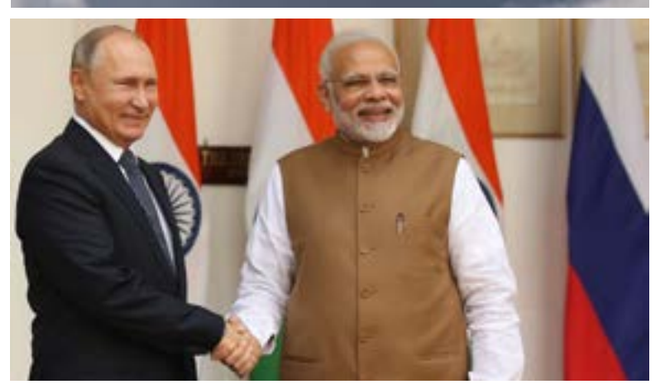
This was the time, when Indo-Pacific concept was gaining currency and the closest military ties with the US to contain assertive China were deemed necessary and an idea of the Quad was floated.

However, international defence cooperation is based on national interests and threat perception in concrete geopolitical scenario, which can rapidly change at any juncture due to unforeseen developments. Election of Donald Trump as the 45th President of the United States of America has destabilised the post-Cold War world order by launching of trade war with China and virtually harassing old NATO allies in Europe, asking them to foot the bill for their security as the powerful military-industrial complex was starving for fresh orders.


Sikorsky's MH-60 Romeo Helicopters


Apache AH-64E


Indian Air Force Su-30MKI


PM Narendra Modi and Russian President Vladimir Putin

Staunch American allies in former USSR – Georgia and Ukraine with NATO membership aspirations were left to themselves in the event of conflict with powerful adversary Russia, with which Washington did not want to pick a fight except imposing sanctions.

India is too big to be dependent on any foreign nation, be it the most powerful United States, this realisation is manifested in Prime Minister Narendra Modi's exercise of active strategic autonomy by balancing relations with China and Russia (Wuhan and Sochi informal summits).

Ever since the Soviet collapse in 1991, post-Communist Russia continues to build its defence relations with New Delhi on the deep understanding of geopolitical scenario in South Asia and India's threat perception.

"India's interest in Russian arms is growing. One of the reasons

INDIA IS TOO BIG TO BE DEPENDENT ON ANY FOREIGN NATION, BE IT THE MOST POWERFUL UNITED STATES, THIS REALISATION IS MANIFESTED IN PM MODI'S EXERCISE OF ACTIVE STRATEGIC AUTONOMY BY BALANCING RELATIONS WITH CHINA AND RUSSIA (WUHAN AND SOCHI INFORMAL SUMMITS)

MUSINGS FROM RUSSIA


T-90 MBT Bhisma


MiG-29 aircraft


AK-203 Rifle

for this is the difficult situation prevailing in the region in recent years. Traditionally, China is the main economic and political competitor of India in Asia," wrote Russian news portal New Eastern Outlook and observed that in recent years China began to actively fight for dominance in Asia-Pacific and Indo-Pacific region building up their economic influence and trying to squeeze out the United States.

The New Eastern Outlook noted that India also faced an increasing Chinese influence in those countries that she has long regarded as part of her sphere of influences: in Nepal and Sri Lanka.

"Moreover, China is actively developing cooperation with the main adversary of India – Pakistan. All this greatly worries India and makes it actively strengthen its defence capability and cooperate with other states competing with China," the publication explains logic behind New Delhi's close defence cooperation with the US.

However, Moscow is unfazed by this. Russia's arms export control agency – Federal Service for Military-Technical Cooperation (FSMTC) reminded that since USSR disintegration in 1991, Moscow has supplied military hardware and weapon platforms to India to the tune of US$70 billion.

In reality Russia by far remains India's dominant arms supplier going into the 2020s, accounting for 62 per cent of Indian arms imports in the previous five years, according to the Stockholm-based think-tank SIPRI.

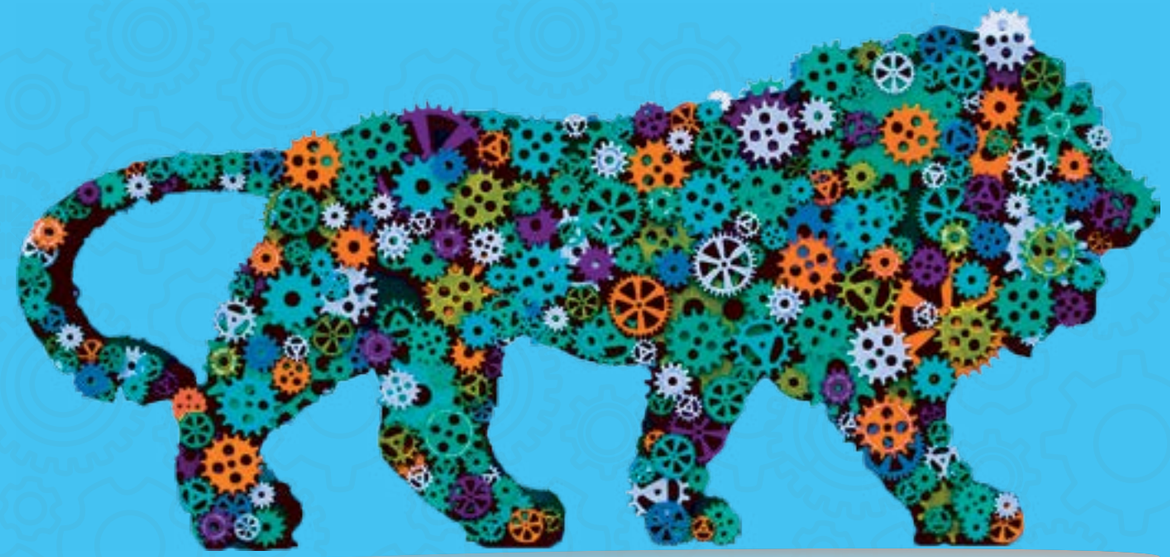
In the first nine months of 2019 alone India spent a record USD14.5 billion on Russian weapons with many of the deliveries and financial outlays continuing into 2020. Furthermore at the Vladivostok summit in September 2019, India also signed an Inter-Governmental Agreement (IGA) with Russia allowing it to license manufacture spare parts and components for Russian systems in service with the Indian Armed Forces.

Meanwhile, more joint ventures along the line of BrahMos Aerospace for the production of defence hardware including AK-203 assault rifles, Kamov Ka-226T multi-role utility helicopters are in various stages of implementation.

Besides the agreement for the acquisition of four Admiral Grigarovich class stealth frigates, two of which will be built in India under transfer of technology (ToT), license production of additional 464 modernised T-90MS main battle tanks in Avadi, lease of another Akula class nuclear attack submarine for the Navy and acquisition of additional Sukhoi Su-30MKI and MiG-29 fighters as a stopgap measure to check IAF's depleting strength will be carried out.

So paraphrasing Mark Twain, we can say the reports of the Indo-Russian arms trade's death have been greatly exaggerated.

- The author is a Moscow-based independent analyst. Views are personal.



RE-IMAGINING MAKE IN INDIA

TRANSFORMATION, INNOVATION AND OPTIMISATION

The green shoots of the initiative Make in India in defence are now somewhat visible. The transformation that started six years back has now reached the stage where innovations (in abundance) are the key driver and it's optimisation in truest sense will ensure that wide spectrum of indigenous defence platforms are possible in near future. The DefExpo 2020 emphatically showcased this reality. Hopefully, the future roadmap will be an excellent blend of innovation, transformation and optimisation with Indian frugality, albeit a refined one.

***Raksha Anirveda* explores to visualise the reimagined Make in India....**

BRAHMOS: FIRST SUPERSONIC CRUISE MISSILE KNOWN TO BE IN SERVICE

The world class missile BrahMos carries stealth technology and guidance system with advanced embedded software. Developed for all the three versions of land, sea and air, the missile's hypersonic version BrahMos-II is under development

- BrahMos: A Joint Venture between DRDO, India and Joint Stock Company "Military Industrial Consortium" "NPO Mashinostroyenia", Russia - earlier known as Federal State Unitary Enterprise NPOM.
- BrahMos - the name represents the fury of Brahmaputra river in India and the grace of Moskva river in Moscow.
- Indo-Russian JV is responsible for designing, developing, producing and marketing the BRAHMOS supersonic cruise missile.
- Foundation stone of BrahMos complex was laid by Dr A Sivathanu Pillai, CEO and MD of BrahMos Aerospace On September 23, 2002. Russian President Vladimir V Putin inaugurated the complex on December 4, 2004.
- BRAHMOS: A two-stage missile with a solid propellant booster engine as its first stage which brings it to supersonic speed.The liquid ramjet which is the second stage takes the missile closer to 3 Mach speed in cruise phase.
- The world class missile carries stealth technology and guidance system with advanced embedded software. The missile has flight range of up to 290-km with supersonic speed all through the flight leading to shorter flight time.
- BRAHMOS operates on 'Fire and Forget Principle' adopting varieties of flight trajectories on its way to the target. It ensures lower dispersion of targets, quicker engagement time and non-interception by any known weapon system in the world.
- Missile's destructive power is enhanced due to large kinetic energy on impact. BRAHMOS' cruising altitude goes up to 15 km and terminal altitude as low as 10 meters. It carries a conventional warhead weighing 200-300 kg.
- Compared to existing state-of-the-art subsonic cruise missiles, BRAHMOS has: 3 times more velocity, 2.5 to 3 times more flight range, 3 to 4 times more seeker range, and 9 times more kinetic energy.
- The missile has identical configuration for land, sea and sub-sea platforms and uses a Transport cum Launch Canister (TLC) for transportation, storage and launch.
- Three versions of supersonic missiles in service are: Ship based Weapon Complex (Inclined & Vertical Configuration), Land based Weapon Complex (Vertical Launch Configuration from Mobile Autonomous Launcher), Air launch version (successfully test-fired in 2017, creating history).
- The cannisterised missile is capable of being launched vertically from underwater and had been successfully flight tested from a submerged platform.
- Required modifications in Su-30 MKI for interface with the missile launcher and integration with the weapon control of the aircraft being carried out together with Indian Air Force and Sukhoi Design Bureau.
- BrahMos - a role model by integrating public-private industries from India and Russia as a consortium of "Missile Industry Complex." It penetrated international market with the most potent weapon system for precision strike and a Force Multiplier in Network Centric Warfare.
- BrahMos is a commendable paradigm of seamless integration and rapid development of high technology defence products in world market. Success of BrahMos emerged due to shared vision of leaders of both the countries to create common culture and strategic relationship.
- BrahMos is a high-tech, knowledge intensive organization and have large number of technical staff. Strong product support system backed by experienced and proactive team forms the backbone of the organisation for the BRAHMOS Weapon System.
- BrahMos Aerospace Design Centre is situated in New Delhi and the production unit of BrahMos Aerospace is located at Hyderabad (BrahMos Integration Complex - BIC) where the integration of the missile takes place.
- BrahMos Aerospace Thiruvananthapuram Limited (BATL) formed in December 2007 has production structure for aerospace components and systems. BATL meets the needs of ISRO, DRDO, BARC and other aerospace industries.

Established in India through an **IGA** signed on February 12, 1998. Established with an authorised capital of **$250 million** with **50.5%** from Indian side and **49.5%** from Russian side

BRAHMOS is the First supersonic cruise missile **known** to be in service. Induction of the **first version** of **BrahMos** Weapon Complex in **Indian Navy** commenced from 2005 with **INS Rajput** as the first ship. **INDUCTION** in Indian Army started from **2007** onwards.

BrahMos missile created history on November 22, 2017 after it was **successfully** flight-tested for first time from **Indian Air Force's** frontline fighter aircraft **Sukhoi-30MKI** against a sea based target in the **Bay of Bengal**

Special Features of BrahMos Cruise Missile

- Universal Missile for multiple platforms
- "Fire and Forget" principle of operation
- High supersonic speed all through the flight
- Long flight with varieties of trajectories
- Low radar signature
- Pin point accuracy & high lethal power
- Advanced guidance system incorporating high manoeuvres & steep dive capabilities
- Air-breathing ramjet propulsion for fuel-efficiency & supersonic speed
- Better stability & accurate direction of missile during the flight
- Solid-propellant rocket for initial acceleration of the missile

MEGA EXPO: IMMENSE OPPORTUNITIES AT DISPLAY

DefExpo provided tremendous opportunities to DPSUs, foreign defence and security companies, Indian private companies, academia and the delegations came from abroad to assemble together on a common platform for their mutually beneficial discussions and deals

By **SRI KRISHNA** AND **PK GHOSH**

Lucknow/ New Delhi. The five-day 11th biennial edition of defence exposition DefExpo20 concluded in Lucknow on February 9 is claimed to be the biggest ever event of such stature by its organisers, the Ministry of Defence to be precise. Defence Minister Rajnath Singh, at a concluding function of the expo which began on February 5, went on to say that it broke all records of international cooperation and would prove to be a breakthrough in the field of Indian defence manufacturing sector. The event cemented India's position as a major player in the international defence market.

The DefExpo which saw the presence of Prime Minister Narendra Modi, Defence Minister Rajnath Singh, top ministers and government officials from 40 countries showed the importance of the event and provided a boost to the defence corridor in Uttar Pradesh.

DefExpo20 was inaugurated by Prime Minister Narendra Modi, who stated that the DefExpo reflects not only the industry related to defence but also the world's confidence towards India as a whole. Those who know about defence and economy surely know that India is not just a market; India is also an immense opportunity for the whole world. The theme of DefExpo20 was "India: The Emerging Defence Manufacturing Hub".

Prime Minister Modi said the government expects to do arms and ammunition export business of Rs 35,000 crore in the next five years. India's purchases of defence equipment and services amounted to nearly 10 per cent of all global arms imports between 2014 and 2018. The government is giving priority to national security and is planning to modernise its military with a budget of $130 billion over the next five years.

"There are unlimited possibilities in defence manufacturing in India," Modi said. There is talent and there is also technology, there is innovation and there is also infrastructure, there is favourable policy and there is also protection of foreign investment. Here is Demand, Democracy and also Decisiveness."

"Wherever the 21st century is discussed, attention will be naturally drawn towards India. Today's Defence Expo is the vastness of India, its prevalence, its diversity," the Prime Minister said.

The Defence Minister observed it was not just the success for Uttar Pradesh but also a realisation of fulfillment of all countrymen's aspirations towards defence. "I am feeling immensely proud of the successful organising of the biggest DefExpo. This expo is a breakthrough in the field of Indian defence manufacturing, which has broken all records of peoples' participation, public-private partnership and international cooperation," he said.

"This expo has shown that the new India is ready to march ahead, matching steps with the superpowers in this field. This is a clarion call that the future will be that of India. In the times to come, our country will emerge as a major centre of global defence manufacturing," the Defence Minister said.

One of the highlighting features of this year's DefExpo20 was that it provided a significant platform to improve India's defence cooperation with other countries, and the Defence Minister had an opportunity to have bilateral talks with the defence ministers of other countries in the field of security and defence along with the other issues of mutual interest.

DefExpo20 witnessed the signing of over 200 Memorandums of Understanding (MoUs) and agreements. These agreements have made a sort of new history and included Transfers of Technology (ToTs) and product launches making it the most successful event to be held in India.

The pacts are aimed at forging and renewing partnerships for innovative collaboration, and transformation of the defence manufacturing in the country. The Defence Minister said the signing of MoUs was a step in the right direction to achieve Prime Minister's $5 billion defence exports target in next five years.

"DefExpo reflects not only the industry related to defence but also the world's confidence towards India as a whole. Those who know about defence and economy surely know that India is not just a market; India is also an immense opportunity for the whole world"

Narendra Modi
Prime Minister

Over 3,000 delegates from all over the world participated in the event. Not only this, the expo concluded successfully and the representatives of other countries were all praising. With the successful organising of the mega expo, the country has managed to get a very solid base for the defence corridor, which is coming up in the state.

"Participation of over 3,000 delegates from all over the world is a big thing. Their presence made this event even more attractive. Our country will not only be self-reliant in the field of defence but will also become an exporter. This DefExpo will have a major contribution in achieving this feat," the Minister said. Singh said his government has proved that "UP stands for 'Unlimited Potential'".

The exhibition provided a global platform for the major players in the defence sector to display their products and services. The US-India Business Council brought delegates from US' biggest arms corporations to the exhibition, including General Atomics, Northrop Grumman, Raytheon and Textron.

Aerospace giant Lockheed Martin displayed its new multirole F-21 fighter jets, which it claims were tailored specifically to meet New Delhi's "unique requirements."

Two BAE Systems M777 Ultra Lightweight Howitzer (ULH) gun systems took centre stage at the event. The two M777 ULH systems signify the 145-gun agreement between the US and Indian governments to strengthen India's artillery capabilities. Under the agreement, 120 ULH systems are being assembled, integrated and tested in India by Mahindra Defence Systems Ltd (MDSL), as part of the Make in India programme.

"Dassault Aviation is totally focused on supporting India in meeting the strategic and economic challenges of its inspiring vision for the future," said Eric Trappier, Chairman and Chief Executive Officer of Dassault Aviation. "My decision to have Dassault Aviation to participate in Defexpo for the first time is the expression of our full dedication to contribute to India's outreach and our absolute conviction of the major role of India in the concert of nations, today and tomorrow."

In a big boost to Indian defence sector, DefExpo20 witnessed the inking of 14 MoUs between Indian and Russian companies for setting up joint ventures covering a range of equipment from modern T-90 tanks to legacy Pechora air defence systems.

The fifth round of India-Russia Military Industrial Conference (IRMIC) was conducted on the sidelines of Defexpo20 in Lucknow on February 6 co-chaired by Indian Defence Secretary Dr Ajay Kumar, and Deputy Minister of Industry and Trade of Russian Federation Oleg Ryazantsev where the MoUs were exchanged between the Russian Original Equipment Manufacturers (OEMs) and the Indian companies.

The two sides discussed the Inter-Governmental Agreement (IGA) on the joint manufacturing of spares in India which was signed at Vladivostok, Russia on September 4 last year.

This year's DefExpo was significant from the point of view of Russian Helicopters' signing of a roadmap with the Russian-Indian joint venture company Indo-Russian Helicopters Limited (IRHL) for localisation of Ka-226T helicopter production in India. Any movement in the project was long due. Rosoboronexport, a part of Russian State Corporation Rostec, also organised a display of above 1,000 Russian military hardwares.

"This expo has shown that the new India is ready to march ahead, matching steps with the superpowers in this field. This is a clarion call that the future will be that of India. In the times to come, our country will emerge as a major centre of global defence manufacturing"

Rajnath Singh
Defence Minister

A high level Japanese defence delegation led by Director-General of Logistics attended the expo to put back on track the US-2i amphibious aircraft. Since a couple of years the purchase of 12 ShinMaywa US-2i Amphibious and Rescue (SAR) aircraft for $1.65 billion had been put on back burner for several reasons including the lack of funds of the customer – the Indian Navy.

For the first time, India-Africa Defence Ministers' Conclave was held during the DefExpo. Defence Ministers from more than 14 African countries attended the conclave. Bilateral level talks were also held on the sidelines of the Conclave.

That apart, Defence Ministers from nearly 40 odd countries including Czech Republic, Mexico, South Korea and United Arab Emirates (UAE), etc. with their small or big delegations participated in one of the biggest defence expositions of the world.

DefExpo20 saw the registration of about 1,000 companies including 165 offshore enterprises taking part in the expo, which was an increase of about 300 companies over the last edition held in Chennai. Similarly, over 53,000 square metre exhibition spaces compared to around 26,774 square metres were booked by the exhibitors, which are a jump of 96 per cent since DefExpo18, the 10th edition of the event.

Technical and business seminars were organised by various industry chambers including Confederation of Indian Industry, PHD Chamber of Commerce and Industry, The Associated Chambers of Commerce of India. A few seminars were of futuristic topics which included discussions on artificial intelligence, robotics, Internet of Things (IoT), drones and wired warrior, etc.

In the run up to the DefEXpo20, a series of webinars were held which began on December 10. The webinars were of academic interest and relevance to the defence, aerospace and security industry, academia and student fraternity and were widely subscribed.

Arrangements too were made for over 5,000 college students from various technical colleges of the state for visiting the expo during business days to inculcate interest among them. The last two days of February 8 and 9 were kept as public days, the entry for which was free.

The social media platforms of Twitter and Instagram were very active besides a specific mobile app (DefExpo 2020) which was launched by Defence Minister Rajnath Singh just before this year's defence exposition.

Defence Secretary Dr Ajay Kumar complimenting on the successful conduct of the exhibition said, this DefExpo would be remembered for many firsts – including for the signing of largest number of MoUs, ToTs and product launches. Bandhan ceremony witnessed more than 13 product launches, 124 MoUs between DPSUs, private and global defence manufacturing companies.

Twenty three MoUs were signed between the UP Government and private companies. Chief Minister Yogi Adityanath said these MoUs envisage Rs 50,000 crore investments in the defence corridor which would generate three lakh job opportunities. He said investments coming to the state were secure and that the state investment policy was most attractive in the country.

He said this DefExpo would be remembered for many firsts—including for the signing of largest number of MoUs, transfer of technology and product launches.

Dr G Sateesh Reddy, Secretary, Department of R&D and Chairman of Defence Research and Development Organisation, said it was DRDO's duty to ensure that the defence corridor in Uttar Pradesh flourishes, hence DRDO signed a technological partnership agreement with the state government, imparting skill training, hand holding and providing guidance in all aspects related to technology.

DEFEXPO20 WITNESSED THE SIGNING OF OVER 200 MEMORANDUMS OF UNDERSTANDING (MOUS) AND AGREEMENTS. THESE AGREEMENTS HAVE MADE A SORT OF NEW HISTORY AND INCLUDED TRANSFERS OF TECHNOLOGY (TOTS) AND PRODUCT LAUNCHES MAKING IT THE MOST SUCCESSFUL EVENT TO BE HELD IN INDIA.

In another first, state-owned aerospace and defence company Hindustan Aeronautics Limited (HAL), Israel Aerospace Industries (IAI) and Dynamatic Technologies Limited (DTL) inked a MoU for marketing, manufacturing and selling of IAI's Unmanned Ariel Vehicles (UAVs) to Indian potential customers including Indian Defence Forces, Paramilitary Forces and Central Armed Police Forces. The tripartite agreement was signed on February 5.

HAL also signed a Non Disclosure Agreement (NDA) with New Space Research & Technologies Pvt Ltd to explore cooperation for joint development and manufacturing of various products and systems in the area of unmanned systems, swarm technology and space systems.

Not lagging behind, Miniratna Category 1 company Garden Reach Shipbuilders and Engineers Ltd (GRSE) inked a MoU with M/S Berd, Portugal to explore and identify synergies and partnerships to approach the bridge market in India and neighbouring countries.

A tripartite agreement was signed between GRSE, M/s Elbit and BEL for indigenisation of Unmanned Surface Vessel. To explore manufacture of propulsion water jets in India with high level of indigenous

DEFEXPO20 WOULD BE REMEMBERED FOR MANY FIRSTS – INCLUDING FOR THE SIGNING OF LARGEST NUMBER OF MEMORANDUMS OF UNDERSTANDING, TRANSFER OF TECHNOLOGIES AND PRODUCT LAUNCHES, AND BANDHAN CEREMONY ALONE WITNESSED MORE THAN 13 PRODUCT LAUNCHES, 124 MOUS BETWEEN DPSUS, PRIVATE AND GLOBAL DEFENCE MANUFACTURING COMPANIES

content, a MoU was signed between GRSE and M/S Konsberg, Sweden.

OFB launched "Sharang" the 155mm artillery gun with 36 km range and handed over a model to Chief of Army Staff General MM Naravane. OFB also launched JVPC Alpha gun with 100 mt range, Light Machine Gun of 800 mt range and UBGL – Under barrel Grenade launcher.

Navratna Defence PSU Bharat Electronics Ltd (BEL) entered into an agreement with CSIR-NAL for co-operation in the field of avionics and establishing infrastructure for composite manufacturing. BDL launched Amogha-3 the anti-Tank guided missile. It is a man portable fire and forget missile. It also launched Varunastra – the anti-submarine torpedo, manufactured under the technological guidance of DRDO.

Kalyani Group signed five MoUs during the 11th biennial edition of the defence exposition to promote Make in India. Bharat Forge Ltd, Kalyani Group's flagship company signed a MoU with US defence company General Atomics, a global leader in the research, design, and manufacturing of a diverse portfolio of electromagnetic and advanced power and energy technologies.

BFL also tied up with DASTAN Corp, Kyrgyzstan to come together for joint upgrade of CET-65E Torpedoes and participate in jointly identified and mutually agreeable opportunities and programmes related to the underwater weapon systems/product in India and other territories.

Bharat Forge and Thales joined hands to develop the F90 rifles. Kalyani Strategic Systems Ltd (KSSL), defence arm of Kalyani Group and Arsenal Joint Stock Company, Bulgaria signed a MoU to form a strategic alliance in India for manufacturing small arms and ammunition.

In yet another major development, Bangalore-based global technology solution providing company Si2 Microsystems Pvt Ltd entered into an agreement with Defence Public Sector Undertaking (DPSU) Bharat Earth Movers Limited (BEML) for the upgrade of Indian Army's T-90 Bhishma Tank.

The MoU was signed between Sanjay Soni, Director of Si2 Microsystems and Colonel George Jacob (Retd), General Manager of BEML in presence of Defence Minister Rajnath Singh, Minister of State for Defence Shripad Yesso Naik and Uttar Pradesh Chief Minister Yogi Adityanath.

Rolls-Royce, one of the world's leading industrial technology companies, displayed its defence, power and propulsion solutions with 87 years of legacy the company is carrying in Indian defence.

In-a-first-of-its-kind, Mumbai-based textiles major Kusumgar Corporates has joined hands with India's Defence Research and Development Organisation (DRDO) and acquired Transfer of Technology (ToT) for manufacturing of Combat Free Fall (CFF) Parachute System in India.

The Ambassadors' Round Table conference on DefExpo 2020 chaired by the Defence Minister in New Delhi saw Heads of Missions and Defence Attaches of over 80 countries attending the conference.

Leading DPSUs BEL, BEML and HAL took all out efforts to organise road shows in the run-up to the DefExpo India-2020. The road shows were organised to urge vendors from the private sector, MSMEs and start-ups to actively participate in the defence exhibition and take advantage of the potential business opportunities.

Prior to the beginning of DefExpo20, the Defence Minister, UP CM and other high officials reviewed the preparations. The Defence Minister also called for global companies' participation while holding a meeting with representatives of foreign missions in the capital to elicit suggestions and to get companies from their countries to showcase their products.

With Uttar Pradesh having one of the two defence corridors and the other in Tamil Nadu, the state government signed 23 MOUs and the Chief Minister Yogi Adityanath said these MoUs envisage Rs 50,000 crore investment in the Defence Corridor which would generate three lakh job opportunities. He said investments coming to the state were secure and that the state investment policy was most attractive in the country.

He said this DefExpo would be remembered for many firsts—including for the signing of largest number of MoUs, transfer of technology and product launches.

To conclude, it can be said that the DefExpo20 was not the mega opportunity to showcase facilitating resources for Uttar Pradesh defence corridor only, but for Tamil Nadu as well. It gave tremendous opportunities to DPSUs, foreign defence and security companies, Indian private companies, academia and the delegations came from abroad to assemble together on a common platform for their mutually beneficial discussions and deals. It also paved the way for government's mission of Make in India, indigenisation and ultimately self-reliance.

KALYANI GROUP SIGNS 5 MEMORANDUMS OF UNDERSTANDING TO ENDORSE GOVERNMENT'S MAKE IN INDIA PROGRAMME

Pune. Kalyani Group announced its progressive growth plans by partnering with global defence technology and manufacturing companies to create indigenous products and promote the government's Make in India initiative. Below are the five important agreements it signed with the global defence majors during the 11th edition of biennial defence exposition DefExpo20:

- Bharat Forge Ltd (BFL), Kalyani Group's flagship company, signed a Memorandum of Understanding (MoU) with US' General Atomics, which is a global leader in research, design and manufacturing of a diverse portfolio of electromagnetic and advanced power and energy technologies. Under the terms of MoU, BFL and General Atomics' Electromagnetic Systems (GA-EMS) will investigate opportunities to develop and integrate power generation, storage, control and distribution technologies related to surface and undersea naval platforms, and advanced projectiles for weapon system platforms to address Indian defence requirements.

- Bharat Forge signed another MoU with DASTAN Corp, Kyrgyzstan, engaged in development of Torpedoes with advanced homing heads, for ship-borne and submarine platforms used by Indian Navy. Both firms are coming together for joint upgrade of CET-65E Torpedoes and to participate in jointly identified and mutually agreeable opportunities and programmes related to the underwater weapon systems/product in India and other territories.

- Bharat Forge and Paramount Group, a global aerospace and technology company, announced the signing of a strategic and high level collaboration agreement to set up a joint venture to combine the technologies, capabilities and expertise of both the groups in the industrialisation and indigenisation of defence and aerospace systems.

- Bharat Forge and Thales joined hands to develop F90 rifles which will serve the defence and law enforcement sectors in India and abroad. This cooperation is a testament to Make in India initiative of the Government and paves the way to a potential licensing agreement.

- Kalyani Strategic Systems Ltd (KSSL), another defence arm of Kalyani Group, and Arsenal Joint Stock Company, Bulgaria signed MoU to form a strategic alliance in India for manufacturing small arms and ammunition. KSSL and Arsenal will be aggressively developing a manufacturing capability in India for the "AR" 7.62 x 39mm assault rifle and "MG" 7.62 x 51mm machine gun series.

KALYANI GROUP OF COMPANIES CONTRIBUTE RS 25 CRORES TO TACKLE COVID-19 PANDEMIC

Pune. Bharat Forge, the flagship company of Kalyani Group and other Group companies have pledged assistance via direct contribution of Rs 25 crores to the Prime Minister's Citizen Assistance and Relief in Emergency Situations (PM CARES) Fund to fight against the COVID-19 pandemic.

The other group companies involved are Kalyani Steel, Saarloha Advanced Material Pvt Ltd, Automotive Axles and Hikal Ltd.

Baba Kalyani, Chairman, Bharat Forge Limited, said: "The group is committed to assist the central and state government and the local authorities in all possible ways to deal with the pandemic. We are also using our group R&D facilities to look at ways of easing the shortage of critical medical equipment's including ventilators, respiratory equipment and other sanitation/ hygiene equipment.

As part of our CSR activity we have started addressing the food requirements of the local community and will increase the efforts in the coming days".

PARTICIPATING IN DEFEXPO20 EXTREMELY BENEFICIAL, SAYS DEEP EXPLO CEO

New Delhi. "We at Deep Explo, though in the field for over 30 years, haven't marketed our vast product portfolio elsewhere till now," says Lalesh Saxena, CEO, Deep Explo Equipments Pvt Ltd, an Aligarh-based defence company, while sharing his experience about DefExpo 2020. Defence Expo 2020 was our first ever attempt at marketing where-in we exhibited a modest stall displaying 130 products out of our 500+ strong defence catalogue for our visitors to experience first-hand and it couldn't have gone down any better. The power packed 5 day event helped us immensely in connecting and discussing future prospects with industry leaders and our fellow exhibitors. We got to meet scientists and personnel from government bodies like DRDO, OFB, BDL, DGQA, DQAGA, Navy, Air Force, ARDE etc. We even got to interact with many private organisations in the defence sector from India and abroad. Apart from the exhibition itself, there was a huge amount of knowledge at our disposal regarding the future opportunities and the defence landscape of the country and the world at the various conferences that took place during the whole event. The live demos not only showcased the defence capabilities of India but also inculcated within us the pride of serving the defence sector and will motivate us to work even better.

Overall the event was extremely beneficial and we will be glad to participate in the next edition of Defence Expo.

Si2 MICROSYSTEMS SIGNS MOU WITH BEML FOR T-90 BHISHMA TANK UPGRADE

Lucknow. Bangalore-based global technology solution providing company Si2 Microsystems Pvt Ltd entered into an agreement with Defence Public Sector Undertaking (DPSU) Bharat Earth Movers Limited (BEML) at the DefExpo 2020 in Lucknow on February 8 for the upgrade of Indian Army's T-90 Bhishma Tank.

The Memorandum of Understanding (MoU) was signed between Sanjay Soni, Director of Si2 Microsystems and Colonel George Jacob (Retd), General Manager of BEML respectively in presence of Defence Minister Rajnath Singh, Minister of State for Defence Shripad Yesso Naik and Uttar Pradesh Chief Minister Yogi Adityanath. In the area of defence and military market segment, Si2 Microsystems provides a broad range of components, subsystems and related services for military operations, including obsolescence management and electronics re-engineering.

Si2 brings 25 years of industry experience in compliance with standards including MIL/JSS 55555 MIL 19500, MIL 883, MIL 810, MIL 461 etc. As far as land systems are concerned Si2 plays a pivotal role in the modernisation of air defence missile systems in collaboration with OEMs / technology partner and the design and manufacture of ADMS testers.

A Miniratna Category-1 company under the Ministry of Defence (MoD), Government of India, being India's leading defence equipment manufacturer BEML keeps the Indian Army and other defence forces abreast with state-of-the-art military equipment. The company manufactures variants of BEML Tatra vehicle for all terrain operations including Bridge Layer, Field Artillery Tractor, Medium & Heavy Recovery Vehicle, Pontoon Mainstream Bridge Systems, Crash Fire Tenders, Mobile Mast Vehicle, etc.

BEML plays a stellar role in the country's Integrated Guided Missile Development Project by supplying ground support vehicles. The company has also created a world class test track at its KGF Complex to test defence equipment and vehicles.

BOEING DISPLAYS ADVANCED DEFENCE AND SERVICES CAPABILITIES AT DEFEXPO 2020

Lucknow. Visitors witnessed a range of advanced defence capabilities including the F/A-18 Super Hornet, KC-46 tanker, AH-64E Apache and the P-8I at the Boeing display during the DefExpo 2020 held in Lucknow from February 5-9.

India is a crucial defence partner for Boeing, with some of its most mission-critical platforms integrated with the Indian armed forces. Today, India has 11 C-17 Globemaster IIIs, eight P-8Is (with four more on order), 17 AH-64 Apaches (against an order of 22) and 10 CH-47 Chinook (against an order of 15). Boeing's local sustainment and training capabilities are making Indian armed forces mission ready.

Boeing's exhibit at Hall 3, Booth S16 with the theme 'Building the Future Together' focused on its partnerships with India's armed forces, and highlighted the strategic investments the company has made in developing India's indigenous aerospace and defence ecosystem. These included the engineering and technology centre in Bengaluru and Chennai, the joint venture with Tata Advanced Systems, and the company's work with over 200 suppliers and partners in support of 'Make in India' and 'Skill India.'

Boeing also provided visitors a virtual flying experience with the F/A-18 Super Hornet Block III simulator to understand a wide range of missions, carrier-based aviation and capabilities the aircraft can offer the Indian Navy. The F/A-18 Super Hornet serves as the frontline multi-role fighter of the US Navy and air forces of several countries, and is currently on offer to the Indian Navy and Indian Air Force.

The combat proven F/A-18 Block III Super Hornet will bring the most contemporary next generation war fighter technologies to the Indian Navy through battle-space situational awareness, counter stealth targeting, greater range and improved survivability, reduced radar signature and room for growth.

In addition to defence platforms, Boeing also focussed on its local sustainment and training capabilities for its Indian customers. As Boeing steadily increases its sourcing from India, and expands its supplier network, it highlighted its contribution towards 'Make in India' which would fully harnesses India's manufacturing capability, talent, innovation and productivity.

LOCKHEED MARTIN, BEL TO EXPLORE OPPORTUNITIES IN F-21 FIGHTER PROGRAMME

Lucknow. Lockheed Martin (LM) has signed a Memorandum of Understanding (MoU) with Navratna Defence PSU Bharat Electronics Limited (BEL) to explore industrial opportunities in the F-21 programme. Lockheed Martin is strengthening and growing its partnerships with the Indian industry to support the company's F-21 proposal for the Indian Air Force. "We are excited to begin exploring F-21 opportunities with BEL, one of India's leading aerospace and defence companies," said Dr Vivek Lall, Vice President of Strategy and Business Development, Lockheed Martin Aeronautics. "An F-21 partnership with India integrates Indian industry, including BEL, into the world's largest and most successful fighter aircraft ecosystem and demonstrates Lockheed Martin's commitment to India." Anandi Ramalingam, Director (Marketing), BEL, said: "We are happy to collaborate with Lockheed Martin which is a global major in the aerospace sector. We are eagerly looking forward to cash in on this co-operation to address domestic and international market needs in this sector." The advanced, single-engine F-21 is the ideal solution to meet the Indian Air Force's capability needs and deliver unparalleled industrial opportunities. The F-21 delivers an advanced, single-engine multi-role fighter at the most optimal Life Cycle Cost for the Indian Air Force, with the longest service life of any competitor – 12,000 flight hours. In concert with India's Rafale and Tejas, the F-21 will fill a critical operational gap for the Indian Air Force. The F-21 also provides unmatched opportunities for Indian companies of all sizes, including Micro, Small & Medium Enterprises (MSMEs) and suppliers throughout India to establish new business relationships with LM and other industry leaders in the US and around the globe.

AIRBUS SIGNS AIRCRAFT SERVICES MOU WITH ADANI DEFENCE & AEROSPACE

Lucknow. Airbus India and Adani Defence & Aerospace signed a Memorandum of Understanding (MoU) at DefExpo 2020 in Lucknow on February 6 to leverage synergies in aerospace and civil aviation sector. The MoU was signed by Anand Stanley, President and MD, Airbus India & South Asia and Ashish Rajvanshi, Head of Adani Defence & Aerospace.

Airbus and Adani will explore opportunities for collaboration in the area of aircraft services for Indian and South Asian market. Airbus' Global Services forecast envisages the Indian aircraft services market to grow to US$6.3 billion by 2025.

"Airbus is not only the world's leading civil aviation company but is also a major innovator and provider of aircraft services. This MoU demonstrates our commitment to support the development of India as a world-class services hub for aerospace products," said Anand Stanley.

Adani Defence & Aerospace has established a comprehensive aerospace and defence ecosystem in India. With Adani's recent foray into airports, this potential collaboration will leverage the synergies between the product and services excellence of Airbus and infrastructure, engineering and mega project execution capabilities of Adani.

"India is at the cusp of transformational growth in aircraft services market. Our collaboration with Airbus is aligned to our vision of nation building and to indigenise critical technologies and services thus creating a vibrant ecosystem in aerospace capabilities in India," said Ashish Rajvanshi.

ULTRA ELECTRONICS COMMAND AND SONAR SYSTEMS SHOWCASES AT DEFEXPO

Lucknow. UK-based Ultra Electronics Command and Sonar Systems showcased a new torpedo defence system (NTDS) for the Indian Navy during DefExpo 2020 in Lucknow held from February 5-9. Ultra Electronics joined its partners Mahindra Defence Systems (MDNS) and the UK Department for International Trade (DIT) at the DefExpo 2020 to display its command and sonar systems prowess. As co-operation between both the UK and India continues, Ultra Electronics believes close collaboration is key to growth. During the DefExpo, Ultra Electronics partner Mahindra Defence was represented by Cdr S Ahlawat and S Mahamuni while the UK's Parliamentary Under-Secretary (Ministry of Defence) James Heappey, MP, represented himself on behalf of UK Department for International Trade before the industry.

RUSSIAN HELICOPTERS SIGNS AN EVENTS ROADMAP FOR KA-226T LOCALISATION IN INDIA

Lucknow/ Moscow. Russian Helicopters Holding Company (part of Rostec State Corporation) has signed a roadmap at the Defexpo 2020 exhibition with the Russian-Indian company Indo-Russian Helicopters Limited (IRHL) for localisation of Ka-226T helicopter production in India.

The document defines the main stages and terms for organising production of the Ka-226T helicopter and its units in India with respect to the date when the corresponding contract will be signed. In particular, the roadmap reflects timelines for setting up production in India, contracting with suppliers, transferring design documentation, supplying technological equipment and machine kits, training Indian personnel and other key stages of the project to localise production of the Ka-226T helicopter in India.

"The roadmap signed today will be the basis for further development of the Ka-226T localization project in India after the signing of the contract," said Director General of Russian Helicopters holding company Andrei Boginsky during DefExpo on February 6.

Indo-Russian Helicopters Limited is a joint venture of Russian Helicopters, Rosoboronexport and the Indian corporation HAL. The company was registered in India in May 2017 as part of a project to localise the production of Ka-226T helicopters.

The light utility helicopter Ka-226T has a coaxial twin-rotor system, its maximum takeoff weight is 3.6 t, and it is able to transport up to 1 t of payload. A transport cabin is installed on the helicopter, designed to transport up to six people or modules with special equipment. Improved performance characteristics of the Ka-226T, its eco-friendly features, cost effectiveness; advanced avionics and additional flight safety solutions make this helicopter one of the best models in its class.

IAI ENTERS STRATEGIC UAV COLLABORATION WITH HAL, DTL

Lucknow. Israel Aerospace Industries (IAI) on February 5 signed a strategic collaboration Memorandum of Understanding (MoU) with a focus on UAVs with Hindustan Aeronautics Limited (HAL) and Dynamatic Technologies Limited (DTL). The MoU will reflect existing UAV capabilities developed by IAI over the years and promote the production of Indian UAVs in line with Government's 'Make in India' policy. The strategic partnership with the Indian corporations will allow the implementation of optimal solutions for the needs of the local customer based on their specific technologies and needs. IAI has also established, with local collaboration, an MRO dedicated to UAVs to provide the customers with high-availability responses and quick maintenance.

IAI is the global UAV leader for nearly 50 years, and is the exclusive UAV supplier for all of India's military arms. The company provides services to over 50 customers worldwide and boasting over 1.8 million operational flight hours. The collaboration will center on the sharing of unique technologies for upgrading UAV capabilities, offering the Indian customers advanced systems that comprise integrated local technologies.

IAI Executive Vice President and General Manager of the Military Aircraft Group, Moshe Levy speaking on the occasion said, "We are delighted to sign the strategic agreement with our partners, HAL and DTL. India is an important strategic partner for UAVs and I'm confident the combination of IAI's extensive experience and the technological capabilities of HAL and DTL will lead to significant advancements in the field."

HAL CMD R Madhavan commented: "The collaboration will provide excellent opportunity to HAL to expand its product offerings to defence customers, absorb critical technologies and strengthen the aerospace ecosystem in the country, especially for UAVs."

A ROBUST PLATFORM TO SHOWCASE DEFENCE PROWESS

THE BIENNIAL MEGA EVENT WAS ONE OF THE BEST PLATFORM PROVIDED BY THE MINISTRY OF DEFENCE, GOVERNMENT OF INDIA WHICH FOSTERED THE GLOBAL DEFENCE COMPANIES MAKE IN INDIA STRATEGY

SALIL GUPTE
President
Boeing India

An important part of our India strategy is ensuring our defense customers have the most advanced platforms and capabilities, supported by a services model that optimizes mission readiness, high performance and safety. DefExpo India 2020 provided us the opportunity to engage with our customers, partners and industry to discuss areas of collaboration that will help in taking the vision of Make in India forward to build a robust defense a erospace ecosystem in India.

REPRESENTATIVE OF ROSOBORONEXPORTS

Rosoboronexport's exposition has drawn considerable attention from the visitors of DefExpo India 2020. Particular interest of the guests of the stall was payed to the special anti-drone systems, Kalashnikov and Orsis rifles, AU-220M automatic artillery station. It should be noted, that the exhibition in Lucknow was very well organized, its organizers have done huge work.

DefExpo is a major event for BAE Systems to exhibit at in India. The company had a very productive show this year, with excellent customer, partner, supplier engagements. We had great focus on our exhibits which included the M777 Lightweight 155mm howitzer, the locally produced castings cradle for the M-777 by PTC Industries Limited, MK-45 naval gun, APKWS amongst others. It was also a great platform for the company to engage further with key stakeholders in India, enabling us to strengthen existing partnerships and exploring avenues for new ones.

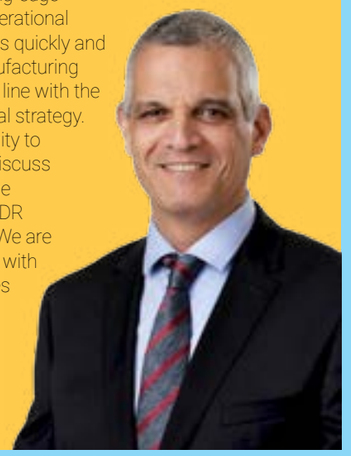
NIK KHANNA
India, Managing Director, BAE Systems

"DefExpo was a great place to showcase Saab's ambition to contribute to India's vision of building a larger indigenous defence industry, and help build capability that will enable India to design and build its own next-generation defence systems. We showcased our latest technologies like Gripen E, Skeldar (VTOL UAV), latest ground based radar the Giraffe 1X, Carl Gustaf M4, AT4CS AST, Next-Generation Light Anti-tank Weapon (NLAW), Signature Management Systems, AUV-62- MR, Double Eagle SAROV, and Saab Light Weight Torpedo, which are changing defence and security planning, deployment and future force readiness. The response to the products we displayed at the event was overwhelming and it was great to see such an informed audience who were really appreciative.

OLA RIGNELL, Chairman and Managing Director, Saab India

RAFAEL has been present in India for over 20 years, producing and providing cutting-edge systems to the Indian military, to ensure its operational advantage, addressing its military urgent needs quickly and effectively. We have also developed local manufacturing capabilities together with our local partners, in line with the nation's Make in India policy and with our global strategy. At DEFEXPO we enjoyed yet another opportunity to meet with our Indian partners and clients, to discuss our capabilities, such as the SPIKE missiles, the SPYDER, Iron Dome and C-Dome, the BNET SDR communications systems, and many others. We are confident of the continued fruitful cooperation with all forces of the military, especially now in times of uncertainty, and we look forward to seeing positive results in the near future.

MAJ GEN (RETD) YOAV HAR- EVEN
RAFAEL President and CEO



As a leading defense manufacturer in South Korea, Hanwha had a valuable opportunity to showcase our products, such as Hybrid BIHO, K9 and Air Defense Gun systems, to Indian customers during the DefExpo 2020. Based on successful cooperation on the K9 self-propelled howitzer manufacturing for the Indian Army, Hanwha is fully committed to expand collaboration with the Indian counterparts in support of the "Make in India" policy to help strengthen India's defense industrial base.

SHIN JONG-HYUN
Vice President / Head of Business Development, Asia, Hanwha Defense International

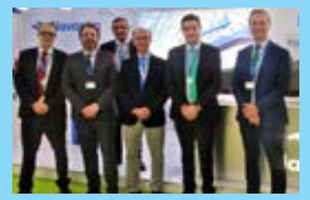
The magnificent DefExpo was an excellent platform to showcase our capabilities and explore opportunities. Si2 is proud to become a partner of BEML and take part in the T-90 upgrade programme. Si2 Microsystems' status as a Make in India partner of M/s Uralvagonzavod, Russia and M/s Shvabe holdings provides Si2 with access to the latest technology required to implement critical upgrades to the T-90 tanks. Critical upgrades would include addition of a Digital Ballistic Computer and the Automatic Target Tracker to significantly enhance the fighting capabilities of the T-90.

SANJAY SONI
Director
Si2 Microsystems

SUNIL GUPTA
Co-founder and CEO,
QuNu Labs Pvt. Ltd.

We at QNu Labs are highly passionate and motivated about our mission to accelerate the world's transition to Quantum Safe security solutions to protect critical data from an imminent Y2Q (Years to Quantum Computers) event which will bring a "crypto apocalypse". We were selected by MoD to present our unique offering in the India Pavilion of DefExpo and we chose to showcase a use case of "Quantum Channel based Real-time Key Distribution Framework" along with BEL. We saw a good foot fall with some of the top Indian and Foreign defence personnel's visiting our booth and discussed the possible solutions of leveraging QNu's technology to create a Quantum Safe Secure Networks. DefExpo was our biggest showcase since we launched our product in 2019.

Navantia considers India a priority market, and DEFEXPO provided the perfect opportunity to gain more visibility in India, and to renovate engagements with the local industry, in particular in relation to two projects currently under competitive tender processes: Four state-of-the-art LPDs, and six last-generation P75(I) submarines. During DEFEXPO, Navantia signed an MOU with one Indian strategic partner, and received visits from international clients and official delegations from several countries. DEFEXPO was also the launching pad for and online industry event scheduled for the 21st April, as it facilitated contacts with more than 100 local suppliers. The industry event shall be focused on indigenization, in support of the Make in India principle, to which Navantia is strongly committed. Finally, we were honoured to receive at our stand the Indian Navy Chief of Staff, Admiral Karambir Singh, and to participate in several workshops with key industry players.



Team Navantia

DEFEXPO 2020: EXPERIENCES AND KEY TAKEAWAYS

DefExpo 2020 with its new intent offered the much needed platform to Indian Start-ups, MSMEs and SMEs to showcase their innovations and also the opportunity to collaborate with the industry

By **ABHISHEK JAIN**

The DefExpo (expo), which was held in Lucknow (capital city of Uttar Pradesh) from February 5-9, this year turned into a unique blend of experience as it was organised in a new city and with a new intent. This article wishes to explore the experiences in the expo and key takeaways to the things began on the good note that can be made better.

THE INTENT

The best part of the expo was its new intent. From the very first day the intent was clear that it was designed to help the smaller and innovative companies and to showcase the capability of India to the world. Micro, Small and Medium Enterprises (MSMEs) were given 50 per cent discount on the booth charges and some of the most innovative start-ups had been given space free of cost in the India Pavilion.

Composite sea water pump developed under TDF scheme

Political will to promote the show was visible with the Prime Minister, Defence Minister and Uttar Pradesh Chief Minister all attending the day one event, not to mention the countless state ministers and MLAs. The PM's visit to the India Pavilion was a much-needed promotion of India's innovation. Young and innovative energy was seen in the show.

It was heartening to see different states offering sops to the industry to come and invest. This healthy competition among the states is good for our country and would deliver efficiency.

ORGANISATION

As always, the who's who of the defence world was present in this event. The space allocated for the event was more than adequate and the facilities were organised brilliantly. With this, the "Make in India" bug seems to have really caught on to every global company and they are trying to find ways to shop local and be more competitive and of course align with the vision.


Director TDF DRDO at DRDO Pavilion with Zeus and Godrej representatives

BETTER NEXT TIME

Time planning is one area in which some thought needs to be given. The show from the beginning should have been announced for five days with only the fifth day open for general public. Unfortunately, children and selfie seekers stormed the event from day three and it turned into a chaotic scene. Many of the foreign delegates left their booths and sealed them after the crowd started mishandling the exhibits.

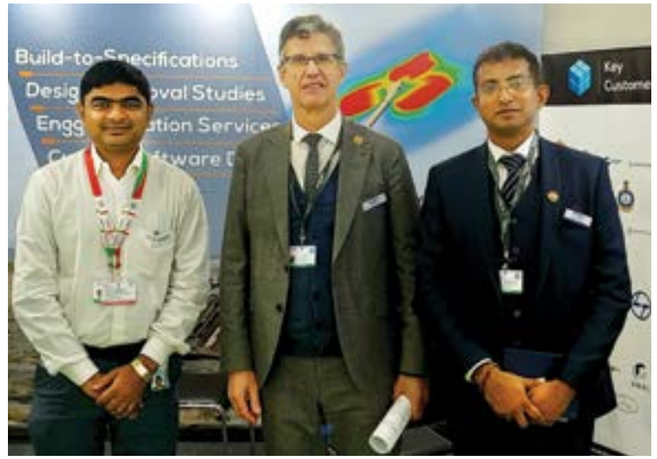
Second issue was the accommodation. Hotels prices increased by 700 per cent to 1000 per cent and the establishments started rejecting online bookings. Though it's not the organiser's fault, it sullies the image of the city.

KEY TAKEAWAYS

For me the takeaways are simple; Government has provided the platform and it is now up to the industry to utilise it. Policies have been modified to favour Indian industry and indigenisation. The TDF DRDO booth, where I was present was very popular as it funds technology development.

The expo reaffirmed my belief that this is the age of collaboration. A single company cannot do anything. Big and small players, academia and consultants with complementary core competencies must form a consortium and build products.

Secondly, the procedures are becoming increasingly transparent. Information flow is free and wide, software does not do favours. "We as an industry need to start thinking of the greater good and stop projecting that the system is rigged just because a project is not awarded to us." This was the expo for collaboration and innovation!


At Zeus stall with Naval Group delegation

"WE AS AN INDUSTRY NEED TO START THINKING OF THE GREATER GOOD AND STOP PROJECTING THAT THE SYSTEM IS RIGGED JUST BECAUSE A PROJECT IS NOT AWARDED TO US"

Abhishek Jain

The most pleasing experience in Uttar Pradesh capital Lucknow for me was with its police personnel. They were all extremely polite and helpful despite being stressed with lots of VIP movement and managing huge public. I thank them for the real 'Atithi' treatment.

– The writer is Vice President, Strategic Partnerships, Zeus Numerix, a Pune-based defence and space solutions providing company

(With editorial inputs from Vaishnavi Pai)

DEFEXPO 2020 AND MAKE IN INDIA

Some close to 200 plus MoUs were signed on the final day, and are still counting. Of these 200; 23 MoUs are exclusively with Uttar Pradesh Expressway Industrial Development Authority

By **LT GEN JK SHARMA (RETD)**

India's biggest ever DefExpo held at Lucknow from February 5 to 9 has been rightly described by Uttar Pradesh Chief Minister Yogi Adityanath as 'Maha Kumbh' of defence manufacturers. The curtain raiser was on February 4, and February 8 and 9 were kept as public days, therefore the mega defence expo resulted in an event of six days rather than three. The unprecedented scale of 1000 plus exhibitors and a footfall of close to 80 million clearly made this the biggest DefExpo ever held in India or even for that matter in Asia.

In a sequel to the successful conduct of Kumbh at Prayagraj by the Uttar Pradesh government, the joint efforts of Ministry of Defence (MoD), Government of India (GoI) and the state government ensured that pitfalls and shortcomings of all the previous expo's are adequately addressed.

There were many other extraordinary features of this DefExpo. First among the many and most noticeable was 'Daily live demonstrations of military capability in mock settings'. A large variety of new equipment and some at the development stage by India's Defence Research and Development Organisation (DRDO) was also fielded, which, while giving confidence to the users, was also a demonstration of our design and development capability.

Not known to many but a very important feature was the 'Military Cooperation conference of Defence Ministers of 30 countries'. There were large number of other defence delegations, some led by the defence ministers, others by the Ambassadors/ High Commissioners who could interact with the UP CM and his team.

Other ministerial delegations from many Indian states were able to exploit this opportunity to connect with the foreign Original Equipment Manufacturers (OEMs) for investment in their own state. This has served as a major boost to the progress of the Uttar Pradesh Defence Industrial Corridor (UPDIC).

INDIA'S BIGGEST EVER DEFEXPO HELD AT LUCKNOW FROM FEBRUARY 5 TO 9 HAS BEEN RIGHTLY DESCRIBED BY UTTAR PRADESH CHIEF MINISTER YOGI ADITYANATH AS 'MAHA KUMBH' OF DEFENCE MANUFACTURERS

The numbers of Indian manufacturers/ exhibitors participating in DefExpo 2020 have been the largest ever. While many had bought the space directly from the Ministry of Defence, a huge number were exhorted and facilitated by the Uttar Pradesh Expressway Industrial Development Authority (UPEIDA) especially who had shown an intent of coming in as manufacturers in UPDIC.

A Seminar chaired by the Defence Minister was also organised by UPEIDA in collaboration with Federation of Indian Chambers of Commerce and Industry (FICCI). This was attended by the who's who of Indian industry beside the CM, Defence Secretary, other MoD staff and representatives of the state governments. The entire perspective was laid out along with the objectives of UPDIC, that is;

- Development of internationally competitive enterprises
- Create and maintain an eco system for manufacture of major defence systems and platforms
- Become strategically independent in defence manufacturing
- Integrate industry with global manufacturing supply chain
- Strengthen the defence industry eco system especially MSMEs
- Strengthen the development base

The incentivised policies and large number of interactive sessions held as a run up to the DefExpo with the industry enthused the environment. Some close to 200 plus MoUs were signed on the final day, and are still counting. Of these 200; 23 MoUs are exclusively with UPEIDA. And they are not just papers. They are strengthened by philosophy, spirit and process.

The two major factors in favour of UPDIC are the hugely incentivised policy and the availability of land and infrastructure. Add to that the scale of the items required if we include the requirements of CAPFs and state police are at least in the segment of small arms, surveillance and detection.

Defence Minister Rajnath Singh mentioned in his Valedictory Address that "Success of DefExpo is a declaration to the world that the coming years will signify India's domination in defence manufacturing".

While there were exhibitors from all over the world, however the thrust rightly has been towards indigenisation. But in the spirit of Make in India and taking the Indian Economy to US$5 trillion mark as announced by Prime Minster Narendra Modi, there is a huge need to focus on exports simultaneously, e.g. Lockheed

"Success of DefExpo is a declaration to the world that the coming years will signify India's domination in defence manufacturing"

Rajnath Singh
Defence Minister

THE OPPORTUNITIES ARE HUGE IN ALL SEGMENTS INCLUDING IN CASE OF SMALL ARMS IF WE AGGREGATE THE REQUIREMENTS OF THE ARMED FORCES, CAPF AND STATE POLICE. IT WOULD ONLY BE RIGHT NOW TO KEEP BUILDING UP ON THE ENTIRE PROCESS WITH MORE INTENSE INTERACTIONS TO IRON OUT ANY GREY ZONES

Martin exports to 60 countries, what is made in India.

While the philosophy and the policy of indigenisation is extremely relevant and useful towards self sufficiency, wherein our dependence of defence needs on other countries is reduced as also our own industry gets the desired impetus and incentive with a big boost towards Foreign Direct Investments (FDIs).

At the same time we already have a large number of foreign OEMs who are already making in India for India and also for export either independently or in Joint Ventures (JVs). We need to continue to incentivise this process as well which besides enhancing self sufficiency within has a huge incidental potential of job creation and earning through exports.

The Government of Uttar Pradesh and the Department of Industry have included many measures and incentives in the policy to attract the foreign OEMs to establish manufacturing units in the state. For MSMEs many more measures have been taken including hand holding for certification and testing facilities in the designated nodes.

The opportunities are huge in all segments including in case of small arms if we aggregate the requirements of the armed forces, CAPF and state police. It would only be right now to keep building up on the entire process with more intense interactions to iron out any grey zones. It is also to take the manufacturing on a much faster pace with synergy between industry, services and the government/ MoD and the state governments mainly in UP and Tamil Nadu and even other states like Maharashtra, Gujarat, Andhra Pradesh as well.

–The author is Senior Defence Advisor, Government of Uttar Pradesh (India)


Defence Minister Rajnath Singh interacting with iDEX startups during Def-Connect 2019

iDEX: A NATIONWIDE OUTREACH PROGRAMME THROUGH INDIGENOUS STARTUPS FOR DEFENCE

The iDEX initiative is a unique and evolving process where it has been able to attract attention of a large number of Indian innovators

RAKSHA ANIRVEDA DESK

Startups play a pivotal role in modernisation of any nation and history is replete with such examples where new ideas implemented through startups have brought a stark change in our lifestyles. Taking a cue from the fact that our country has one of the largest startup ecosystems while being one of the largest armed forces with strong dependence on imports, the concept of Innovations for Defence Excellence (iDEX) was conceived by none other than our Prime Minister Narendra Modi. A formal announcement and launch of the iDEX initiative was made by then Defence Minister Nirmala Sitharaman in August 2018 after DefExpo 2018 in Chennai.

The team iDEX comprising two Programme Directors and two Programme Executives under the leadership and guidance of Sanjay Jaju (IAS), Joint Secretary Defence Industries Production (DIP) and Officiating CEO, Secretary (Defence Production), Defence Secretary, and support from Department of Defence Production and Atal Innovation Mission at NITI Aayog has come a long way from a very humble beginning in April 2018.

The Ministry of Defence (MoD) commenced with the conceptualisation of iDEX Initiative, and subsequent formation of Defence Innovation Organisation (DIO), launch of Defence India Startup Challenges (DISC) I-III, formation of High Powered Selection Committees with representation from eminent IITs, IIM-A and chaired by flag rank level officers from Services, setting-up Defence Innovation Hubs across the country, and the ongoing Open Challenge to seek applicants from across the country to pitch for their ideas and innovations for application in defence.

All this has been achieved in a very short span of time, though a long way to go and much more to achieve. It started with an aim to equip our defence forces with a cutting-edge technology in various domains, and hence there is concerted effort to harness the innovations that the indigenous startups bring to the fore for defence applications and optimise their capabilities through iDEX's team of Partner Incubators (PIs) located across various IITs (Delhi, Bombay, Madras, Hyderabad), IISc Bangalore, IIM Ahmedabad etc., to name a few.

DIO, a not-for-profit Section 8 company formed by Defence Public Sector Undertakings (DPSUs), has adopted a unique and robust working model to invite Indian innovators. It had sought requirements from all three Services - Indian Army, Indian Navy and Indian Air force, which came up with 18 product-oriented Problem Statements, to be launched as Defence India Startup Challenge (DISC). These challenges were open to Indian innovators (Startups, SMEs/ MSMEs/ individuals/ research & technology professionals, etc.) and included Secure Hardware Encryption Device, Unmanned Surface & Underwater Vehicles, Carbon Fibre Winding, Individual Protection System, Portable Spoof Emitter for radiations, See through Armour, Remotely Piloted Airborne Vehicles, etc.

The iDEX initiative is a unique and evolving process where it has been able to attract attention of a large number of Indian innovators. Out of over nearly a thousand applications, around 58 have been shortlisted under iDEX and these DISC winners are eligible for Support for Prototype and Research Kickstart (SPARK) grant up to Rs 1.5 crore each through iDEX and a matching contribution from the winner. Presently, a number of them are being supported through SPARK grant and mentored with regular handholding from the nodal officers of the respective Service.


PM Modi being apprised about its product by an iDEX startup during DefExpo 2020


SPARK grant release to an iDEX startup

MINDFUL OF THE FACT THAT THE YOUNG BUDDING STARTUPS DO NOT HAVE DEEP POCKETS AND TIME TO WITHSTAND THE RIGOUR OF COMPETITIVE BIDDING PROCESSES USUALLY FOLLOWED BY SERVICES, IDEX PROVIDES A MUCH SHORTER RUNWAY TO STARTUPS TO TAKE OFF

These startups aim at developing and commercialising products/ technologies for our armed forces with intent of reducing dependence of Services on imports and creating niche technologies to fill-up technology gaps in our defence, and one may never know this could just be the beginning of creation of few Lockheed Martins in India!

As a part of this larger aim of iDEX, a mega nationwide outreach event has been conducted to seek participation of our best engineers and entrepreneurs, covering various IITs, IIM Ahmedabad, Pune University, KIIT Bhubaneswar etc. This has helped young startups to move out from confines of regular PSU funded R&D laboratories to the iDEX's facilities where they pass through rigour of ideation, iteration, innovation, trials and testing, under close supervision of highly qualified mentors.

Besides DISC challenges,

INNOVATION OUTREACH

WHILE IDEX ALLOWS ITS STARTUPS TO STRIVE TO EXCEL AND THINK BEYOND THE LIMITATIONS OF CURRENT TECHNOLOGY OR BUSINESS SENSE, IT ALSO SUPPLEMENTS THEM WITH NECESSARY DATA AND REINFORCES THEM WITH SUPPORT FROM SERVICES TO CREATE A SENSE OF SELF BELIEF

Launch of iDEX Compendium by Defence Minister Rajnath Singh during Def-Connect 2019

Dr VK Rai, Programme Director, DIO-iDEX, MoD

iDEX outreach programme at CIIE-IIM Ahmedabad in December 2019

another avenue under the banner of "Open Challenge" has been created for the young indigenous innovators to pitch their product/ technology which may not be aligned to any specific challenge issued by the armed forces but could be an innovation that may be a good fit for defence. Such innovators can be incubated with iDEX support as a "Technology Watch" to be retained within nation to be utilised later or provide a low-cost import substitute. In due course, iDEX aims at helping our defence forces to migrate from a Buyers' Service to one which is capable of exporting its products and services.

Redeeming features of the iDEX initiative are manifolds. At the outset, it provides a robust ecosystem of Partner Incubators and Services' representatives to indigenous and agile startups/ innovators to grow and flourish. It has been able to harness untapped innovators to channelise their talent constructively for use in our armed forces.

The iDEX initiative has also been able to successfully create employment for many. We have fewer talented engineers who are jobless now, a regular graduate need not accumulate professional courses certificates while aspiring to become a successful entrepreneur, and all this is achieved along with introduction of technologically advanced products to cater for defence needs.

The iDEX through its meticulous sifting process is able to identify the innovation in its startups, create viable business sense, possible dual-use product, and incubation, testing and funding support and eventually lead to an assured order from the armed forces under Make II process. Mindful of the fact that the young budding startups do not have deep pockets and time to withstand the rigour of competitive bidding processes usually followed by Services, iDEX provides a much shorter runway to startups to take off.

It has just the right blend of techno-financial diligence and flexibility to create innovative products for the defence. While iDEX allows its startups to strive to excel and think beyond the limitations of current technology or business sense, it also supplements them with necessary data and reinforces them with support from Services to create a sense of self belief.

iDEX is here to stay leveraging the strength of Indian innovators to infuse innovation in our armed forces, and will soon alter the way defence procurements happen!

With inputs from Programme Director, DIO-iDEX, in an interaction with Editor, Raksha Anirveda

NNetRA – IIT BOMBAY

PIONEERING WORK IN STRATEGIC SEMICONDUCTOR TECHNOLOGIES

NNetRA is a network project co-funded by MeitY and DST, GoI. The IITB node of the network, NNetRA-IITB, has developed a special focus on semiconductor technologies for strategic applications on defence, aerospace and critical infrastructure

By **PROF SWAROOP GANGULY**

Indian Institute of Technology (IIT) Bombay i.e. IITB, has been working on the project of Nanoelectronics Network for Research and Applications (NNetRA). Apart from IITB, IIT Delhi, IIT Madras, IIT Kharagpur and Indian Institute of Science (IISc), Bangalore are also working on the NNetRA project with support from the MeitY and DST, GoI.

Under the NNetRA project, two significant nanoelectronics technologies developed by IITB were on display during the DefExpo 2020 in Lucknow:

GaN RF HEMT Technology: The first Gallium-Nitride (GaN) High Electron Mobility Transistor (HEMT) in India was fabricated in IITB under the MeitY Centre of Excellence in Nanoelectronics (CEN) project in 2010 by the team of Prof Dipankar Saha. The technology has been developed since then in collaboration with Indian Space Research Organisation-Space Applications Centre (ISRO-SAC), for radio-frequency applications, specifically radar and communications. Under the aegis of NNetRA, it has now been matured to the point where a technology demonstration and knowledge transfer project for a GaN-based Power Amplifier Monolithic Microwave Integrated Circuit (MMIC) for radar products is being executed with a Defence PSU. This is expected to lead to investment in a small-volume GaN fab with technology transferred from IITB.

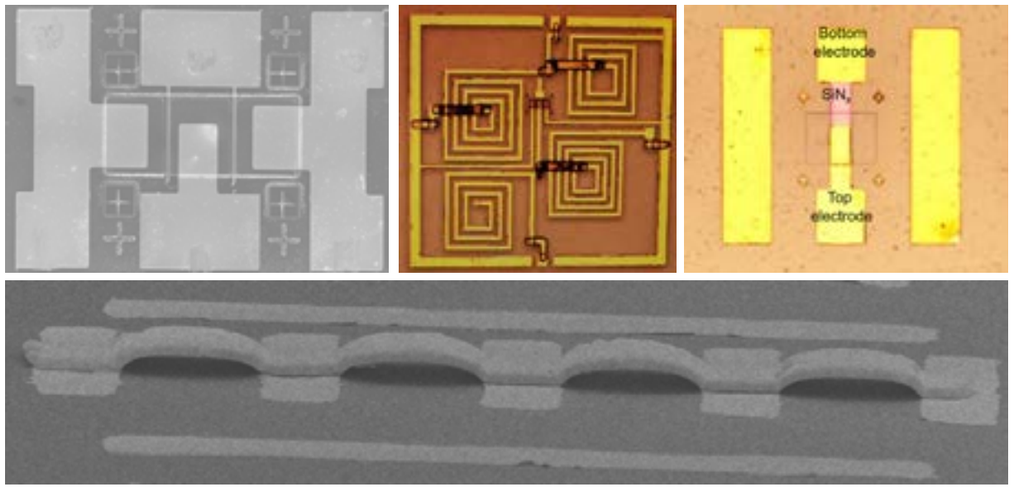
One-Time Programmable (OTP) Memory Technology: Under the aegis of NNetRA, the team of Prof Udayan Ganguly at IITB collaborates with the Semi Conductor Laboratory (SCL) in Chandigarh. SCL, under the Department of Space, is India's only silicon chip fabrication (manufacturing) plant. It runs a 180 nanometer (size of the semiconductor devices) fabrication line, licensed from an international semiconductor company, for digital and mixed signal electronics applications. The goal of NNetRA-IITB is to indigenously enhance the capabilities of the SCL line so as to enable other useful applications.

First, a bipolar device technology for satellite RF communications was collaboratively designed and demonstrated on the SCL line without any capital equipment augmentation. Second, a one-time-programmable memory was collaboratively designed and demonstrated on the SCL line, again without any equipment augmentation.

Besides enabling memory applications, this technology was discovered to enable a hardware encryption application Besides enabling memory applications, this technology was discovered to enable a hardware encryption application (Random, Secret and Unique Chip ID) that was patented by IITB, is being developed with SCL, as the production partner - along with IITD and SETS Chennai for circuits and security expertise.

The Nanoelectronics Network for Research and Applications (NNetRA) is a network project co-funded by MeitY and the Department of Science & Technology, Government of India. Its nodes are the erstwhile MeitY-initiated Centre of Excellence in Nanoelectronics (CEN) at IIT Bombay (IITB) along with other four CoE at IITD, IITM, IITK and IISc. The IITB node of the network, NNetRA-IITB, has developed a special focus on semiconductor technologies for strategic applications on defence, aerospace and critical infrastructure, and is the institutional coordinator for the same within NNetRA. The goal of NNetRA-IITB is to enable Make in India (manufacturing) for strategic semiconductor technologies – where external dependence spells vulnerability in terms of data security, technology access and pricing.

–The author is Chief Investigator, Nanoelectronics Network for Research and Application (NNetRA) and Professor, Electrical Engineering, IIT Bombay. He can be contacted at swaroop.ganguly@gmail.com



Elements of GaN HEMT technology fabricated at IIT Bombay. Active and passive devices on top left to right: transistor, spiral inductor and MIM capacitor. Bottom: series of air-bridge interconnects between the devices

GA-ASI AND L3HARRIS TECHNOLOGIES SUCCESSFULLY INTEGRATE WESCAM MX-20 ONTO MQ-9

SAN DIEGO. General Atomics Aeronautical Systems, Inc. (GA-ASI) and L3Harris Technologies completed the successful integration of the WESCAM MX™-20 Electro-optical/Infrared (EO/IR) system onto a GA-ASI MQ-9 Remotely Piloted Aircraft System (RPAS) to provide an advanced targeting solution. A series of test flights began on February 18 to demonstrate the MX-20-equipped MQ-9's ability to locate and track targets at long stand-off ranges. When integrated onto the MQ-9 Predator® B series of RPAS, the WESCAM MX-20 EO/IR system will support Intelligence, Surveillance and Reconnaissance (ISR) and Precision Guided Munitions (PGM) missions. Field-proven through multiple deployments, the WESCAM MX-20 is equipped with high-sensitivity multi-spectral sensors for day, low-light and nighttime missions. The WESCAM MX-20 operates with outstanding detection and recognition capabilities from ultra-high altitudes.

GA-ASI is the world's leading designer and manufacturer of RPAS and mission related systems. Team SkyGuardian combines the best of industry with the world's most advanced Medium-altitude Long-endurance (MALE) RPAS, the MQ-9B SkyGuardian, being developed to fulfill the world's future RPAS requirements.

CHINA'S EXPANDING LAND, AIR AND OUTER SPACE PROWESS

China has precisely but secretly been expanding its missile, nuclear deterrence and outer space prowess and DF-26 intermediate-range ballistic missile is a key air defence system in the country's weapons system arsenal

Missile arsenal one of the martial strengths of the People's Liberation Army (PLA) of China. China's missile arsenal is advanced, and contains a multitude of more than 40 types which can be used to carry either conventional or nuclear warheads.

DF-26 intermediate-range ballistic missile (IRBM), which is being introduced in greater numbers, is a key missile in Chinese arsenal.

China tested an anti-satellite (ASAT) weapon in 2007 and in January 2019, Chinese lunar rover was successfully placed on the dark side of the Moon, a technically difficult mission.

It has managed to carry out its space activities under the dual-use technology ploy so as to avoid any undue military attention. China is in the process to set up a new space station, a Moon base and undertake multiple missions to Mars.

China fired more than 100 ballistic missiles during testing and exercises in 2019, a figure which is in excess what the US and Russia launched together.

China accelerating the development of missiles for the PLA Rocket Force (PLARF). China test fires most of the missiles in its northwest province, where the US and others have poor radar coverage.

China has planned to establish Space Silk Road, and achieved definite advantage over Indian effort in the same field. As early as 2003, it had success with the first manned Space mission followed with a second mission in 2005. In 2008, a three-person crewed space flight also included the maiden spacewalk by a Chinese Taikonaut.

A successful space station programme in 2011 resulted in the first crewed Space Station docking in 2016 and established the long term space presence for China.

Among the missiles that China fired last year, a large number were DF-21D medium-range anti-ship ballistic missiles (MRBM) and DF-26 IRBMs. DF-26 IRBMs has a range of up to 4,000km. These two missiles illustrate Chinese efforts to keep US and allied warships far from China's coast.

As per US sources, China launched more ballistic missiles for testing and training than the rest of the world combined in 2019.

China strategically increasing its overseas investment to emerge an influence in the world dynamics, maintaining an aggressive stand closer to its borders as in case of South China Sea and the Taiwan Strait.

In the Space sector, China's missions have been remarkably successful and have reached a potential to grow as a primary adversary against US Space Command.

Washington in August 2019 withdrew from the 1987 Intermediate Range Nuclear Forces Treaty (INF) with Russia following China's proliferation of land-based missiles in the 500-5,500km range. China has gained a distinct advantage in MRBMs and IRBMs because it was not bound by such a treaty.

Nicknamed the "Guam killer", the DF-26 is dangerous as it is dual-capable and can either a nuclear or high-explosive warhead. The PLA is believed to have fielded the DF-26 within an operational unit for the first time in 2016.

China soon to overtake France with the world's third-largest nuclear arsenal and its stock has doubled over the past 15 years. Beijing is still far behind nuclear weapon numbers in Moscow and Washington.

China's 2019 Defense White Paper listed the aim of enhancing nuclear deterrence and counterattack and strengthening intermediate and long-range precision strike forces, and it is doing precisely that with mounting numbers of the DF-26.

A latest assessment by US sources says, PLA has an estimated inventory of 80 DF-26 launchers and up to 160 missiles, whereby each launcher might have one missile reload available.

DF-26 missiles are manufactured at a facility in Fangshan in the western part of Beijing. The same factory also seems to make DF-21 and air defense missiles.

If there are 18 launchers in each DF-26 brigade, the estimate of 80 TELs could mean enough weapons for up to four brigades even if not all are operational yet and units are still being equipped.

It is estimated that 2-3 DF-26 units existed a year ago, with each brigade having 6-12 TELs. If each DF-26 brigade has 12 or fewer TELs (instead of 18), Appearance of 18 TELs at Qingzhou indicating the presence of more than one unit training together.

Chinese city of Xinyang is about 3,750 km from Guam, the westernmost territory of the United States, compared to 4,350km for Mumbai. Thus, a few DF-26s could target locations in India that are closer than this

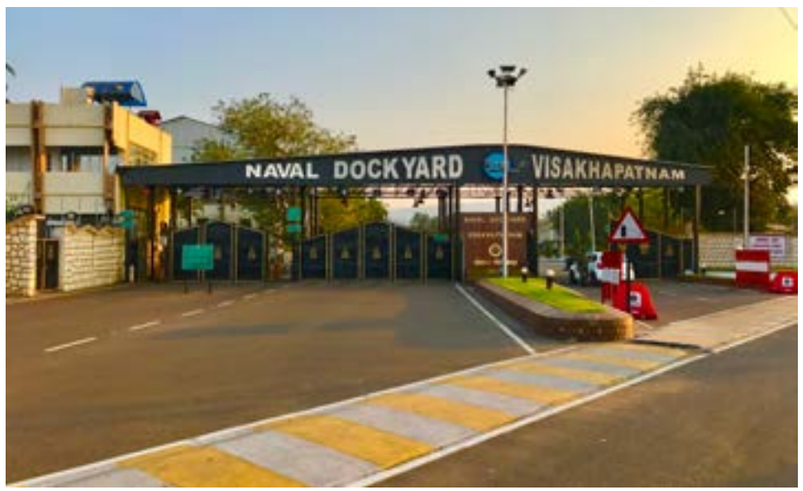
Qingzhou contains a nearby PLARF missile support base with different missile types appearing there over the years.

HOW TO DEVELOP SMART CANTONMENT, MILITARY STATION, AIR FORCE STATION OR A NAVAL DOCKYARD?

Presently there are no or little smart interventions planned or executed in developing a cantonment, military station, air force station, and/ or naval shipyard or dockyard as a smart city, however, there is a need to develop them on the lines of modern smart city projects

By **COL MANOJ MEHROTRA (RETD)** AND **VIPUL MEHROTRA**

Units of defence forces are located at various places, which are organised in different forms depending on the location such as cantonments, military stations, air force stations, naval dockyards/ shipyards and the field areas. Generally, all can be clubbed and called as Cantt. The management of all these entities remains more or less same; however, the amenities and services available depend on the size and location of cantonments and military stations. However, field areas generally lack the services and amenities being temporary or in remote areas.



Need for developing smart cantonments/ military stations/ air force stations/ naval dockyards:

There are a total number of 62 cantonments/ military stations, 60 air force stations and five naval stations in India. Military stations/ air force stations/ naval dockyards can be considered as mini cities/ satellite cities as these are located within the geographical boundaries and jurisdiction of Urban Local Bodies (ULBs). The administration and citizen services are managed under the aegis of military authorities/ organisations such as the Station Headquarters, Military Engineering Services (MES) and the Garrison Engineer.

The administration and management of all these so far has been manual as hither to fore. However, keeping in pace with the need for automation and quick responses combined with efficiency as well as effectiveness, it has now inescapable that these be converted as smart entities.

Applications/ Services / Interventions to be Planned Including Technologies

Sr. No.	Asset / Service	Managed within by	Technology Proposed
(a)	Security	Military authorities	• Intrusion protection • Identification and tracking of visiting personnel and vehicles • Perimeter protection • Prevention of observation from adjoining areas • Prevention of observation by drones • Cyber interventions to prevent hacking, leakage of info • Awareness programmes for personnel and families • Prevention and detection of short circuits • Prevention and detection of fire due to high temperatures • Detection and prevention of unauthorised entries in installations
(a)	Land	Station headquarters	GIS for maps
(b)	Electricity and water	MES	• SCADA based water, electricity supply • Smart meters • Sewage water recycling plant • Distribution system be included in GIS maps
(c)	Health services including ambulance	Military hospital	• Automation of ambulance services • Integration with 112 emergency service
(d)	Postal services	Army postal service	NA
(e)	Fire services	Limited military firefighting equipment Available	• Automation of fire fighting vehicle services • Integration with 112 emergency service • Sensors for detection of fire
(f)	Waste Manage-ment	Station headquarters	• Door to door collection • Tracking of waste collection vehicles • Attendance of workers • Compost making and making smokeless fuel
(g)	Transport	Very limited e-vehicle facilities available	• Use of e-vehicles • App for tracking and calling e-vehicles • Smart bikes • E-charging stations
(h)	Safety and security	Military police and military authorities.	• CCTV • Sensors for intrusion detection • RFID for personnel and vehicles • Gap detection in perimeter wall/ fencing • Use of drones
(j)	Traffic manage-ment	-do-	• ITMS for traffic control including traffic lights • Multi-level parking
(k)	House, water and electricity bills	MES	• Smart meters linked with app and web portal • Fault reporting, rectification and monitoring • GPS based digital address system
(l)	School buses	Station headquarters	Live tracking and monitoring
(m)	Housing constru-ction and maintenance	Station headquarters and MES	Complaints and repair management system based on mob app and web portal
(n)	Smart poles		• Create awareness by digital signage • Improve mobile connectivity • Smart lighting • Environment data collection

What should MoD and service headquarters do?

It will be appreciated that there are a large number of interventions which are required in each location, and would need detailed planning. There is a need to develop a vision for each station keeping in mind the futuristic requirements as well as operational compulsions.

Step 1 –Based on the above, there

will be a need to prioritise the requirements for each location in consultation with the local military authorities. As it will not be feasible to plan and execute all interventions simultaneously, there will be a need to develop a roll on plan for each location.

Step 2 – It is envisaged that the interventions dealing with the following two aspects would need to be taken up on priority for each location –

Security – to be planned and executed at the local level depending upon the requirements

GIS mapping – This is recommended to be taken up centrally by each service headquarters for all locations.

Step 3 – Allocation of funds to each location for planning and executing interventions as per priorities allocated based on recommendations of local authorities. It may be worthwhile to create a separate fund head for smart projects so that these funds cannot be used/ side stepped for other projects.

It must be ensured by the Ministry of Defence (MoD) and service headquarters that the plan once approved and funds allotted should not be changed, pending with change of authorities. In addition, once funds are allotted the intervention must be completed within the financial year. Most projects are delayed due to change in perception when new incumbents are in chair in between projects.

USE OF DATA COLLECTED

In comparison to data collected by smart cities, the volume of data collected by smart cantts will be quite low due to lesser area and low percentage of population. Nevertheless, the data collected can be made use by ULBs for augmenting their data. The data can be used by ULBs and service headquarters for the following purposes:-

- Comparison of health, environment (pollution levels) data between cantts and rest of the city for analysis as well as planning of green belts within as well as outside the cantts
- Health and incidents/ events data can be used for sociological and demographic studies as well as can serve for comparison with rest of the city
- Planning of amenities/ expansion and redevelopment of cantts by service headquarters
- Predictive data can be used for advance planning and execution of interventions to prevent adverse situations like outbreak of diseases, water shortage, flooding etc
- GIS maps can be used for a host of different requirements, some of which are listed below

- Planning and alignment of infrastructure
- Installation of security arrangements and planning of contingencies in case of terrorist attacks
- Planning of sewage, water, drainage, telecom towers etc
- Land acquisition and land management issues
- Comparison of data for identification of encroachments in and around the cantts

- Inter-cantonment prioritisation for efficient decision making and planning as well as allotment of projects
- Transparency and efficiency in allotment of accommodation, repair and maintenance, budgeting based on predictive data
- Optimisation of resources such as waste collection vehicles, school buses, traffic management etc

CONCLUSION

Every cantt/ military station/ air force station/ naval shipyard or dockyard can be treated as a small town or a mini smart city. Presently, there are no or little smart interventions planned/ executed in these areas but there is a need to develop these as smart. However, in case of field stations, a deliberate decision is needed before executing such interventions as field stations may be temporary.

THERE IS A NEED TO DEVELOP A VISION FOR CANTONMENT, MILITARY STATION, AIR FORCE STATION, AND/ OR NAVAL SHIPYARD OR DOCKYARD KEEPING IN MIND THE FUTURISTIC REQUIREMENTS AS WELL AS OPERATIONAL COMPULSIONS SO THAT TO SEE IT EVOLVING INTO A SMART CITY

– The author is an Indian Army veteran, and has been Principal Consultant to Department of Urban Development, Govt of MP for Smart City Projects. He can be reached at: manoj_42ch@yahoo.co.in

– The co-author is a seasoned management professional, and has been associated with various think tanks in defence and security

COMBATING INDIA'S NEW STRATEGIC CHALLENGES: THE ALTERNATIVES

China-Pakistan dominating PoK, large parts of Gilgit Baltistan and growing proximity between Pak-Afghan terror groups with those of Iraq, Syria and erstwhile Islamic nations of large parts of Central Asia are bigger strategic and security challenges for India

By **SHIBDAS BHATTACHARJEE**


Taliban leaders during US-Taliban Peace Deal in Afghanistan

Present India is undoubtedly the most prominent liberal voice of the continent. However, the potential force of the nation aspires to evolve as a power with proper strategic vision. But strategic affairs keep on changing and hence there is nothing to accept for granted. Prevailing situation in the periphery of India is a classic example of this. Strategic calculus has taken a paradigm shift yet again in this region. Geo-strategic proximity of India with both Pakistan and China has been a matter of multi-pronged challenges for India. Recent developments have increased the magnitude.

For India, US withdrawal from Afghanistan as per new peace agreement between the US and the Afghan Taliban is undoubtedly a potential strategic challenge. Much more concerning reality is: Washington has made Pakistan the most important stakeholder in the Afghan affairs. Thus, Pakistan once again has the opportunity to extend its influence in Afghanistan and erect strong base in that war-ravaged country. This is contrary to the spirit of relationship between India and United States and yet another example of US hypocrisy and dual approach regarding terrorism. The peace agreement has ultimately acknowledged the terror outfit Taliban as the actual representative of Afghan masses.

This is true that United States has been fighting a lost battle in Afghanistan. There has been mounting domestic pressure on the US President to take such drastic step for poll-bound America. But this is because of the American policy that Afghan affair has come to such critical juncture. In the post Taliban regime in Afghanistan, India played productive role both in forms of investment, infrastructure building, professionalising Afghan police and security forces and democratising radical Afghan society. India sacrificed a lot for this. India also contributed in stewarding regional opinion in favour of democratic Afghanistan in the region. India's direct or indirect support to United States in Afghanistan was mostly on ethical ground; democracy striking roots on fertile ground and restricting Pakistan in spreading and misleading Afghan people with terror doctrine. But American action ultimately has done the same what India has been apprehending and trying to restrict.


Iran's Chabahar port

This is but one side of the problem. China-Pakistan all-weather friendship has got enhanced through the China Pakistan Economic Corridor (CPEC). Road and railway link between China and Pakistan through the transit point of Pakistan occupied Kashmir (PoK) region and Gilgit Baltistan will provide China the much aspired accessibility of connecting with the nations of Central Asia through land-route and dominating vast areas of the Indian Ocean Region (IOR) using Gwadar port of Pakistan in the Arabian Sea. Several media reports have indicated that China has already invested a lot in Gwadar port of Pakistan. But CPEC is actually a part China's larger strategic vision.

Now after US withdrawal from Afghanistan and China getting land route accessibility to Afghanistan through Pakistan, India's strategic challenge has become larger. China-Pakistan dominating PoK, large parts of Gilgit Baltistan and growing proximity between Pak-Afghan terror groups with those of Iraq, Syria and erstwhile Islamic nations of large parts of Central Asia are bigger strategic and security challenges for India. But what are the viable options before India? Here India's relation with Iran is very important. Iran shares a large boundary with Afghanistan.

More so, Iran's hostility with United States is much discussed issue. But considering other nations of Islamic world, Iran is different both in tone and trajectory. But the important fact that bears great strategic significance for India is Iran's border disputes with both Afghanistan and Pakistan. All is not that well between Iran and Pakistan as far as border disputes between the two countries are concerned. Iran still claims Persian Dari speaking people living alongside its borders in both Pakistan and Afghanistan its territory.

Also, Iran's stand on terrorism makes the Persian nation a natural ally of India. India needs

INDIA MUST MAKE APPEAL TO THE ERSTWHILE ISLAMIC NATIONS TO MAKE THE POINT CLEAR HOW CHINA IS TACTICALLY LEADING PAKISTAN TO STATE OF VIRTUAL CIVIL WAR. INDIA'S POINT GAINS STRENGTH FROM THE FACT HOW IRAN HAS SUBSTANTIALLY RESTRICTED FOREIGN INFLUENCE IN CHABAHAR PORT DESPITE IRAN-CHINA SPECIAL RELATIONSHIP


US troops withdrawal from Afghanistan

STRATEGIC THREAT


Overview of Gwadar port

INDIA'S STRONG MARITIME PRESENCE IN INDIAN OCEAN REGION (IOR) IS IMPORTANT THAT PROVIDES BOTH SHIELD AND ARM, WHICH HAS THE POTENTIALITY TO DELIVER FOR INDIA'S STRATEGIC NEEDS AND ASPIRATIONS AND SUBDUING THE SINISTER DESIGN OF BOTH UNITED STATES AND CHINA; THE LARGER GAME BEING PLAYED AGAINST INDIA, USING PAKISTAN AND AFGHANISTAN

to take forward this relationship and support Iran's legitimate claim on Baluchistan. India must support Iran vehemently against US war cry and raise the issue on the international forum. India's approach regarding Syria and Iraq must be guided by India-Iran joint co-operation. Iran's special relationship with both Iraq and Syria may be alternative agenda that India can advocate to neutralise the terror factory operating there. Point is: if US undermine India's strategic and security interests, New Delhi must give Washington a clear message that India can go to any extent to subdue US strategic interests in the region and beyond.

As per China's economic corridor with Pakistan is concerned, India must expose China and its oppressive rule against the Muslim community in that country. How China is restricting Chinese Muslims to practice their religion and in place of the holy Quran compelling them to go through communist scriptures must be highlighted which will not only expose real character of China but hypocrisy of Pakistan administration and the army; the self-acclaimed messiahs of global Islamic community.


Afghan Taliban outfit

There is rising grievance, which is taking organised shape in the form of anti-China movement in large parts of PoK and Gilgit Baltistan. India must continue to provide moral support to them. There is fomenting grievance among the fishermen of Pakistan particularly among those of the Gwadar port. China has already taken control of the port which denies legitimate rights of the fishermen to do their age-old earning from the Arabian Sea within the Pakistani nautical boundary across Gwadar port. Similarly, while addressing issues related to Pakistan, India must keep on pointing the hidden Chinese agenda behind providing Pakistan the investment required for the CPEC and developments of ports. India's voice may not sound credible for Pakistanis. In that case, India must make appeal to the erstwhile Islamic nations to make the point clear how China is tactically leading Pakistan to state of virtual civil war. India's point gains strength from the fact how Iran has substantially restricted foreign influence in Chabahar port despite Iran-China special relationship.

However, India's strong point is her dominance in the vast region of the Indian Ocean. Apart from strengthening her naval base, maritime co-operation with Japan and Iran, India must extend her influence in the small island nations of the Indian Ocean. This is the region both US and China are looking to access. India's strong maritime presence in Indian Ocean Region (IOR) is important that provides both shield and arm, which has the potentiality to deliver for India's strategic needs and aspirations and subduing the sinister design of both United States and China; the larger game being played against India, using Pakistan and Afghanistan. ■

- The author is a Guwahati-based strategic affairs expert

INSTABILITY IN WORLD ORDER LEADS TO INCREASE IN DEFENCE EXPENDITURE

The annual publication of the International Institute for Strategic Studies (IISS) - Military Balance that was launched at the Munich Security Conference 2020 gives interesting yet disturbing insights into the current geo-political trends

THE YEAR 2019 witnessed an increase of 4 per cent in global defence expenditureas compared to 2018 - the highest year-on-year increase in a decade. The rise can be attributed to the unstable world order being witnessed in the present scenario.

IN EUROPE, Germany leads in defence spending as it accounts for a third of Europe's increase in defence expenditure. The defence spending in Europe is also on the up and has increasedaround 4.2 per cent as compared to 2018. More money is slowly going into procurement, research and development.

AT THE strategic level, the process of deploying hypersonic glide-vehicles and hypersonic cruise missiles - super fast systems that threaten to overturn calculations about the effectiveness of missile defences is gaining prominence. Both Russia and China appear to be in a rush.

THE GERMAN defence expenditure rose by some 9.7 per cent between 2018 and 2019, yet its short of the NATO target of spending 2 per cent of GDP on defence. Only seven NATO members currently meet this goal: Bulgaria, Greece, Estonia, Romania, Latvia, Poland and the UK.

BOTH THE US and China saw its defence spending increasing by 6.6 per cent in 2019. While growth rate in defence spending is accelerating in the US, it's slowing in China.

IN RESPONSE TO China's rise as a regional superpower,defence spending has been rising in Asia for last few years and the trend continues. In a decade, fuelled by the region's rising levels of GDP the overall defence spending in Asia has increased by 50 per cent.

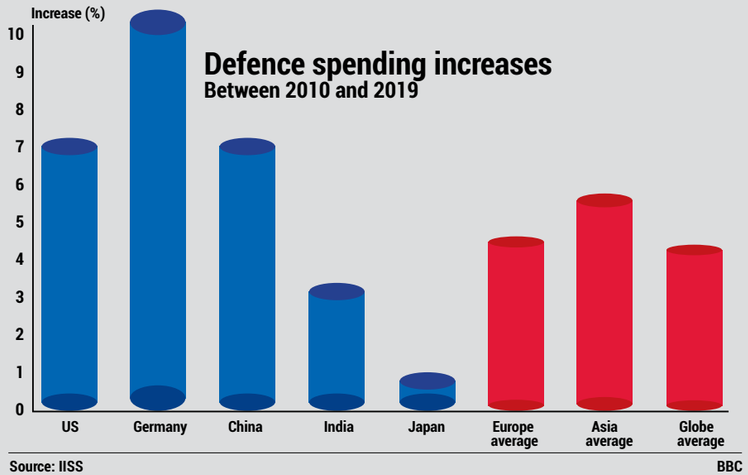
THIS IS all a reflection of a changing world and the return of state-on-state competition. It asserts that defence debates remain dominated by an unstable international security environment. At present, the key elements of the rules based international order that characterised the post-World War II period, are being challenged.

THE UNRAVELLING of the fabric of arms control agreements inherited from the Cold War has set in a nervous look by observers towards both US and Russia to see if the key remaining element of the arms control architecture - the New START Treaty - will be renewed. This expires in less than a year and is the only surviving agreement limiting the strategic arsenals of the two nuclear super-powers.

WITH THE emergence of new approaches / warfare strategies, it is hard to counter these with conventional military responses. Hence, developing the right military and intelligence capabilities, boosting the adaptability and resilience of equipment / military forces and, more broadly, of societies and political decision-making is leading to premium defence expenditure.

IT ALSO points out the significant advances in military technology; systems that are now either entering service or have already made their mark. The relative ubiquity of uninhabited aerial vehicles (UAVs) used now by both state and non-state actors has prompted renewed interest in anti-UAV systems.

CURRENTLY, ONE of the fundamental strategic problems is the concern that "competitor states" are now using "strategies to achieve effect by operating below the threshold of war".Example:Iran's activities and its ability to conduct warfare through third parties; Russia's initial move into Crimea; its denials of involvement in eastern Ukraine; its use of chemical weapons in the UK; and its alleged election meddling.



DARK SIDE OF QUANTUM COMPUTERS - A LURKING THREAT TO NATIONAL SECURITY

Armos uses Quantum Key Distribution (QKD) to provide unconditional protection to data while it is at its most vulnerable–in motion. Using the principles of quantum physics, Armos secures the distribution of symmetric encryption keys

Quantum computing has long promised the next major leap forward in computing power. However, there is a darker side of it having the potential to undermine the foundations of internet privacy and commerce

By **SUNIL GUPTA**

Cryptosystems are designed to cope with the worst case scenarios: an adversary with infinite computing resources can get access to plaintext/ciphertext pairs (and thus could study the relationship between each pair) and knows the encryption and decryption algorithms; so can choose plaintext or ciphertext values at will.

The only element not accessible to this adversary is the secret key; thus the security of a cryptosystem depends solely on the security of the key. This is a long-standing design philosophy first enunciated by Auguste Kerckhoff in 1883 which states: "The security of a cryptosystem must not depend on keeping secret the crypto-algorithm. The security depends only on keeping secret the key."

Today's encryption (secret) keys are highly vulnerable due to many reasons such as weak randomness, advances to CPU power, new attack strategies, emergence of new algorithms such as Shor's, which when run on quantum computers will ultimately render much of today's encryption unsafe. Some of the recent news and disclosures has shown the stark reality and the ugly face of data security.

- Snowden disclosed in 2013 that Government Communications Headquarters (GCHQ), a British agency, has been copying 20 petabytes of data every day off optical fibers around the world under a secret project "Tempora" and had been giving the encrypted data to National Security Agency (NSA).
- A Reuters report in 2013 mentioned that NSA paid $10 million to put its backdoor in RSA encryption such that, the programme had a random number generator, but there were a number of fixed, constant numbers built into the algorithm that could function as a kind of skeleton key. Anyone who knows the right numbers can decipher the resulting crypto text.
- Another recent news with an interesting title, 'The intelligence coup of the "century" shook the world. As per this news, for decades, the CIA and the West German intelligence have been reading the encrypted communications of over 60+ countries, including allies and adversaries for decades.

There are also echoes of crypto in the suspicions swirling around modern companies with alleged links to foreign governments.

While the bright side of powerful QCs will help solve a lot of problems for humanity and will give a huge boost to discovery of drugs, new materials and space research, at the same time the dark side of QCs will accelerate the maturation of the three of global top 10 risks, which are cyber-attacks, data theft or fraud and breakdown of information infrastructure. These global risks will create another sort of havoc by exposing and threatening the leakage of national defence secrets.

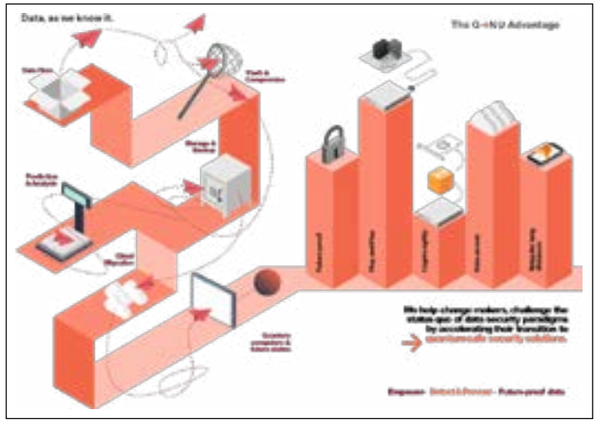
A particular concern is that data encrypted today can be intercepted and stored by state-sponsored hackers or other well-funded hackers for decryption in future by quantum computers. This is known as "Harvest Now Decrypt Later" attack.

Quantum safe technology needs to be adopted to safeguard the hacking of encryption keys. A technology that can address the practical difficulties such as generating long random keys, distributing keys to recipients, sender and receiver to be totally synchronised to make sure that the same keys are used for the same message, and ensuring that keys are never reused.

Quantum key distribution (QKD) is one such technology that addresses all of the above mentioned challenges. It is a key establishment and distribution protocol which creates a shared symmetric key material by using quantum properties of light to transfer information from Alice to Bob in a manner that will highlight any eavesdropping by an adversary. This can be used to derive a key, and the resultant key material can then be used to encrypt plaintext using a one-time pad encryption or using AES to provide unconditional security. QKD is especially good at creating long random keys from a short input – key extension functionality, which could be invaluable for OTPs.

QKD is a unique weapon in the cryptographer's toolbox, albeit potentially powerful, empowering our defence and intelligence organisations with detection and prevention capabilities in case of any attempt of eavesdropping event. Defence can leverage the power of quantum secure solutions in the following applications:

- **QKD for backbone bulk connectivity:** Dynamic and effective key changes on important backhaul OFC links and even tactical bulk communication media in the field.
- **Secure OFC ring networks:** Development of static internet communication networks especially optical fibre ring networks in cantonments and other sensitive areas.
- **Secure internet-based services:** The growing dependency on internet-based service is a potential security threat and the use of strong encryption with QKD presents a viable solution.
- **Generation of a large number of highly random keys:** The keys must be truly random to be effective. True entropy can be achieved by using a quantum source for entropy, called 'Quantum Random Number Generator'.
- **Network-based encryption key distribution and management:** Replacement of out-dated manual key management systems with real time key distribution and management using QKD.



QNu Labs is India's one and only quantum secure communication company offering quantum safe internet and cloud security solutions. QNu Labs offers two products - Tropos (Quantum Random Number Generator) and Armos (Quantum Key Distribution System). These offerings make security of critical data unconditional and future proof. The company's quest has been to offer crypto agility to organisations where the existing infrastructure can be upgraded to quantum secure in a seamless manner without any disruption in the business and any wastage of existing investments. QNu Labs has achieved this by replacing the vulnerable core of data security that relies on the complexity of mathematical algorithms with the unique principles of quantum physics.

QNu Labs is highly passionate and motivated about its mission of accelerating the world's transition to quantum safe security solutions to protect critical data from an imminent Y2Q (Years to Quantum Computers) event, which will bring a 'crypto apocalypse'. The company was selected by MoD to present its unique offering in the India Pavilion of DefExpo 2020 and QNu Labs chose to showcase a use case of "Quantum Channel-based Real-time Key Distribution" along with BEL. The company saw a good footfall with some of the top Indian and foreign defence personnel visiting its booth and discussed the possible solutions of leveraging QNu's technology to create a quantum safe secure network.

–The author is Co-founder and CEO, QNu Labs Pvt. Ltd.

QNU LABS IS HIGHLY PASSIONATE AND MOTIVATED ABOUT ITS MISSION OF ACCELERATING THE WORLD'S TRANSITION TO QUANTUM SAFE SECURITY SOLUTIONS TO PROTECT CRITICAL DATA FROM AN IMMINENT Y2Q (YEARS TO QUANTUM COMPUTERS) EVENT, WHICH WILL BRING A 'CRYPTO APOCALYPSE'

DIFFERENT VERSION OF RIFLES: AN ANALYSIS

Assault rifles were first put into mass production and accepted into widespread service during World War II. As a selective-fire rifle that uses an intermediate cartridge and a detachable magazine, they have innovated further and established themselves as combat proven weapon system. At DefExpo 2020, wide range of assault rifle display by both Indian and foreign companies was a big attraction. *Raksha Anirveda* presents an analysis of top assault rifles available in the global market…..

ISRAEL IWI CARMEL

The Carmel 5.56x45mm caliber assault rifle was unveiled by Israeli firearms manufacturer Israel Weapon Industries (IWI) in June 2019. The IWI CARMEL assault rifle is a combat-proven innovative weapon system, built to be durable and robust.

Caliber: 5.56x45mm
Operating system: Gas-operated
Magazine capacity: 30 rounds
Length: 721 to 806 mm
Barrel length: 267mm, 305mm, 368mm, and 406mm
Weight: 3.3 kg
Rate of fire: 700 – 1,000 m
Effective range: NA

CHINA QBZ-91

This new assault rifle was unveiled at the Chinese army military parade that was held in Beijing on October 1, 2019. This is a new way for the Chinese armed forces using the QBZ-95B, a bullpup-style assault rifle designed and manufactured by the China Ordnance Industries Group Corporation Limited also known as China North Industries Group Corporation Limited officially abbreviated as Norinco. Norinco is a Chinese state-owned defense corporation that manufactures a diverse range of civil and military products.

Caliber: 5.8x42mm
Operating system: Gas-operated short-stroke piston
Magazine capacity: 30 rounds
Barrel length: 10.5" and 14.5"
Rate of fire: 600 to 800 RPM
Length: 710 to 950 mm
Weight: 3 kg
Effective range: 400 m

A brand new enhanced carbine 5.56mm caliber assault rifle M5 was unveiled by the US small arms manufacturer Colt at Bahrain International Defence Exhibition and Conference (BIDEC) in October 2017.

Caliber: 5.56x45
Operating system: Gas-operated
Magazine capacity: 30 rounds
Length: 74.6 mm to 89.53 mm depending of the models
Barrel length: 10.33, 11.5" or 14.5"
Weight: 3.17 kg to 3.6 kg
Rate of fire: 700 to 1,000 RPM
Effective range: 400 to 600 m

UNITED STATES COLT M5

During Defence and Security Equipment International (DSEI) defence exhibition in London (UK) in September 2017, Thales introduced a new generation ambidextrous and NATO interoperable military assault rifle, the F90MBR – Modular Bullpup Rifle, suited to support the modern integrated soldier.

Caliber: 5.56x45mm
Operating system: Semi and fully automatic short-stroke gas piston operated
Magazine capacity: 30 rounds
Length: 396mm
Barrel length: F90 360 653mm / F90 407 701mm / F90 508 802mm
Weight: F90 360 3.15 kg / F90 407 3.25 kg / F90 508 3.39 kg
Rate of fire: 740 RPM
Effective range: 600 m

FRANCE THALES F90MBRA

SERBIA ZASTAVA MODULAR ASSAULT RIFLE

Serbian manufacturer of firearms and artillery Zastava Arms introduced its new modular automatic assault rifle at International fair of armaments and defence equipment PARTNER in Serbia in June 2017. This new weapon is available in 6.5x39mm and 7.62x39mm caliber.

Caliber: 6.5x39mm and 7.62x39mm
Operating system: Gas-operated
Magazine capacity: 20 or 30 rounds
Length: 880 to 945 mm
Barrel length: NA
Weight: 3.66 to 3.7 kg
Rate of fire: NA
Effective range: NA

GERMANY HECKLER & KOCH HK433

The Heckler & Koch HK433 is a modular and compact assault rifle chambered for 5.56×45mm which combines features of the G36 and the HK416 families of assault rifles. The HK433 was designed by Heckler & Koch.

Caliber: 5.56x45 mm
Operating system: Gas-operated
Magazine capacity: 30 rounds
Length: 577 to 843 mm
Barrel length: 280mm
Weight: 3.250 kg
Rate of fire: 700 RPM
Effective range: 500m

CZECH REPUBLIC CZ BREN 2

The CZ BREN 2 is a modular assault rifle designed and manufactured by the Czech company Česká zbrojovka Uherský, which was introduced in 2016.

Caliber: 5.56×45mm and 7.62×39mm
Operating system: Gas-operated
Magazine capacity: 10 and 30 rounds
Length: 807mm maximum
Barrel length: 280mm
Weight: 2.9 kg
Rate of fire: 760 RPM
Effective range: 500m

TURKEY MKEK MPT-76

The MPT-76 is a 7.62mm NATO modular assault rifle designed by Kalekalip and produced by the Turkish defence company MKEK to replace the Turkish army's Heckler & Koch G3 battle rifles. The development of the MPT-76 started in 2007.

Caliber: 7.62x51mm
Operating system: Gas-operated
Magazine capacity: 20 rounds
Length: 920 to 1,020 mm
Barrel length: 12, 16 and 20 inch
Weight: 4.1 to 4.7 kg
Rate of fire: 700 RPM
Effective range: 600 m

THAILAND XT-105

The XT-105 is a refined version of the XT97 unveiled in 2015, the first unit off the production line was gold plated. It features interchangeable 300mm, 360mm, and 450mm barrels.

Caliber: 5.56×45mm NATO and 9×19mm Parabellum
Operating system: Gas-operated, rotating bolt
Magazine capacity: NA
Length: 850 mm (stock extended) / 770 mm (stock retracted) / 580 mm (stock folded)
Barrel length: 370mm
Weight: 4 kg
Rate of fire: 850 PM
Effective range: 600 m

UNITED STATES REMINGTON R4

The Remington R4 is an assault rifle platform based on the AR-15/M16/M4/M4A1 series that is designed and manufactured by Remington Arms and introduced In 2012.

Caliber: 5.56x45mm NATO
Operating system: Gas-operated
Magazine capacity: 30 rounds
Length: 710 to 810 mm
BARREL LENGTH:
- R4 Patrol/Operator/Enhanced: 11.5 in (290 mm)
- R4 Patrol/Operator/Enhanced: 14.5 in (370 mm)
- R4 Patrol/Operator/Enhanced: 16 in (410 mm)
- R4 Patrol: 20 in (510 mm)
Weight: 3 to 3.6 kg
Rate of fire: NA
Effective range: 400 m

POLAND FB MSBS

The FB MSBS Grot is a modular assault rifle developed and manufactured by the Polish defence industry enterprise FB "Łucznik" Radom. This assault rifle was unveiled in September 2014 during the International Defence Industry Exhibition MSPO in Poland.

Caliber: 5.56×45mm NATO and 7.62×39mm
Operating system: Short-stroke gas piston, rotating bolt
Magazine capacity: 30 and 6 rounds
Length: MSBS Grot B 720mm - MSBS Grot C 980mm
Barrel length: 10, 16, 20 inch
Weight: MSBS Grot B 3.4 kg - MSBS Grot C 3.7 kg
Rate of fire: 700 - 900 RPM
Effective firing range: 500 m

The Bullpup Multirole Combat Rifle (BMCR) and Conventional Multirole Combat Rifle (CMCR) were unveiled at the Singapore Airshow in 2014. BMCR and CMCR are assault rifles designed and manufactured by ST Kinetics of Singapore.

Caliber: 5.56x45 mm NATO
Operating system: Semi-automatic, Gas-operated, rotating bolt
Magazine capacity: 10, 20 or 30 rounds detachable
Length: BMCR 645mm / CMCR NAmm
Barrel length: BMCR 14.5" / CMCR 20"
Weight: BMCR 2.9 kg / CMCR 3.8 kg
Rate of fire: 400 to 600 RPM
Effective range: BMCR 400 m / CMCR 520 m

SINGAPORE CMCR ST KINETICS

BELGIUM FN SCAR-L AND FN SCAR-H

Belgian firearms company FN Herstal has designed and developed a full range of assault rifles including the FN SCAR-H chambered in 7.62x51mm NATO caliber and the FN SCAR-L chambered in 5.56x45mm NATO caliber rifles competition.

Caliber: FN SCAR-L 5.56x45mm - FN SCAR-H 7.62x51mm
Operating system: Gas-operated
Magazine capacity: FN SCAR-L 30 rounds - FN SCAR-H 20 rounds
Length: FN SCAR-L CQC 788mm / STD 903 mm – FN SCAR-H CQC 893mm / STD 969 mm
Barrel length: FN SCAR-L 10 and 14.5" / FN SCAR-H 13" and 16"
Weight: FN SCAR-L 3.3 to 3.5 kg / FN SCAR-H 3.7 to 3.9 kg
Rate of fire: 550 to 650 RPM
Effective range: 400 to 500 m

GERMANY SIG SAUER SIG516

The SIG516 is a firearm manufactured by German firearms manufacturer SIG Sauer. The rifle is based on the earlier 5.56×45mm NATO AR-15 and the M16.

Caliber: 5.56×45mm NATO / 7.62×39mm / 7.62×51mm NATO
Operating system: Gas-operated
Magazine capacity: 10, 20 and 30 rounds
Length: 972mm
Barrel length: 16" 406mm
Weight: 3.4 kg
Rate of fire: 800 RPM
Effective range: 550 to 650 m

RUSSIA KALASHNIKOV AK-12

Russia's largest firearms manufacturer Izhmash unveiled in February 2012 a prototype of its new Kalashnikov AK-12 assault rifle with improved ergonomics and tactical flexibility. It is a Russian assault rifle chambered in 5.45×39mm caliber but the rifle is also available in 7.62×39mm caliber, designated as the AK-15.

Caliber: 5.45×39mm and 7.62×39mm caliber
Operating system: Gas-operated long-stroke piston system
Magazine capacity: 30 rounds detachable box magazine - 60 rounds detachable casket magazine - 96 rounds detachable drum magazine from the RPK-16
Length: 945 mm
Barrel length: 415 mm
Weight: 3.3 kg
Rate of fire: 700 RPM
Effective range: 500 to 600 m

SHOWCASE

ITALY BERETTA ARX160A3

The Beretta ARX160 is a modular assault rifle manufactured by the Italian company Beretta. It was developed for the Italian Armed Forces as part of the Soldato Futuro (English: "Future Soldier") and was launched in 2008.

Caliber: 5.56×45mm NATO and 7.62×39mm

Operating system: Gas-operated rotating bolt

Magazine capacity: 30 rounds detachable STANAG Magazine, 100 rounds detachable C-Mag drum magazine (5.56×45mm NATO) and AK-47 or AKM magazines (7.62×39mm)

Length: -11′ barrel **Extended Stock:** 31 in. (78.6 cm) - **Collapsed Stock:** 28.3 in. (72 cm) - **Folded Stock:** 22 in. (56 cm)

-16′ barrel **Extended Stock:** 35.4 in. (90 cm) - **Collapsed Stock:** 33.1 in. (84 cm) - **Folded Stock:** 26.8 in. (68 cm)

Barrel length: 11 and 16 inch **Weight:** 11′ – 3.45 kg and 16′ – 3.5 kg

Rate of fire: 700 RPM **Effective range:** 100 to 600 m

BRAZIL IMBEL IA2

The IA2 is an assault rifle, designed and built in Brazil by the Brazilian defence company IMBEL. It was launched to replace the FAL, M16A2 and HK33 currently in service with the Brazilian Armed Forces. The IA2 is available in 2 calibers.

Caliber: 5.56 and 7.62mm **Operating system:** Gas-operated

Magazine capacity: 20 and 30 rounds according to the caliber

Length: 993 mm (39.1 in) to 740 mm (29 in) IA2 5.56/7.62 caliber

Barrel length: 17.2 in (440 mm) IA2 5.56/7.62 Rifle / 14.5 in (370 mm) IA2 5.56 Carbine / 10.3 in (260 mm) IA2 5.56 CQC

Weight: 3.2 to 3.7 kg **Rate of fire:** 650 to 750 RPM

Effective range: 300 to 600 m

SOUTH KOREA DAEWOO K11

The K11 is a multi-weapon resembling the earlier US Objective Individual Combat Weapon in concept, design and operation. This weapon is designed and manufactured by S&T Daewoo of South Korea.

Caliber: 5.56x45mm NATO

Operating system: Gas-operated, rotating bolt

Magazine capacity: 20 or 30 rounds

Length: 860mm

Barrel length: 310 to 405mm

Weight: 6.1 kg

Rate of fire: 700 RPM

Effective range: 300 to 500 m

GERMANY HK416 A5

The HK416 A5 is a further development of the HK416 assault rifle in 5.56 x 45 mm NATO caliber.

Caliber: 5.56x45 mm

Operating system: Gas-operated

Magazine capacity: 10 – 20 – 30 rounds

Length: 797 to 893 mm

Barrel length: 368mm

Weight: 3.49 kg

Rate of fire: 850 RPM

Effective range: 300 to 600 m

SURPRISED!!

This space belongs to an Indian assault rifle brand /manufacturer that's coming soon hopefully….

LT GEN KANWAL JEET SINGH DHILLON TAKES CHARGE AS DG DIA

New Delhi. Lt General Kanwal Jeet Singh Dhillon has taken over as the Director General of Defence Intelligence Agency (DG-DIA) and Deputy Chief of Integrated Defence Staff, Intelligence (DCIDSI).

Prior to taking over the new assignment, Lt Gen Dhillon was the Commanding Officer of the strategic XV Corps or 15 Corps of the Indian Army.

Defence Intelligence Agency is a department that comes under the Chief of Defence Staff (CDS) in the newly created Department of Military Affairs (DMA). The 57-year-old General officer, who is from the 1983 batch of the Indian Military Academy (IMA), recently handed over the charge of XV Corps to Lt Gen B S Raju. He will be heading an organisation which is responsible for collating technical

as well as human intelligence for the three armed forces, sources said. The DIA was created in 2002 on recommendations of a Group of Ministers (GoMs) which looked into lapses leading to the Kargil intrusion in 1999. The DIA is a nodal agency for all defence related intelligence which collects information technically as well as through satellites to safeguard the interest of the country. The DIA also forms part of the Multi Agency Centre (MAC), an umbrella of organisations which looks into infiltration of terrorists from Pakistan and Pakistan-occupied Kashmir (PoK).

REAR ADMIRAL KRISHNA D SWAMINATHAN APPOINTED WESTERN FLEET COMMANDER

New Delhi. Rear Admiral Krishna D Swaminathan took charge on February 14 as the Fleet Commander of the Western Fleet known as the 'Sword Arm' of the Indian Navy.

The change of command was held at sea onboard the aircraft carrier INS Vikramaditya. The baton of the Flag Officer Commanding Western Fleet was handed over by Rear Admiral Sanjay Jasjit Singh to the new Fleet Commander. Rear Admiral Swaminathan, VSM is an alumnus of the National Defence Academy (NDA), a specialist in Communications and Electronic Warfare, and has commanded frontline warships like INS Vidyut, INS Vinash, INS Kulish, INS Mysore and aircraft carrier INS Vikramaditya.

The Western Fleet has been at the forefront of all naval operations across the Arabian Sea and Indian Ocean Region (IOR) since its inception, consistently executing the military, diplomatic, constabulary and benign roles of the Indian Navy. The Fleet has grown in capacity and capability over the years and presently include the aircraft carrier, multi-role destroyers and frigates, fleet tankers, three air squadrons and integral flights.

Under the command of Rear Admiral Sanjay Jasjit Singh, the Fleet maintained a very high operational tempo, strengthening maritime and energy security, deterrence at sea. It also established Indian Navy's position as a Net Security Provider in the Indian Ocean Region.

REAR ADMIRAL SANJAY VATSAYAN TAKES CHARGER AS EASTERN FLEET COMMANDER

New Delhi. took command of the Eastern Fleet from Rear Admiral Suraj Berry at an impressive Ceremony at Visakhapatnam on February 10. The Eastern Fleet comprising of frontline warships of the Indian Navy are deployed across the indo-pacific region to safeguard the nation's maritime interest.

Rear Admiral Vatsayan is an alumnus of the prestigious National Defence Academy (NDA), Khadakwasla; Defence Services Staff College, Wellington; Naval War College, Mumbai and the National Defence College, New Delhi. The Admiral, who is a Gunnery and Missile systems specialist, has vast experience at sea and ashore.

He has commanded missile vessels Vibhuti and Nashak, the guided-missile corvette Kuthar and has also been the commissioning Commanding Officer of the indigenously constructed state-of-the-art stealth frigate Sahyadri.

Rear Admiral Vatsayan has also held vital appointments dealing with Personnel Policy and Naval Plans at the Integrated Headquarters, Ministry of Defence (Navy). Prior to assuming Command of the Eastern Fleet, he was serving as the Assistant Chief of Naval Staff (Policy and Plans) at New Delhi.

REAR ADMIRAL SANJAY J SINGH TAKES OVER AS COMMANDANT NWC GOACOMMANDER

New Delhi. Rear Admiral Sanjay Jasjit Singh took over as the Commandant of the prestigious Naval War College (NWC), Goa on February 18.

He has held a wide range of operational, training and staff appointments over the past three decades. Prior to this appointment, he was the Flag Officer Commanding, Western Fleet. He was also the lead drafter of Indian Navy's Maritime Doctrine, 2009; Strategic Guidance to Transformation, 2015; and the Indian Maritime Security Strategy, 2015.

He has completed several post graduate study programmes including M Sc and M Phil in Defence and Strategic Studies from Madras University; MA in Defence Studies from Kings College, London and MA (History), M Phil (Political Science) and PhD (Arts) from the University of Mumbai.

RADM RAJESH PENDHARKAR APPOINTED FOST, INDIAN NAVY

New Delhi. Rear Admiral Rajesh Pendharkar, AVSM, VSM assumed charge as the Flag Officer Sea Training (FOST) on February 11.

He is an alumnus of National Defence Academy, and was commissioned into the Indian Navy in January 1987. The officer is a graduate of the Defence Services Staff College, Wellington; Naval War College, Karanja, and Naval Command College, Newport, Rhode Island, US. He holds a Master's Degree in Defence and Strategic Studies. An Anti-Submarine Warfare (ASW) specialist, the Flag Officer has held various challenging staff and command assignments during his distinguished naval career such as commissioning crew of the Off Shore Patrol Vessel INS Subhadra at Masan, South Korea. He also held the rank of Flag Lieutenant to the Flag Officer Commanding Maharashtra Naval Area and instructor at the National Defence Academy, besides the assignments such as ASW Officer of Indian Naval Ships Dunagiri and Ganga, and Analysis Officer in Weapons Analysis Unit.

His other tenures at sea include those as Executive Officer of missile corvette INS Kirpan and missile destroyer INS Mysore, Commanding Officer of missile corvette INS Kora, stealth frigate INS Shivalik and the aircraft carrier INS Viraat. The Flag Officer is a recipient of the Ati Vishisht Seva Medal (AVSM) and Vishisht Seva Medal (VSM) for distinguished service.

REAR ADMIRAL ANTONY GEORGE TAKES CHARGE AS CHIEF STAFF OFFICER (TRAINING), SNC

New Delhi. Rear Admiral Antony George assumed charge as the Chief Staff Officer (Training) at Headquarters, Southern Naval Command in Kochi on February 20.

A graduate from St Stephen's College in New Delhi, the Flag Officer was commissioned into the Indian Navy on July 1, 1987. An Anti Submarine Warfare Specialist, he hails from Alappuzha district in Kerala.

During his illustrious career spanning over 32 years, the Flag Officer has tenanted several important appointments, both at sea and ashore. His major sea assignments include

the Fleet ASW Officer of the Western Fleet, Commands of the Missile Corvette INS Khanjar and the Guided Missile Frigate INS Tarkash (which he commissioned in Kaliningrad, Russia).

The Flag Officer has undergone the Advanced Command and Staff Course in UK and the Naval Higher Command Course at the Naval War College, Mumbai.

On promotion to Flag rank in October 2017, he was appointed as the first Assistant Chief of the Naval Staff (Staff Requirements), the post which he tenanted for over two years.

The Flag Officer is the recipient of the Presidential Awards of Nao Sena Medal (NM) and the Vishisht Seva Medal (VSM).

JAWED ASHRAF TO BE INDIA'S NEW ENVOY TO FRANCE

New Delhi: Jawed Ashraf who is currently Indian High Com missioner to Singapore was on February 26 appointed India's next Ambassador to France. Ashraf, a 1991-batch Indian Foreign Service officer, is "expected to take up the assignment shortly," the Ministry of External Affairs said. He succeeds Vinay Mohan Kwatra as Indian Ambassador to France, considered a crucial posting in view of rising strategic ties between the two countries. Kwatra has been appointed Indian Ambassador to Nepal.

RAFAEL APPOINTS GLIKMAN AS NEW HEAD OF R&D AND ENGINEERING DIVISION

TEL AVIV. RAFAEL Advanced Defense Systems Ltd has appointed Executive Vice President Dr Zach Glikman as head of its R&D and Engineering division. Glikman is replacing another EVP Dr Ran Gozali who has recently been appointed as head of the company's Land and Naval Systems division. Dr Glikman (52 years old) holds BSc, MSc and PhD degrees in mechanical engineering from Israel's Technion. He joined RAFAEL in 1996 and has served in various senior managerial and technological roles. In the last five years he has served as head of RAFAEL's Ordnance Division. RAFAEL's R&D and Engineering division is made up of some 3,000 engineers, researchers and scientists from a variety of disciplines, including computer

software, image processing, mechanics, electronics, aeronautics and more. RAFAEL's President and CEO Maj Gen (Retd) Yoav Har-Even stated that Glikman's experience and managerial skills will lead the division forward in reaching its goals and in continuing to give RAFAEL the technological leadership necessary to achieve its business objectives and provide its users with an operational advantage..

LOCKHEED MARTIN GETS NEW PRESIDENT AND CEO

Washington: World's leading defence company Lockheed Martin will have a new top executive from June this year as it announced on March 16 that James Taiclet, 59, has been selected as President and CEO of the company succeeding Marillyn Hewson. Though Taiclet has been a member of Lockheed's board since 2018, but had not worked directly inside the company before. He has served as Chairman, President and CEO of American Tower Corporation, a wireless and broadcast communications infrastructure company based in Boston, Massachusetts since 2004. Previously, he worked as President of Honeywell Aerospace Services and Vice President of engine services at Pratt & Whitney. Taiclet is also a retired US air force officer, whose

biography cites more than 5,000 flying hours, including as part of the first Gulf War.

"I know it is the right time to transition the leadership of Lockheed Martin. The corporation is strong, as evidenced by our outstanding financial results last year and a record backlog of business. We have a bright future — particularly with Jim and our outstanding leadership team at the helm," Hewson said in a statement. Hewson took over the company in 2013, the first woman to lead Lockheed. Her ascension came as a surprise following the sudden removal of then-Chief Operating Officer Chris Kubasik, who had been in line for the top job. Since coming into power, Hewson successfully guided the company through the US budget sequestration and a major acquisition of helicopter manufacturer Sikorsky, along with getting the F-35 fighter programme largely on track.

AMITABH BHATT TAKES OVER AS CEO OF HAL BENGALURU COMPLEX

Bengaluru. Amitabh Bhatt has taken over as Chief Executive Officer (CEO) of HAL's Bangalore complex. Earlier, he was heading the Light Utility Helicopter (LUH) project as Executive Director.

Bhatt is a Post Graduate in Management and served in SKF India Limited for 15 years before joining HAL. With his 32 years of professional experience in HAL, he spearheaded marketing, planning and projects. He led the team as Chief of Projects (LUH), played a key role in setting-up an integrated new helicopter factory, a Rs 3000 Crore greenfield project. Bhatt is a Director on Board of HAL's Joint Venture, 'Indo Russian Helicopters Limited', formed to build Kamov KA-226T helicopters for defence services. During his stint at helicopter division, helicopters were delivered to ONGC, Geological Survey of India and Government of Jharkhand and exported to Nepal, Surinam, Mauritius and Ecuador.

NAVANTIA OFFERS S-80 PLUS SUBMARINE DESIGN FOR NAVY'S P-75 (I) PROGRAMME

Navantia has positioned itself as a serious contender with its S-80 offering for P-75 (I) submarine programme

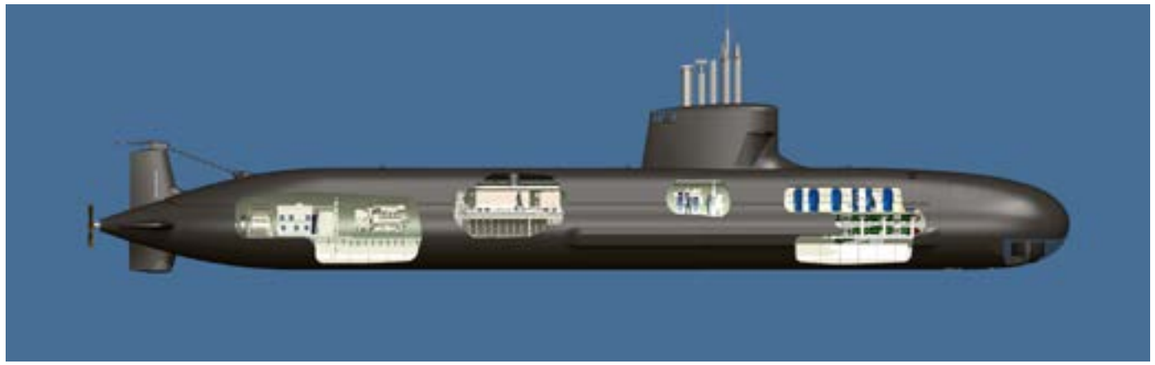
London. Spanish state-owned high technology military and civilian vessels manufacturer Navantia has offered a design derived from its S-80 Plus Submarine to the Indian Navy for its P-75 (I) submarine programme. It may be noted here that the Indian government in January 2020 had shortlisted two Indian shipyards and five foreign defence companies for P-75I project under which six conventional submarines would be constructed/ manufactured domestically here in India.

The two local shipyards shortlisted are the privately owned L&T Group and state-owned Mazagon Dock Shipbuilders Limited (MDL). However, the five foreign defence companies are Daewoo Shipbuilding and Marine Engineering DSME from South Korea, Spanish Navantia, Naval Group from France, Rubin Design Bureau from Russia and ThyssenKrupp Marine Systems TKMS of Germany. The Spanish naval major had recently participated in 'Underwater Defence & Security 2020' (UDS 2020) which was held in Southampton, London from March 3 to 5.

Speaking on the characteristics and capacities of S-80, Cartagena Shipyard Engineering Director Germán Romero Valiente said it is a unique product in the international market for its size and capacity, thanks to its Air Independent Propulsion (AIP) system.UDS 2020 witnessed a record participation of attendees and lecturers from 36 countries, and in this occasion Navantia has been able to report on progress of the S80 Plus submarine programme, both from the constructive point of view, as of a robust design that makes it suitable for export.

During the UDS 2020, Navantia was also invited to a panel of experts where future trends in rescue and underwater rescue were discussed.

At present, the first submarine in the series has passed the hull closure milestone, and is scheduled to be floated at the end of 2020, tested during 2021, and delivered to the Spanish Navy in 2022. The AIP system has been developed specifically for the project by the Spanish company Abengoa (bioethanol reformer) and the American Collins Aerospace (fuel cells). The AIP system is much more versatile and efficient than others on the market.



RAFAEL POSTS RECORD SALES OF US$2.7 BILLION IN 2019, UP 3.9% FROM PREVIOUS YEAR

TEL AVIV. RAFAEL Advanced Defense Systems Ltd posted record sales of US$2.7 billion (9.7 billion Shekels) in 2019, which is an increase of 3.9 per cent compared to the corresponding period in the 2018, the company financial results released on March 26 said. The financial results released amid global Covid-19 crisis said the company's orders totalled US$2.8 billion (10 billion Shekels) with record high export orders including a backlog order of US$7.2 billion (24.8 billion Shekels), which is equivalent to 2.5 sales years, despite the significant depreciation in the dollar- and euro-to-shekel exchange rates.

Dr Uzi Landau

Notably, in 2019 the company handed over a dividend of some 500 million Shekels to the Israeli government. In 2019, RAFAEL continued to press ahead with extensive marketing and business activities in Israel and around the world, including the acquisition of UAV manufacturer Aeronautics and other companies, as well as numerous other activities. Speaking on the occasion, RAFAEL President and CEO Maj Gen (Retd) Yoav Har-Even said: "As RAFAEL concludes the 2019 fiscal year, in addition to its significant contribution to developing and providing defense technologies, it is also engaged in the effort to find solutions for the COVID-19 and against its spread.

We are certain that the company's financial robustness will ensure its ability to face the coming uncertainties and challenges. These days, thanks to adequate preparation, we are able to carry out our work, while adhering to the Ministry of Health's directives, and to maintain our commitments, with the relentless hard work of our outstanding men and women who consider this effort their mission."

The reason behind the strong financials is that in the past year, RAFAEL made a number of other significant achievements including the sale of two Iron Dome batteries to the US Army, and an on-time delivery of the US Army's first TROPHY Active Protection Systems. In addition to that RAFAEL received an urgent order from India for the supply of SPIKE missile systems and a major order for SPIKE from Germany while expanding its SPIKE user-base to 34 nations in 2019.

The company signed a number of important JVs, and posted an increase in the number of users of its Litening Pod. Domestically, RAFAEL won a strategic contract for a multi-domain project with the Israeli MOD, and was also awarded the Israel Defense Prize for its SPICE 1000 air-to-surface system.

RAFAEL's investment in its manpower continued in 2019 recruiting over 800 new employees primarily in technological fields with nine per cent of its sales channelled to R&D of defence and civilian technologies, which also entailed vast cooperation with academic bodies in Israel and around the world.

Dr Uzi Landau, Chairman of RAFAEL said, "Our human resource is the engine that propels us to achieve our mission and our vision to find new solutions and breakthroughs and to fulfill our goals, all while dealing with the newly-imposed reality. The dedication of our men and women, those at home and those who are still attending work, and the commitment that we as management have towards them, are the secret behind our force and our ability to cope with the impact of COVID-19."

Yoav Har-Even

FINANCIAL RESULTS BREAKDOWN:

CATEGORY	RESULT 2019	RESULT 2018
Net Profit after taxes	$111m (397 million Shekels)	$133m (479m Shekels)
Sales	$2,723m (9,70 million Shekels)	$2,592m (9,319m Shekels)
Orders	$2,823m (10,064 million Shekels)	$2,639m (9,488m Shekels)
Order Backlog	$7,173m (24,790 million (Shekels)	$6,780m (25,411m Shekels)

HAL RECORDS TURNOVER IN EXCESS OF OVER ₹21,100 CRORE

Compared to the corresponding period of the last fiscal, HAL has posted a robust turnover and received an appreciation from the Defence Ministry

Bengaluru: Defence Public Sector Undertaking (DPSU) Hindustan Aeronautics Limited (HAL) recorded a turnover of over Rs 21,100 crores (provisional and unaudited) for the financial year ended March 31, 2020 (corresponding figure for the previous year was Rs 19,705 crores). The Company has posted a revenue growth of around seven per cent during 2019-20 for the second consecutive year, post listing as compared to 3.8 per cent during 2017-18.

The encouraging performance of the company in 2019-20 has been achieved in-spite of difficulties in cash flows, interruptions in operations due to workmen agitation and the interruption arising in the month of March 2020 due to COVID-19 lockdown which has affected the final tests and certification of certain additional aircraft that were under final stages of production.

This sustenance in financial performance during current financial year is in wake of production of 31 new aircraft and helicopters and 117 new engines and overhaul of 199 aircraft and helicopters and 490 engines.

HAL has managed to sustain the growth rate and turnover in the current circumstances due to uniform production and project execution measures put in place by the company.

R Madhavan, CMD, HAL

During the financial year the company, besides achieving all the physical and financial targets, has also been maintaining uninterrupted supplies and services to the defence forces in-spite of various constraints including cash flows. This has encouraged it to focus more on cost optimisation measures including indigenisation of various components, increasing outsourcing efforts and rationalisation of manpower, said R Madhavan, CMD, HAL.

He said more dedicated efforts are being made towards meeting the current and future requirements of customers.

This strategy will also help HAL to be on the growth track in meeting the expectations of the shareholders further, he said.

HAL has produced 13 new Advanced Light Helicopters (ALHs) against the contract of 40, out of which three were produced ahead of schedule for the Indian Army. The first helicopter for Indian Coast Guard is ready and awaiting customer trials at Cochin which should have been completed but for the outbreak of Covid-19. The complete test equipment is already positioned to ensure commencement of trials immediately after the situation improves. All the new systems for CG are ready and bulk of the trials are already completed satisfactorily and have met customer requirements.

The first LCA-Tejas FOC standard aircraft also completed its contract flight test acceptance within 12 months of the standard of preparation release in February 2019. The aircraft is ready for delivery once the operations resume likely in April 2020.

The glass cockpit of Dornier-228 is an important business portfolio for the future and is expected to get HAL more revenues in the years to come. The avionics upgrade of Hawk and Su-30 MKI and BRAHMOS missile modifications would be a game changer and is important for the Defence Public Sector Unit (DPSU).

HAL has completed production of all Su-30 MKI contracted to it by Indian Air Force during the current year and is expecting to get few additional orders for Su-30 MKI. With this and the expected order for 83 MK1A Light Combat Aircraft (LCA) which is cleared by Defence Acquisition Council (DAC) and 15 Light Combat Helicopter (LCH) limited series production aircraft, which is in final stages of discussion, the order book is likely to attain a healthy position during the next financial year 2020-21.

Further to support the government, it has already contributed a sum of Rs 26.25 crores towards PM CARES Fund, and are paying the salaries of daily wage earners throughout the company in advance to support the needy in this hour of acute crisis.

TATA OPENS DEFENCE SUBSIDIARY NOVA

New Delhi. Tata Sons' subsidiary Tata Advanced Systems Limited (TASL) has opened it's defence subsidiary NOVA Integrated Systems Limited (NISL) in Hyderabad on March 12 bringing five new defence projects. The defence projects of NISL include mobile command and controls for Indian Army, mobile VSAT communication shelter, radar and microwave component manufacturing, electro optics and electronics manufacturing and R&D and prototyping facilities. This will create direct employment to 600 people and help the local defence supply chain to grow.

Speaking at the ground breaking ceremony of NISL, Telangana IT and Industries Minister KT Rama Rao said, "I am glad to be here for the ground-breaking ceremony of NOVA Integrated Systems Limited (NISL), the defence subsidiary of TASL. The growth of TATA group companies in Hyderabad during the past decade and in particular the past six years has been phenomenal. We are glad that you chose Hyderabad to host over 90 per cent of TASL aerospace manufacturing and continue to further invest in our ecosystem." He acknowledged TATA group's contribution in bringing marquee global OEMs such as Sikorsky, Lockheed Martin, Boeing and GE Aviation to Hyderabad. The projects have been instrumental in making Hyderabad a preferred destination for global OEMs for Make in India aerospace and defence, he added. Hyderabad has been a defence hub with over a dozen large Defence Research and Development Organisation (DRDO) labs and home to several Defence Public Sector Undertakings (DPSUs). "We also have a strong private sector defence industry comprising of 25 large companies and over 1,000 MSMEs catering to defence and aerospace sector," he said.

MOD MULLS DEPLOYING INDEPENDENT MONITORS TO DECIDE ON CONTRACT WINNER FOR SPAD GUN MISSILE

New Delhi. The Indian Ministry of Defence (MoD) is mulling to deploy independent monitors to prepare a report and submit it on the Self Propelled Air Defence Gun Missile System (SPAD-GMS) deal. "Russia had raised objections to the short listing of the South Korean company Hanwha Defense's offer for the Self Propelled Air Defence Gun Missile System project. Companies from Russia and South Korea had responded to the request for proposal for this platform. However, no decision has been taken yet as Russia has raised its concerns with the Indian side," officials in the know said.

"During the recently concluded DefExpo 2020, an announcement was expected to be made about the winner of the contract," they said.

To ensure that all the steps have been followed and concerns raised by those who could not be shortlisted, the Ministry decided to have independent monitors to prepare a comprehensive report and outline the concerns if any.

Of the five bidders, only Russia and South Korea made it to the stage of trials. However, Russia failed the trials and this left South Korean company in the fray creating a single vendor situation.

The deal is for around US$3 billion. However, those who could not clear the trials have been reaching out to the MoD expressing concerns against the South Korean company. Issues related to the non-compliance to the specifications in the RFP have been pointed out in several representations made by the Russian side in various meetings.

The Russians indicated that the system offered is one generation older and will have to go for an upgrade immediately.

However, the South Korean company Hanwha Defense officials have denied such reports.

"The system is in compliance to the specifications mentioned in the RFP — Hybrid Biho, which is an improved version of the original Biho mobile air-defence system. It features upgraded firing capability, newer sensors, and other improved devices," they say.

"Also, it has an electro-optical sights fire control system too, and the system can detect low-flying aerial targets, including drones or UAS, as tests and evaluations were successfully taken for the sale of the systems to some other countries," officials added.

According to sources some companies claimed that the major issue which was raised stated that the K-30 Biho (Flying Tiger) twin 30mm short-range mobile self-propelled anti-aircraft system has no fire control radar.

Also that it has offered 2D Doppler radar – not in line with the RFP. And it is old and outdated.

Though the independent monitors will be preparing their own observations in a report.

The Indian Army is planning to replace its 1360 obsolete Bofors L 70 40mm single barrel and Soviet-era ZU-23-2 towed 23 mm twin-barrel weapon systems.

In response to a global tender in 2013, upgraded Tunguska system was fielded by Almaz Ante and Pantsir by KBP Tula systems from Russia went in for trials and failed. South Korea's Hanwha Defense — Hybrid Biho system was found to be not fully compliant, which the company denies.

But, sources in the Indian Army observed that there were shortcomings in both the systems offered by the Russian as well as what was offered by the South Korean side.

ROSTEC DEMONSTRATES 155MM MSTA-S HOWITZER DEVELOPED BY URALVAGONZAVOD

New Delhi. Rosoboronexport and UralVagonZavod (UVZ), both part of Rostec State Corporation, have for the first time demonstrated the combat capabilities of the 155mm Msta-S self-propelled howitzer. The demonstration of the self-propelled gun system to Middle Eastern customers took place at the Nizhny Tagil Institute of Metal Testing's (NTIIM's) Staratel Proving Ground. During the tests, the Msta-S SP howitzer hit all its targets and performed all planned manoeuvres.

The Msta-S, developed at the initiative and with the participation of Rosoboronexport, uses a NATO standard 155mm gun and is designed to destroy artillery and mortar batteries, tank columns, command & control and reconnaissance posts.

"This combat vehicle has powerful artillery armament and road performance that are not inferior to modern armoured vehicles. It is equipped with advanced communications, satellite navigation and surveillance systems. During the tests, the Msta-S showed excellent results in target engagement using an automated fire control and the Orlan-10E unmanned aerial reconnaissance system.

I'm sure that our Middle East partners were able to see once again the advantages of the Russian military equipment," said Viktor Kladov, Director for International Cooperation and Regional Policy at Rostec.

The Msta-S self-propelled howitzer can be successfully used against fortifications and field depots, manpower and firearms in strong points and at deployment lines, air defense, missile defense and electronic warfare assets. The howitzer is capable of firing including also at sea targets within their reach.

Today Russia's 155mm Msta-S self-propelled howitzer manufactured by Uraltransmash is steadily taking its place among artillery systems of the most common caliber worldwide. In terms of cost performance, it significantly outperforms competitors presented on the world market.

In addition, it has characteristics comparable to those of similar howitzers, and surpasses them on a number of items. We are expecting the Msta-S will be of considerable interest to countries in the Middle East, Africa and the Asia-Pacific region," added Alexander Mikheev, Director General of Rosoboronexport.

The 155mm Msta-S self-propelled howitzer is equipped with an automatic laying and fire control system, a thermal imaging sight coupled with a laser rangefinder, observation devices, a muzzle velocity radar, loading mechanisms, mechanized charge stowage, mechanisms for feeding projectiles and charges from the ground, and a 12.7 mm machine gun mount.

It is also fitted with communications equipment, two filtration units, a self-contained power supply and air conditioning unit, electrical equipment, a hydraulic system and a gun loading control system. Satellite navigation equipment is used to locate the self-propelled howitzer in a given coordinate system. The fighting compartment meets all modern ergonomic requirements.

"Our partners have praised the combat capabilities of the new artillery system. The howitzer showed excellent results. Firings with automatic realignment were also carried out during the firing tests. Field tests showed the reliability and effectiveness of the Russian gun and substantiated the claimed specifications," said Alexander Potapov, Director General of UralVagonZavod.

HAL CONDUCTS FIRST FLIGHT FOR FOC OF LCA TEJAS

New Delhi: In a major development for the indigenously-developed Light Combat Aircraft (LCA) Tejas, Hindustan Aeronautics Limited (HAL) on March 17 conducted first flight for final operational clearance (FOC) standard (SP-21) variant of the fighter jet. The test flight was conducted for 40 minutes. The flight, piloted by Air Cmde KA Muthana (Retd), took-off from HAL Airport in Bengaluru at around 1230 hours.

The FOC-standard Tejas is equipped with several advanced features such as Air-to-Air refueling, Beyond Visual Range missile system. It has a lot of manufacturing improvements which were based on the operational feedback of initial LCA fleet with IAF.

This would pave way for production of remaining 15 fighters from the FOC block, which are planned to be delivered during the next financial year. This signifies exemplary team work between various stakeholders of the LCA Tejas programme such as HAL, Directorate General of Aeronautical Quality Assurance, Centre for Military Airworthiness and Certification, Indian Air Force and Aeronautical Development Agency, HAL CMD, R Madhavan said.

"HAL achieved the momentous feat within a record time of 12 months after release of Drawing Applicability List (DAL) and SOP (Standard Operating Procedure) by CEMILAC", the statement said.

MODERNISATION OF ORDNANCE FACTORIES AS PER COMPREHENSIVE MODERNISATION PLAN PREPARED BY OFB

New Delhi. Modernisation of Ordnance Factories has been carried out in the last decade by procurement of state-of-the-art machines as per the Comprehensive Modernisation Plan for the 11th and 12th Five Year Plan prepared by Ordnance Factory Board (OFB) leading to induction of new and modern technologies available globally, Rajya Sabha was told.

To keep pace with the contemporary manufacturing technologies, OFB now prepares an annual investment plan towards modernisation of its existing plant and machineries and other infrastructure, Minister of State for Defence Shripad Yesso Naik said.

The Government has taken a number of steps to strengthen the functioning of OFB including delegating enhanced financial powers for Revenue and Capital procurement in September, 2016.

OFB has been granted Approval-in-Principle by the Government for capital procurement of plant and machinery for up-gradation and modernisation with estimated cost of about Rs 1,727 crores since September, 2016.

The Minister said state governments of Uttar Pradesh and Tamil Nadu have so far acquired 1,182 hectares and 1,537 hectares for defence industrial corridors respectively. The Government has taken several steps to bring in critical technologies and modernise the defence industry in the country.

Foreign Direct Investment (FDI) policy has been revised and under the revised policy FDI is allowed under automatic route up to 49 per cent and beyond 49 per cent through government route wherever it is likely to result in access to modern technology or for other reasons to be recorded, the Minister said.

He said one approval for 100 per cent FDI inflow has been given till date. Government has issued 464 licenses till February, 2020 for manufacture of a wide range of defence items to Indian companies, out of which a total of 238 licenses have been issued since the launch of the 'Make in India'.

The Ministry of Finance has allocated Rs 1,13,734.00 crore for BE 2020-21 under Capital Outlay on Defence Services, which is an increase of Rs 10,339.69 crore over BE 2019-20 allocation and Rs 3,339.69 crore over RE 2019-20 allocation. In RE 2019-20 Rs 7,000 crore increase has been given reversing the trend of no allocation or reduced allocation at RE stage.

OFB EXPORTED TWO 52 CALIBRE BARRELS TO SWEDISH COMPANY BOFORS

New Delhi: Ordnance Factory Board (OFB) said it has exported two 52 calibre barrels to Swedish arms manufacturer Bofors AB from which it had imported 155 mm howitzer guns in the mid-1980s. In the last 14-15 years, the OFB has done "immense progress" in the field of high-calibre barrels, be it for tanks, medium and heavy artillery guns, and the barrel of Dhanush artillery gun has been indigenously developed, OFB Chairman Hari Mohan said.

The OFB, which celebrated its 219th foundation day on March 18, has exported its newly developed 52-calibre barrel for 155 mm artillery guns to Bofors Test Centre, he said. Mohan said that OFB has exported two 52-calibre barrels to Swedish arms manufacturer Bofors AB, from which it had imported 155 mm howitzer guns in the mid-1980s.

"We have made a prototype which is truck-chassis mounted," Mohan told the media in New Delhi.

"Now we are embarking upon a barrel further increasing it to 52-calibre. The range of 155 mm Dhanush gun is 38 km. The Bofors gun barrel is 39-calibre, while that of Dhanush is 45-calibre," he said. The OFB Chairman said the OFB has already designed and manufactured 52-calibre barrel, an important component of a full-fledged gun, and mounted one on a truck.

"We have exported these to Bofors and 52-calibre barrels have been taken by its test centre, which is using these for validation of 155 mm ammunition being developed by global OEMs," he said. More than 150 rounds of shells have been fired from these 52-calibre barrels, he said.

"The barrel is behaving better than expected and the Bofors Test Centre is extremely happy," he said.

Apart from the barrel, Bofors is also taking the breech mechanism and muzzle brakes and all the three are being used, he said.

"We indigenously developed the technology for 155mm/52-calibre barrels and exported these to Bofors Test Centre," OFB chairman said. He said the OFB, which had initially handed over six Dhanush artillery guns to the Indian Army will in a few weeks supply another six such guns.

HAL HANDS OVER 50TH SET OF L-40 STAGE OF GSLV TO ISRO

Bengaluru. Defence Public Sector Undertaking (DPSU) Hindustan Aeronautics Limited (HAL) handed over the 50th L-40 stage of Geo Synchronous Launch Vehicle (GSLV-MKII) to Indian Space Research Organization (ISRO) at a programme in Bengaluru on February 28.

This L-40 stage is meant for GSLV MKII- F12 Flight planned by ISRO in August 2020. The Aerospace Division of HAL has so far integrated and supplied L-40 stages for 12 flights of GSLV MKII including the GSLV MKII -F10 flight planned in the first week of March-2020.

Apart from the Integrated L-40 stages, HAL is manufacturing the riveted structures, propellant tanks, feedlines of PSLV, GSLV MKII and GSLV MKIII launch vehicles and structures of various satellites for ISRO.

HAL is one of the most reliable partners of ISRO for the past three decades, and has contributed and participated in almost all of ISRO's ambitious projects namely Chandrayaan-I, Chandrayaan-II, Mangalyaan and upcoming projects like Gaganyaan.

Amitabh Bhatt, CEO-BC, Dr. V. Narayanan, Director-LPSC of ISRO, Dr. A Manimaran, Dy. Director (MME, LPSC), Mr. Mihir Mishra, General Manager (HAL Aerospace Division) and other officials of ISRO and HAL were present on the occasion.

THYSSENKRUPP, EMBRAER AND ATECH INK CONTRACT TO BUILD SHIPS FOR BRAZILIAN NAVY

Contract includes a sustained transfer of technology in naval engineering for building military ships and combat and platform management systems

Rio de Janeiro: Emgepron, an independent state company under Brazilian Ministry of Defense and Águas Azuis, a company created by ThyssenKrupp Marine Systems, Embraer Defense and Security and Atech, inked a contract for building four state-of-the-art Tamandaré Class Ships with deliveries scheduled between 2025 and 2028.

The construction will take place 100 per cent in Brazil, and is expected to have local content rates above 30 per cent for the first vessel and 40 per cent for the others. ThyssenKrupp will supply the naval technology of its proven MEKO® class shipbuilding platform of defence vessels that is already in operation in 15 countries.

Embraer will integrate sensors and weaponry into the combat system, bringing also to the programme its 50 years' experience in systems technology solutions and in-service support.

"We are grateful to participate again in such important milestone in the history of Brazil's naval defence with the most advanced ships in their class. Looking back the great achievements we had since the construction of Tupi Class submarines in 1980s, it is a recognition of the technological excellence, reliability and longevity solutions we have offered for almost two centuries. The Tamandaré Class Programme will strengthen our ties by transfering technology and generating highly qualified jobs for the country," said Dr Rolf Wirtz, CEO of ThyssenKrupp Marine Systems.

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Besides construction, the contract includes a sustained transfer of technology in naval engineering for building military ships and combat and platform management systems, as well as integrated logistical support and lifecycle management.

The Tamandaré class programme has the potential to generate direct and indirect job opportunities of high level of qualification. It provides for a solid national partnership model with proven ability to transfer technology and qualify local labour, which guarantees the development of future strategic defence projects in Brazil.

The naval alliance between ThyssenKrupp Marine Systems and Embraer Defense and Security can also enable creating a base for exporting naval defence products from Brazil.

INDIGENOUS DEFENCE EQUIPMENT MANUFACTURERS WITNESS HUGE INCREASE IN CONTRACTS

New Delhi: There has been considerable rise in the contracts given to indigenous vendors in defence sector touching 75.03 per cent in 2019-20 from 39.06 per cent in 2015-16, Rajya Sabha was told on March 16.

Replying to a question, Minister of State for Defence Shripad Naik said that up to January 31 this year for the 2019-20 indigenous manufacturers got contracts worth Rs 57,834.89 crore while in 2015-16 (Rs 47,877.29 crore), 2016-17 (Rs 94,559.53 crore), 2017-18 (Rs 40,690.97 crore) and 2018-19 (Rs 80,413.56 crore). During the last five years 2015-16 to 2019-20 (up to January, 2020), 158 contracts have been signed with Indian vendors and 100 contracts were signed with foreign vendors for capital procurement of defence equipment for Armed Forces, the Minister said.

The defence equipment procured from Indian vendors over the last five years includes Helicopters, Radars, Electronic Fuzes, Bridges, Ballistic Helmets, Bullet Proof Jackets, TI Sights, Rocket launchers and Vehicles.

The defence equipment procured from foreign vendors over the last five years includes Helicopters, Aircraft, Search and Rescue Equipment, ULH, Air Defence Radars and Systems, Assault Rifles and Rockets.

Over 200 partnerships involving Signing of Memorandums of Understanding (MoUs), Transfer of Technology (ToT) and product launches were concluded during DefExpo 2020.

These include 14 MoUs signed at the Fifth India-Russia Military Industrial Conference between Russian defence companies and Indian companies under the framework of Inter Government Agreement (IGA) between the two countries. The signing of MoUs/ToTs are a step in the direction to achieve the target of Rs 35,000 crore defence exports target in next five years.

This edition received unprecedented response with 1000+ exhibitors, 35+ Foreign Defence Ministers and over 12 lakh visitors.

GRSE DELIVERS 4TH ANTI-SUBMARINE WARFARE CORVETTE 'YARD 3020'

Kolkata. Garden Reach Shipbuilders and Engineers Ltd (GRSE), a leading warship builder and Miniratna Category 1 company under the administrative control of the Ministry of Defence (MoD) delivered Yard 3020 (Kavaratti), to the Indian Navy on February 18. The ship is the 104th Warship built and delivered by GRSE since its inception in 1960 and is the last in the series of four Anti-Submarine Warfare Corvettes (ASWC) under the Project 28.

"Kavaratti" was handed over by Rear Admiral VK Saxena, IN (Retd), Chairman & Managing Director, GRSE to Cdr Sandeep Singh, Commanding Officer (Desig) of the ship, in the presence of Cmde DK Goswami, CEO, Chairman, D448 Eastern Naval Command, SS Dogra, Director (Finance), Cmde Sanjeev Nayyar, IN (Retd), Director (Shipbuilding) and Cmde PR Hari, IN (Retd), Director (Personnel) and other senior officials of Indian Navy and GRSE.

The frirst three ships of the series, INS Kamorta, INS Kadmatt & INS Kiltan were delivered earlier and now form an integral part of Eastern Fleet of the Indian Navy. The P28 class of ships strengthens the Indian Defence System and is the shining armor in the "Make in India" programme.

The first three Anti-Submarine Warfare Corvettes built by GRSE have been creating waves across the world since their induction to the Indian Navy, having participated in several Overseas Operations and International Maritime Exhibitions at Malaysia, Singapore and other countries including International Fleet Reviews.

The third Anti-Submarine Warfare Corvette, INS Kiltan recently participated in the prestigious Exercise Malabar 2019, an endeavor to strengthen India-Japan-US Naval Cooperation and enhance inter – operability. With 90 per cent Indigenous Content, equipped to fight in Nuclear, Biological and Chemical Warfare conditions, featuring the integration of a host of weapons and sensors, the P28 Class of ships is yet another milestone in the journey towards self – reliance and Make In India. These Anti-Submarine Warfare Corvettes have catapulted the Indian Navy into the Elite Club of building Stealth Ships.

The "X" form of the Hull and Super Structure gives very Low Radar Cross Section and special design of propulsion system minimises Radiated Underwater Noise. The Stealth features make the ships almost invisible to the enemy both above and below the sea surface.

The Kamorta class of Corvettes are designed to be equally effective in the littorals as well as in the deep oceans. These class of ships have been designed as an extremely versatile ASW Platform capable of neutralising the enemy submarines using her indigenous weapons like Torpedoes, Rocket Launchers and integral Helicopter.

The ship has a displacement of 3250 tonnes, length of 109 M and width of 12.8 M. The ship has a maximum speed of 25 Knots with an endurance of over 3400 NM at 18 knots speed and can accommodate 17 officers and 106 sailors. Some of the special features incorporated in these ships for the first time in the country include the following:-

(a) Special High Strength Warship Grade Steel Type DMR 249A Indigenously developed and has been used for shipbuilding for the first time in the country on these ships.

(b) Kavaratti and INS Kiltan are the first two major warships to have the unique feature of Superstructure made of Carbon Fiber Composite Material. It is for the first time in the country that such composite material is being integrated with steel hull of a ship and GRSE is the first shipyard in the country to have successfully achieved this task.

(c) Over 90 per cent Indigenous Content and hence a major step towards achieving self-reliance in the state of the art warship design and construction.

The journey of delivering "Kora Class" Missile Corvettes way back in the 1990s to the delivery completion of the four Anti – Submarine Warfare Corvettes gives GRSE the exclusive edge in construction of these Frontline Corvettes for the Indian Navy.

GRSE currently has a strong order book position of over Rs 27,000 crore under which there are a total of 18 warships at various stages of construction. GRSE touched a key milestone with the delivery of six warships in 12 months (March 2019-February 2020). With the delivery of Kavaratti, the company has five Shipbuilding Projects that are underway viz., Four Projects of the Indian Navy and One of the Indian Coast Guard.

GRSE is aggressively bidding for the new Request for Proposals (RFP) that have been issued by Ministry of Defence and is exploring possibilities for Export to friendly countries for its Warships and Pre-fabricated Steel Bridges.

The shipyard has been recently awarded with the ICC PSE Excellence Award (2017-18) for "Operational Performance Excellence" and 16th National Award for "Excellence in Cost Management" in the category of Medium Public Sector Manufacturing Companies. In Jul 19, GRSE was also recognised as one of the "Next Fortune 500 Companies of India".

GRSE continues to sail on a growth trajectory with incorporation of latest technologies (Artificial Intelligence, Machine Learningand Data Analytics) in various areas of operations to improve internal efficiencies & profit margins.

AIRCRAFT MAJOR BOEING EXPRESSES SATISFACTION OVER INDIA'S ACQUISITION OF AH-64 CHOPPERS

New Delhi. Coinciding with the two-day visit of US President Donald Trump to India, American aircraft company's India wing, Boeing India on February 25 expressed satisfaction at the contract executed between India and the US for the former's acquisition of six AH-64 Apache helicopters. "We are honoured to sign this contract with the Indian government for the acquisition of six AH-64 Apache helicopters and lifecycle services support for the Indian Army. The AH-64E Apache will be a force multiplier for the Army, just as it is today for the Indian Air Force. We congratulate the US and Indian governments on this key milestone and welcome the positive momentum in the bilateral defence trade and industrial partnership," Salil Gupte, President, Boeing India said in a press statement. "Through our local entity, Boeing Defense India, we are supporting the P-8I, C-17, CH-47 Chinook, and AH-64 Apache with holistic lifecycle support to assist with India's defence modernisation effort and mission-readiness at competitive costs. This new contract is a testimony to the trust and long-standing partnership Boeing has nurtured over the years with our Indian customers and we are committed to delivering on our commitments in the future as well," he added.

The Apache contract for six helicopters for the Indian Army follows a contract for 22 helicopters ordered by the Indian Air Force in 2015. Boeing has delivered to the Indian Air Force 17 of 22 Apaches and the remaining five will be delivered by the end of March. Deliveries for the Indian Army Apaches are planned to begin in 2023. The Apache sale is a hybrid procurement – Direct Commercial Sale (DCS) between Boeing and the Ministry of Defence and Foreign Military Sale (FMS) between the Government of India and the US Government. The Indian Army will get the AH-64E Apache configuration – the latest attack helicopter version that the US Army first took delivery of in November 2011. The AH-64E Apache stands as the world's most advanced multi-role combat helicopter and represents the backbone of the US Army attack helicopter fleet, as well as a growing number of international defence forces. They incorporate 26 new technologies designed to enhance the aircraft's capabilities. To date, more than 400 AH-64E model Apaches have been delivered worldwide.

DEFENCE MINISTER REVIEWS PERFORMANCE OF OFB, DPSUs

New Delhi. Defence Minister Rajnath Singh on February 24 reviewed the performance of Ordnance Factory Board (OFB) and Defence Public Sector Undertakings – Hindustan Aeronautics Limited (HAL), Bharat Electronics Limited (BEL), Bharat Earth Movers Limited (BEML) and Bharat Dynamics Limited (BDL) in New Delhi, with officials of these undertakings giving a presentation of their ongoing and future projects to the Minister and senior officials of Department of Defence Production, Ministry of Defence.

Expressing satisfaction at the overall achievements of OFB and these DPSUs, Singh urged them to strive further to increase their competitiveness in the global market. Lauding the indigenisation efforts, he called upon the officials to identify more 'Make in India' avenues and help in making India self-reliant in defence production.

The Minister urged the officials to explore new modes of business models focussing on increased defence exports. He expressed hope that the DPSUs will play a pivotal role in making India a global manufacturing hub as well as net exporter.

The OFB with headquarters in Kolkata has filed 246 Intellectual Property Rights applications. Forty-two R&D Centres with specific technological domains have been set up with project-based collaborations with IITs/IISc/NITs. Development of futuristic technologies with Indian private industries through iDex platform is one of the focus areas of OFB.

The HAL has achieved operational clearance on seven platforms Light Combat Aircraft (LCA), Light Combat Helicopter (LCH), Light Utility Helicopter (LUH), Advanced Light Helicopter -Weapon System Integrated named as Rudra, 19-seater Do-228 civil Aircraft, Jaguar Darin III and the Mirage Upgrade.

The BEL has successfully implemented projects of strategic importance such as Weapon Locating Radar for the Indian Army, Akash Missile System, Coastal Surveillance System for the Coast Guard.

The BDL has grown into a multi-product, multi-customer, multi-located enterprise producing defence equipment meeting international quality standards. The BDL is the lead Integrator of the Akash Weapon System (AWS).

It signed contract worth Rs 1,188 crore for supply of Varunastra or the Heavy Weight Torpedo to the Indian Navy.

The BEML through 'Make in India' initiative for the first time has designed and developed biggest eco-friendly Electrical Excavator of 180 tonne capacity, Biggest Electric drive dump trucks of 150 tonne and 190 tonne capacity, which serve as import substitution and help promote the cause of green mining and would save foreign exchange.

The BEML gave major thrust to self-reliance and achieved indigenisation levels of over 90 per cent in the mainline mining and construction products, Rail Coaches & EMUs, over 80 per cent in High Mobility Vehicles (HMV) and over 65 per cent in Metro cars. BEML is also working towards 'ZERO IMPORT' policy of Government to reach higher levels of indigenisation.

BEL POSTS RECORD TURNOVER OF RS 12,500 CRORES IN FY 2019-20

Bengaluru. Navratna Defence PSU Bharat Electronics Limited (BEL) posted a turnover in excess of Rs 12,500 crores (Provisional & Unaudited) during the Financial Year 2019-20, a company press statement said on April 1. BEL had a growth of six per cent over the previous year's turnover of Rs 11,789 crores. It's Order Book as on April 1, 2020 is Rs 51,800 crores. The year saw the company securing significant orders worth Rs 13,000 cr. Some of the major orders acquired during the year are Akash (7 Sqdn), Coastal Surveillance Systems (CSS), Upgrade for EW system, Radars, AMCs for Radars & Weapon systems, Software Defined Radio (SDR), Sonars, Advanced Communication Systems, etc. The flagship projects executed during FY 2019-20 are Command & Control Systems, Thermal Imagers for tanks, Upgrade of communication system, Land Based EW systems, Weapon Repair Facility, Electronic Fuzes, various Radars, Smart City Projects, Delhi CCTV project, Schilka Upgrade, Avionics Package for LCA, Classroom Jammers, Real Time Information System for Railways and LRSAM. BEL achieved Export sales of US$ 48.59 million during FY 2019-20. Major products exported include Cable Looms, Coastal Surveillance System Spares, Radar, Compact Multi-Purpose Advanced Stabilization System (CoMPASS), Electro Mechanical parts, etc.

BEL's Chairman & Managing Director MV Gowtama said, "The global lockdown due to COVID-19 and the economic slowdown had some impact on BEL during the last month of the last quarter of FY 2019-20. Execution/acceptance of some of the major projects could not be completed due to Force Majeure which otherwise would have further contributed to BEL's revenues during FY 2019-20 itself.

However, BEL remained focused on enhancement of its capabilities and competitiveness through diversification, continuous modernisation, indigenisation and outsourcing to Indian industries with increased thrust on MSME sector.

BEL has established its visibility and presence in the international markets through commencement of operations of its overseas offices at Vietnam, Myanmar, Sri Lanka, Oman, Singapore and United States as part of maximising its geo-strategic reach and increased global footprint."

BOEING DELIVERS FIRST CHINOOK CHOPPER TO NETHERLANDS

Philadelphia. Boeing recently delivered the first CH-47F Chinook to the Royal Netherlands Air Force (RNLAF) in keeping with its track record of on-time deliveries to customers. The RNLAF will operate a fleet of 20 CH-47F Chinooks, the newest configuration in use by countries around the world. "The RNLAF made it clear to us that they need the advanced, proven capability of the CH-47F now," said Andy Builta, vice president of Cargo and Utility Helicopters and H-47 programme manager. "I want to thank our phenomenal team for working hard during a difficult situation to safely deliver these aircraft. This is a reminder to all of us of how important Chinooks are to our customers."

The 20 CH-47F Chinooks will be a fleet equipped with the same state-of-the-art technology as the US Army, including digital automatic flight controls, a fully-integrated Common Avionics Architecture System (CAAS) glass cockpit, and advanced cargo handling capabilities. The common configuration leads to lower overall life cycle costs. The RNLAF currently flies a mix of F-model Chinooks with the Advanced Cockpit Management System (ACMS) and CH-47D Chinooks. "It has been a pleasure to work closely together with the US Army and Boeing teams to achieve this milestone," said Col Koen van Gogh, Netherlands Defence Materiel Organisation. "The Chinook helicopter is a vital asset for our missions and the in-time delivery certainly supports our operational planning. I salute the Boeing workforce for their continued efforts to make this happen in these troubling times, as well as the US Army officials that helped keep us on track." Deliveries to the RNLAF are expected to continue into 2021. Chinooks are currently in service or under contract with 20 international defence forces, including the US Army, US Special Operations Forces and eight NATO member nations.

COVID-19 FALLOUT: SMALL COMPANIES IN DEFENCE SUPPLY CHAIN SEEING DISRUPTED CASH FLOW

Washington. In the wake of the COVID-19 spread in the US more than 60 per cent of small companies in the country's defence supply chain are seeing disrupted cash flow, a new survey released by the National Defense Industrial Association (NDIA) showed on March 27.

"This survey shows how the defense lifeline runs through small business," Hawk Carlisle, NDIA's president and CEO, said in a statement. "These companies must survive if the defense industrial base is to remain the best in the world on other side of COVID-19."

As of March 27, 458 small businesses had responded to the survey, which will remain open through April 10. 55 per cent of respondents have less than $5 million in annual revenue, and 70 per cent have less than 50 employees.

The world's largest defense company will speed up cash payments to small subcontractors to help with bills, among other steps.

Sixty-two per cent of the respondents have seen disrupted cash flow as a result of the economic downturn. Primarily, those have come as cuts to billable hours or delayed payments from prime contractors because of shutdowns or telework. A lack of telework options is also an issue for contractors.

Notably, 54 per cent of respondents say they cannot work on a contract because they are currently under a shelter-in-place order.

And optimistically, 69 per cent do not expect cost overruns on fixed-price contracts as a result of the coronavirus-related disruptions. Those that do expect such overruns predict them to be in the 10-20 per cent range.

The results of the survey were delivered on March 27 to Ellen Lord, Under Secretary of defense for acquisition and sustainment. Speaking to reporters, Lord said she is closely watching the lower tier of the supply chain for weak spots that may appear.

Last week, the Defense Department announced new measures to increase progress payments out to both small and large companies to ensure they are able to keep work moving on schedule.

HAL BEGINS GROUNDWORK TO MAKE APACHE TYPE HELICOPTER

New Delhi. Leading Defence Public Sector Undertaking (DPSU) Hindustan Aeronautics Limited (HAL) has begun an ambitious project of making what it hopes would be the best medium-lift helicopter in the world modeled like the Boeing chopper Apache. The project envisages production of a 10 to 12 tonne attack helicopter by 2027 and as the Chairman and Managing Director of Hindustan Aeronautics Ltd R Madhavan said the aim of the mega project is to stop import of more than Rs four lakh crore worth of military helicopters for the three services in the coming years. He said the HAL has completed the preliminary design of the helicopter and that initial plan is to produce at least 500 units with the first prototype set to be ready by 2023 if the government gives the go ahead to the project this year. "One major project we are focusing on is to produce a helicopter in 10 to 12 tonnes category to replace

the Mi-17 fleet. It will be an indigenous platform with the potential to manufacture around 500 helicopters. It will stop import of more than Rs four lakh crore worth of platforms from foreign countries," he said. Madhavan said an amount of Rs 9,600 crore will be required for design as well as to produce the prototype of the helicopter.

"If we get the approval in 2020, we will be able to manufacture the first chopper by 2027. We are looking at producing at least 500 helicopters of the variant. It will be a major project we are working on," he said. A military expert described the project as the biggest by the HAL after development of the Tejas military aircraft. "We have done the preliminary design. We have also been in discussion with the Air Force and the Navy. The 10-12 tonnes category will have two basic structures on similar platforms. The naval version will have different dimension compared to the one for the Army and the Air Force," Madhavan said on the proposed mega project. "Like the LCH (Light Combat Helicopter) we developed from the Dhruv platform, a similar variant of 10-12 tonnes category can be produced to make it an Apache equivalent," said Madhavan. The helicopter will be powered by twin engines and will feature blade folding option for ship deck operations. The planned roles for the helicopter will be to support air assault, air transport, combat logistics and combat search and rescue.

GERMAN COMPANY DAIMLER EXPLORING DEFENCE SECTOR

Chennai. German auto major Daimler India Commercial Vehicle (DICV) is looking to manufacture defence vehicles, off-highway engines and LCVs in a move to explore uncharted territory to promote innovation, fresh business ideas and bolster revenue growth. "We have started studying what the requirements are from the defence side," said Satyakam Arya, managing director and CEO, DICV. "They need a 4×4 truck mostly and we have started a study on developing that. We, however, have one step to cross and we have to see whether the Government of India changes that regulation."

The regulation he was referring to was with regard to the policy that does not permit foreign companies to supply for defence purposes. He added that the government has indicated that it will look at changing this clause as a truck is a commodity and that more clarity should emerge about this in April.

The German auto major's Indian arm has plans of foraying into new avenues as part of a larger vision and the company has to find ways to "go beyond trucks" and to encourage innovation. In this regard, he also mentioned that another segment that the company was actively studying was that of freight aggregators. DICV's domestic business recorded a drop of 36 per cent with sales of 14,474 trucks in 2019, in line with the 35 per cent drop in industry sales volumes. Exports grew by 14 per cent to over 8,000 units in 2019. When it came to the outlook on the industry, Arya said he expects a 10 per cent decline at the least which could extend to 20-25 per cent if there is no uptick. Arya was optimistic that the shift to BS-VI will bode well for the company since they have already started rolling out trucks in NCR where BS-VI fuel is available. He added that he hoped there would be no further extension in the date for BS-VI compliance. "Our access to Daimler's worldwide network to technological expertise allowed us to efficiently localise our globally-proven Euro06 solution for India's BS-VI emission norms. This helped us to control development cost," said Arya.

FIRST UAE-BUILT HIGH PERFORMANCE DRONE TAKES FLIGHT

New Delhi. In a deal with the UAE armed forces, a regional leader in autonomous systems and services ADASI has officially launched the Garmousha vertical take-off and landing (VTOL) drone. A light military unmanned aircraft, the drone is designed to carry 100 kg over a six-hour period and 150 km with a high-definition camera.

It saves manned helicopters for critical missions and can also be used to detect gas pipeline leaks, to survey infrastructure and for search and rescue operations.

The chief executive officer and managing director of EDGE, Faisal Al Bannai, said: "Drone technology is revolutionising our world, creating safer and cheaper alternative to manned aircraft."

"As an unmanned system, the launch of the sophisticated Garmousha drone helps advance ADASI's vision for the future of defence, while strengthening the company's position as the regional leader in autonomous systems and services," he said. The drone can simultaneously carry a wide variety of payloads, including a stabilised electro-optical sensor for day and night ISR collection.

With a low-consumption diesel engine, its unmanned navigation and concurrent sensor capabilities make it a versatile system capable of solving some of the most difficult challenges in rugged environments.

MINISTRY OF DEFENCE SIGNS RS 880 CRORE CONTRACT WITH IWI FOR MODERN LMGS

New Delhi. The Armed Forces' long-standing requirement of a modern state-of-the-art Light Machine Gun (LMG) has finally fructified with the Acquisition Wing of Ministry of Defence inking a capital acquisition contract with Israel Weapons Industries for procurement of 16,479 LMGs at a cost of Rs 880 crore with the approval of Defence Minister Rajnath Singh.

The contracted Negev 7.62X51 mm LMG is a combat proven weapon and currently used by several countries around the globe. This LMG will greatly enhance the lethality and range of a soldier vis-a-vis the presently used weapon. The provisioning of this operationally urgent and very critically needed weapon will boost the confidence of the frontline troops and provide much needed combat power to the Armed Forces.

OFB, DPSUs, PRIVATE SECTOR TO INVEST RS 3,700 CR IN UP DEFENCE CORRIDOR; RS 3,100 CR IN TN DEFENCE CORRIDOR

New Delhi. An investment of approximately Rs 3,700 crore was announced by Ordnance Factory Board (OFB), Defence Public Sector Undertakings (DPSUs) and private industries for Uttar Pradesh Defence Corridor and another investment of approximately Rs 3,100 crore was announced by them for Tamil Nadu Defence Corridor, Minister of State (MoS) for Defence Shripad Yesso Naik informed Lok Sabha on March 11.

This information was given in a written reply to Prof Dr Kirit Premjibhai Solanki and others.

Further, the government has also appointed a consultant for the preparation of policy and Detailed Project Report (DPR) for these two defence corridors. Incentives to private players and foreign companies are provided under the respective state policies.

In pursuance to the budget announcement (2018-19), it has been decided to set up two defence industrial corridors in the country, one in Uttar Pradesh and another in Tamil Nadu. Subsequently, six nodes in Uttar Pradesh defence corridor viz. Agra, Aligarh, Chitrakoot, Jhansi, Kanpur and Lucknow have been identified.

Similarly, for Tamil Nadu defence corridor, five nodes viz. Chennai, Coimbatore, Hosur, Salem and Tiruchirappalli have been identified. Till date, six consultation meeting of stakeholders each in Uttar Pradesh and Tamil Nadu were organized across its various nodes.

Setting up of defence industrial corridors would catalyse indigenous production of defence and aerospace related items thereby reducing our reliance on imports and promoting export of these items to other countries. This will lead to achieve India's goal of self-reliance in defence, generation of direct/indirect employment opportunities and growth of private domestic manufacturers, Micro, Small and Medium Enterprises (MSMEs) and startups.

Presently, there is no proposal to set up more defence industrial corridor(s) in the country.

G SURGIWEAR: SERVING THE INDIAN ARMY AND MANY MORE IN TIMES OF COVID-19

New Delhi: A leading Indian implants and consumable manufacturing company G Surgiwear Limited has been leading from the front to support the Indian Army in its fight against the global pandemic novel Coronavirus Covid-19.

Indian Army, which ranks second largest land force in the world, has geared up against the Covid 19 pandemic recently and there was requirement of Personal Protective Equipment (PPE) in large quantities across the country, which could not be met following the preventive lockdown imposed by the Central as well as state authorities. It was Uttar Pradesh's Shahjahanpur-based G Surgiwear Limited which took the task in the service of the nation and successfully executed a large order from Indian Army.

A leader in the manufacture of drapes and gowns for the use of hospitals and also supplying a range of combat medical products to the armed forces globally, G Surgiwear has designed a Personal Protective Kit, which is economical as well as very useful in the current pandemic scenario. "We are a leading manufacturer of life saving devices (Combat Tourniquets, Chest seal, Next Generation FFD) for the security forces namely Para Commandos, MARCOS, NSG, CRPF, BSF and other. The company is prepared to serve the customers at all times," a company official said.

"In the current scenario, it's important for us to look after our company's employees' health and safety too. We at Surgiwear believe in serving our customers and at the same time take care of highest quality standards," he noted.

The company feels immense pride in timely executing the Indian Army order during such pandemic situation while respecting the government lockdown decision as well, G Surgiwear official added.

It may be noted here that the nations across the globe have sealed their borders both internal and external following the outbreak of Covid-19. World's largest democracy India too has taken the measures to curtail the outbreak.

CORONAVIRUS AFTERMATH: DEFEA – DEFENCE EXHIBITION ATHENS DEFERRED TO MAY NEXT YEAR: ORGANISERS

New Delhi. Following the outbreak of Covid-19 across the globe, DEFEA – Defence Exhibition Athens, scheduled to be held at Athens in Greece from June 22-24 this year has been moved to May 11-13 next year.

"Even though DEFEA has not suffered any change in terms of either cancellations of participants or interest in the show, we believe that the concerns and difficulties of people and companies to travel would affect the overall quality of the event," organisers of the exhibition noted.

"Therefore the DEFEA organisers in agreement with the Greek Ministry of Defence (MoD) and the Hellenic Manufacturers of Defence and Security Material Association (SEKPY) have taken the decision of postponing the DEFEA from June 2020 to the new dates in May 2021, from 11th to 13th, always in Athens, Greece," the organisers said.

"Over the next few days further details of our May exhibition will be available on our website. We thank you in advance for your understanding and cooperation in this unprecedented situation," the DEFEA organisers added.

MOD ISSUES REQUEST FOR INFORMATION (RFI) FOR 100 LOITERING MUNITION

New Delhi. As part of the modernisation and upgradation of weapons, the Ministry of Defence has issued a Request for Information (RFI) to procure 100 loitering munition systems for the Indian Army. In late January this year, Israeli firm UVision Air announced a joint venture named "AVision" with India's Aditya Precitech to manufacture loitering munitions under the brand PALM (Precision Attack Loitering Munition) Hero Systems.

"AVision will explore various opportunities in India for Loitering Munitions Systems including the design, manufacture, sales, maintenance, support, upgrading, and life cycle management," read a joint statement released by the company. In the RFI issued on March 6 by the Defence Ministry, it says it wants a loiter munition that is man-portable, weigh less than 20 kg, flight endurance of at least 30 minutes, range of 15 km (Line of Sight), ability to operate up to an altitude of 4500 m (Above Mean Sea Level) and not less than 300 m (Above Ground Level), possess anti-jamming and anti-spoofing properties, carry warhead to destroy personnel and soft-skinned targets which have little or no armor.

The loiter munition should also be controlled by a ground controller with a data link established with the loiter munition system. The vendor is to provide one loiter munition with complete set of sensor package mounted on the loiter munition system (with day and night capability) along with one ground control station to include ruggedised handheld display, communication system, antenna and tripod. The ground control station should be able to control multiple loiter munitions.

"It should be able to air dropped placed on a platform system and flexible enough to slither down man packed from helicopters," the RFI issued states. The ministry expects the delivery of almost all of the loitering munition systems within 18 months from the date of signing of the contract. Once launched, loiter munition can 'loiter' in the air and wait for its target, or conduct reconnaissance and surveillance operations. It then launches a 'suicide attack' like a missile after finding out its location. Some types of loitering munitions can even return to the base for future deployment.

KARAM AIMS TO PROMOTE QUALITY PPE PRODUCTS TO BE EMBEDDED IN COUNTRY'S DEFENCE ECOSYSTEM

New Delhi. Reflecting the government's focus on 'Make in India', DefExpo 2020 offered an excellent opportunity for the Indian defence industry to showcase its capabilities and promote its export potential. To contribute and aim to spread awareness about using safety products at all times, KARAM exhibited their PPE products by setting up a stall at the DefExpo. The products showcased were wide range of UIAA certified Karabiners and mountaineering equipment like pulleys, etc. KARAM also showcased diverse range of full body Harness, Lanyards, and Evacuation Equipment.

The company displayed the Quick Zip line System specially designed for self and controlled descent, material lowering and rescue decent (stretcher) to be used in industrial safety as well as disaster management. KARAM is India's leading industrial safety equipment Manufacturing (PPE) enterprise and is rated as one of the finest Indian companies providing world-class PPE. KARAM ranks as the number one Company in the field of Personal Safety in the country, and as one of the top ten Fall Protection manufacturing companies in the World. The product range includes Personal Protective Equipment like safety helmets, safety eyewear, hearing protection, face protection, hand protection, protective work-wear, safety shoes, and a vast range of Fall Protection Equipment. Besides these, engineered safety solutions like anchorage systems, specialised rope access, evacuation and rescue products, and confined space entry egress systems also form a part of KARAM's Product Portfolio

Speaking of the installation, Sandeep Arora, National Sales Head, KARAM Industries, said, "The government is constantly working on making the country a defence manufacturing hub. KARAM Industries aiming to propagate finest quality PPE products to be embedded in the defence ecosystem of the country. We are delighted to have showcased our fine quality products at the Defence Expo 2020 as this helps us in highlighting the importance of a safe work environment and create awareness on the use of safety equipment."

RAYTHEON, AEROJET ROCKETDYNE STRIKE $1 BILLION STRATEGIC SOURCING DEAL FOR STANDARD MISSILE PROGRAMMES

TUCSON, Ariz. Raytheon company's missile systems business has reached a $1 billion, five-year strategic agreement to purchase propulsion systems from Aerojet Rocketdyne for Standard Missile (SMs) products. The deal represents a supply chain centerpiece of multi-year Standard Missiles contracts that Raytheon recently received. Raytheon and Aerojet Rocketdyne provide propulsion systems for Raytheon's Standard Missile family.

Aerojet Rocketdyne provides propulsion systems spanning Raytheon's Standard Missile family. For the SM-2™ missile, SM-3® interceptor and SM-6® missile, Aerojet Rocketdyne supplies the majority of the solid rocket motors for these systems. Also, for SM-3, the company produces the Divert and Attitude Control System, a high-precision, quick-reaction propulsion system that positions the interceptor to defeat incoming ballistic missiles.

Work on the programmes will be spread across Aerojet Rocketdyne sites in Orange County, Virginia, the Solid Rocket Motor Center of Excellence in Camden, Arkansas, and at its Advanced Manufacturing Facility in Huntsville, Alabama. Raytheon produces SM-2 in Tucson, and SM-3 and SM-6 in Huntsville.

ROSOBORONEXPORT SIGNS 1ST DEAL TO SUPPLY BK-10 ASSAULT BOATS TO AFRICA

New Delhi. Rosoboronexport JSC, part of the Rostec State Corporation, has begun to carry out its first export contract recently signed with a foreign customer from Sub-Saharan Africa for the supply of Project 02450 fast assault boats BK-10, a company press statement said on April 10. The assault boats BK-10 are designed and manufactured by Kalashnikov Concern, a member of Rostec State Corporation.

The Project 02450 fast assault boat BK-10 is intended for transporting personnel, landing troops on unimproved shores, providing fire support to forces ashore, fighting piracy and terrorism, rendering assistance to those in distress. It features high speed performance and long operational range.

Powered by two high performance outboard gasoline engines, the BK-10 can reach speeds of up to 40 knots. With its large-capacity fuel tanks, the boat has a cruising range of up to 400 miles without refueling. It can carry up to 10 troopers and is equipped with a metal bow platform or ramp to facilitate landing on an unimproved shore. The boat provides comfortable accommodations for the troopers and the crew. It is fitted with high-performance shock-absorbing saddle-shaped seats which can be easily and quickly dismantled if required.

The BK-10 has an armoured wheelhouse and a bullet-resistant windshield. Armoured plates can be installed around the perimeter of the troop compartment to protect the soldiers. Strong engine protection bars are installed. In addition, the boat has high firepower – up to four 7.62 – 12.7 mm machine guns, which significantly expands its mission area in its class. The BK-10 may be carried by all means of transport (road, rail, air, river and sea) and used as a waterborne platform.

CABINET COMMITTEE ON SECURITY CLEARS US CHOPPER PURCHASE WORTH US$2.6 BN

NEW DELHI. With the countdown for the two-day visit of US President Donald Trump to India begun, the Cabinet Committee on Security (CCS) headed by Prime Minister Narendra Modi on February 19 cleared the procurement of 24 MH-60R Seahawk multi-role helicopters worth US$2.6 billion for the Indian Navy. "The Cabinet Committee on Security (CCS) cleared the procurement of 24 MH-60R multi-role helicopters for the Navy," an official said.

The 24 Lockheed Martin helicopters will be procured through the foreign military sales (FMS) route from the US government. The Defence Acquisition Council (DAC) had cleared the procurement of the 24 multi-role helicopters in August 2018. Later, in April last year, the US State Department approved the sale of the helicopters to India.

The US Defence Security Cooperation Agency (DSCA), which administers the FMS programme, had stated that the State Department made a determination approving a possible FMS to India of 24 MH-60R Multi-Mission helicopters for an estimated cost of US$2.6 billion. The DSCA had delivered the required certification notifying the US Congress of the possible sale. Lockheed Martin will be the principal contractor for the sale. The DSCA had said that the proposed sale will provide India the capability to perform anti-surface and anti-submarine warfare missions along with the ability to perform secondary missions including vertical replenishment, search and rescue, and communications relay. India will use the enhanced capability as a deterrent to regional threats and to strengthen its homeland defence. The helicopters, which will build India's capabilities for anti-surface, anti-submarine warfare and search and rescue missions, will replace the old British-made Sea King helicopters, which were phased out in 2000. This will plug the 'existing capability gap'. The helicopters for India will be armed with Hellfire missiles, precision kill weapon system and MK 54 torpedoes. The helicopters will be an integral part of Indian warships and aircraft carriers. Such choppers in anti-submarine warfare roles fly ahead of warships, place their sonar into the deep waters, search for enemy submarines and release torpedoes and depth charges against them to clear the path for the fleet.

Its sonar suite provides navigation, situational awareness, target data and weapon guidance. The procurement gains importance in light of China expanding its naval reach in the Indian Ocean Region. Importantly, the US Navy has deployed these helicopters as its primary anti-submarine warfare and anti-surface weapon system for open ocean and littoral zones.

GA-ASI INSTALLS NEW PREDATOR MISSION TRAINER AT FTTC

SAN DIEGO. General Atomics Aeronautical Systems, Inc. (GA-ASI) has installed a new Predator Mission Trainer (PMT) at its Flight Test and Training Center (FTTC) in Grand Forks, North Dakota. The aircraft flight simulator, produced by CAE, will be used to train operators of MQ-9 Block 5 Remotely Piloted Aircraft (RPA). GA-ASI offers a range of pilot and sensor operator training at the FTTC for operators of GA-ASI's family of RPA systems. The new PMT extends the training capability of the FTTC, which already features a Block 1 simulator and Ground Control Systems (GCS). "The Predator Mission Trainer will be used to advance the quality and capability of our RPA training at the FTTC," said David R. Alexander, President, GA-ASI. "The PMT will increase training efficiency because it allows us to focus our training and repeat training events in the simulator more easily than on an actual flight system."

BDL PAYS INTERIM DIVIDEND OF RS 100 CRORE

New Delhi. Defence Minister Rajnath Singh on March 5 received a cheque for Rs 100.518 crore as the interim dividend from Defence Public Sector Undertaking (DPSU) Bharat Dynamics Limited (BDL) in New Delhi from the Chairman and Managing Director of BDL Commodore Siddharth Mishra (Retd).

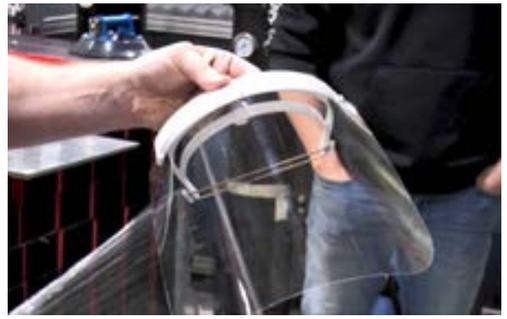
The Hyderabad-based DPSU has declared interim dividend of Rs 6.25 per share of Rs 10/- each for the financial year 2019-20. It pertains to the Government holding in the DPSU. The interim dividend declared by the company works out to 62.5 per cent of the paid-up share capital of Rs 183.28 crore.

Secretary (Defence Production) Raj Kumar and other senior officials from Ministry of Defence and BDL were also present on the occasion.

BEL PAYS INTERIM DIVIDEND OF OVER RS 174 CRORE

New Delhi. Defence Minister Rajnath Singh received a cheque of Rs 174.43 crore as interim dividend from Defence Public Sector Undertaking (DPSU) Bharat Electronics Ltd (BEL) in New Delhi on March 12. Chairman and Managing Director of BEL M V Gowtama presented the cheque to the Minister. The BEL has declared 140 per cent interim dividend (Rs 1.40/- per share of Re one face value) to its shareholders for the financial year 2019-20. It pertains to the Government holding in the DPSU. This is the 16th consecutive year that BEL has paid interim dividend. It has paid a total dividend of 340 per cent on its paid-up capital for the financial year 2018-19. Government of India holds 51.13 per cent equity in the DPSU.

BOEING DELIVERS FIRST REUSABLE 3D-PRINTED FACE SHIELDS FOR COVID-19 RESPONSE



CHICAGO. Boeing on April 10 delivered the first set of reusable 3D-printed face shields to support healthcare professionals working to stop the spread of COVID-19. The Department of Health and Human Services (HHS) accepted the initial shipment of 2,300 face shields this morning. The Federal Emergency Management Agency (FEMA) will deliver the shields to the Kay Bailey Hutchison Convention Center in Dallas, Texas, which has been established as an alternate care site to treat patients with COVID-19.

Boeing is set to produce thousands more face shields per week, gradually increasing production output to meet the growing need for Personal Protective Equipment (PPE) in the United States. Distribution of additional face shields will be coordinated with HHS and FEMA based on immediate needs. Boeing subsidiaries Argon ST in Smithfield, Pennsylvania, and Aurora Flight Sciences in Bridgeport, West Virginia, are also participating in this project.

Solvay, a long-time Boeing supplier, provided the clear film for the face shields. Another supplier, Trelleborg Sealing Solutions, donated the elastic used for the adjustable headband. Face shield production and donations are part of a larger Boeing effort to leverage company and employee resources to aid with COVID-19 recovery and relief efforts. To date, the company has donated tens of thousands of units of PPE – including face masks, goggles, gloves, safety glasses and protective bodysuits – to support healthcare professionals battling COVID-19 in some of the hardest-hit locations in the United States. Boeing has also offered use of its unique airlift capabilities, including the Boeing Dreamlifter, to help transport critical and urgently needed supplies to healthcare professionals. The company is coordinating closely with government officials on how best to provide airlift support.

ULTRA ELECTRONICS INSTALLS FIRST S2150 HULL MOUNT SONAR ON ROYAL NAVY TYPE 23 FRIGATE HMS PORTLAND

New Delhi. HMS Portland has become the first ship to be fitted with Ultra Electronics Command & Sonar Systems' next generation Hull Mounted Sonar Type 2150 as part of a wider refit to the Royal Navy's frigates. The sonar has been designed by Ultra Electronics and will replace the legacy Sonar Type 2050, which has been in Royal Navy service since the 1990s. The new sonar incorporates a state-of-the-art User Interface to improve operator effectiveness and usability. The digital control of the outboard array minimises interference, reduces ships cabling, maximises reliability and extends array maintenance intervals to at least five years. The sonar will be fitted to eight of the Royal Navy Type 23 frigates. Ultra has also been awarded the contract to supply this sonar to the first three Royal Navy Type 26 frigates currently under construction.

GRSE RECEIVES GOVERNANCE NOW PSU AWARDS 2019

Kolkata. Garden Reach Shipbuilders and Engineers Limited (GRSE), a Mini Ratna Category 1 company under the administrative control of Ministry of Defence, has been awarded Governance Now PSU Awards 2019 in the categories of "Communication Outreach", "Digital PSU" & "CSR Commitment." Director (Personnel), GRSE, Cmde P Hari, IN (Retd) received the award at the hands of Arjun Ram Meghwal, Minister of State, Ministry of Heavy Industries & Public Enterprises, Government of India. The Minister graced the felicitation ceremony as the Chief Guest. Shailesh Lodha, actor and writer, famously known as Taarak Mehta was also present as a special guest on this occasion.

BOEING RECEIVES $1.5 BILLION P-8A POSEIDON CONTRACT

Arlington, US. World's leading aircraft manufacturer Boeing has got a contract worth $1.5 billion for the production of next 18 P-8A Poseidon aircraft. This includes eight aircraft for the US Navy, six aircraft for the Republic of Korea Navy and four aircraft for the Royal New Zealand Air Force.

The Republic of Korea Navy and Royal New Zealand Air Force acquired the aircraft through the Foreign Military Sales (FMS) process, and would receive the same P-8A Poseidon variant designed and produced for the US Navy. The Royal New Zealand Air Force is expected to begin receiving aircraft in 2022 and the Republic of Korea Navy is expected to begin receiving aircraft in 2023.

The P-8 is a proven long-range multi-mission maritime patrol aircraft capable of broad-area, maritime and littoral operations. A military derivative of the Boeing 737 Next-Generation airplane, the P-8 combines superior performance and reliability with an advanced mission system that ensures maximum interoperability in the battle space.

The Poseidon P-8 aircraft is militarised with maritime weapons, a modern open mission system architecture and commercial-like support for affordability. The aircraft is modified to include a bomb bay and pylons for weapons. It has two weapons stations on each wing and can carry 129 sonobuoys. The aircraft is also fitted with an in-flight refueling system.

With more than 254,000 flight hours to date, the P-8A and P-8I Poseidon variants patrol the globe performing anti-submarine and anti-surface warfare; intelligence, surveillance and reconnaissance; humanitarian; and search and rescue missions.

ISRAEL'S ELBIT SYSTEMS BAGS US$670 MN CONTRACT TO SUPPLY DEFENCE PRODUCTS IN APAC REGION

New Delhi. Israeli defence firm Elbit Systems said on February 18 that it had won a contract worth about US$670 million to supply defence products to an unnamed country in the Asia-Pacific (APAC) region.The deal will be carried out over a 25-month period.

"This significant contract award is a testament to the trust that customers place with our solutions and to the leading position we hold in the market," Elbit CEO Bezhalel Machlis said in a statement.

Elbit has disclosed over US$1 billion in contracts since the start of 2020. The company has made several deals in the region in recent months.

On February 10, Elbit said it had secured US$136 million in contracts to provide Asia-Pacific customers with airborne laser defence systems over a four-year period.

The Direct Infra-Red Counter Measure systems will equip Airbus and Boeing aircraft to counter heat-seeking ground-to-air missiles.

The system protects commercial Israeli airlines, and is used by the Italian and Brazilian air forces.

Earlier in February, Elbit said it had won a US$43 million deal to equip South Korean fighter jets with its Terrain Following-Terrain Avoidance system, which allows the planes to fly more safely at low-altitudes, in poor visibility and in difficult weather.

In October 2019, Elbit announced a $153 million drone deal with an Asian country to supply it with a networked, multi-layer drone system, with aerial vehicles of varying sizes and capabilities, from its THOR mini-drones to the medium-sizes Hermes surveillance aircraft.

BAE SYSTEMS SECURES $188 MILLION CONTRACT FOR US NAVY'S AEGIS COMBAT SYSTEM

New Delhi. BAE Systems Inc was awarded a five-year $188.2 million contract to provide the US Navy's AEGIS Technical Representative (AEGIS TECHREP) organisation with critical large-scale system engineering, integration, and testing expertise for the AEGIS Weapons and Combat Systems aboard US Navy surface combatant ships. As part of the AEGIS Technical Representative Engineering Support Services contract, BAE Systems will provide Navy acquisition managers with on-site leadership and systems engineering to validate Total Ship Combat design at Navy sites in Mt. Laurel, New Jersey; Bath, Maine; and Pascagoula, Mississippi. The task order was awarded under the National Institutes of Health (NIH) Information Technology Acquisition and Assessment Center's Chief Information Officer–Solutions and Partners 3 (CIO-SP3) Government-Wide Acquisition Contract.

MILREM'S UGV TO BOOST SOLDIERS COMBAT EFFECTIVENESS

Singapore. Giving a new dimension to ground warfare, Milrem Robotics based in Estonia formerly part of erstwhile Soviet Union displayed at the Singapore Airshow 2020 its Unmanned Ground Vehicle (UGV), which is a mission proven fifth generation THeMIS UGV designed to assist soldiers on the battlefield while enhancing their combat effectiveness. The UGV was deployed in Mali, Africa during the French led anti-insurgent operation Barkhane since early 2019. It incorporates all the knowledge gained during rigorous tests held in the United States, Europe and Singapore. During various live military exercises, the UGV has been deployed by the British Army, US Marines, the Royal Dutch Army, Latvian and Estonian Defence Forces. The Defence Technology Institute of Thailand will soon be evaluating the THeMIS for its suitability for the country's armed forces. "We are presenting a mature and robust product that, as our clients have already determined, will greatly enhance warfighting capabilities," said Kuldar Väärsi, CEO of Milrem Robotics. The THeMIS UGV which is already in serial production has been delivered to Indonesia, Germany, the Netherlands, Norway, France, US and the UK to provide combat support and carry supplies with an option to integrate additional kinetic or non-kinetic payloads. This tracked multipurpose UGV can be equipped with remote weapon systems, tethered drones, C-IED solutions and ISR sensors.

"The THeMIS has become the industry standard UGV sought out for various payload integration projects. Together with partners like ST Engineering, EOS, Kongsberg, FN Herstal and MBDA more than a dozen different systems have already been integrated," Väärsi said. Live firing tests have been conducted with five different weapon systems, including the JAVELIN anti-tank missile system.

The UGV has been equipped with autonomous functions including point-to-point navigation, obstacle detection and avoidance, enabling it to follow dismounted troops, patrol a perimeter, provide front line resupply and evacuate casualties with minimal intervention by the operator.

BEL BEATS RUSSIAN, POLISH FIRMS TO BAG CONTRACT IN ARMENIA

New Delhi. India's leading Defence Public Sector Undertaking (DPSU) Bharat Electronics Ltd (BEL) has bagged a contract worth US$40 million defence export deal beating Russian and Polish firms. This is owing to the reliability of the Indian system vis-à-vis its counterparts. Now India will supply four indigenously-built weapons-locating radars to Armenia. "The deal is for supplying four Swathi weapon locating radars developed by the Defence Research and Development Organisation (DRDO) and manufactured by Bharat Electronics Limited to Armenia in Europe," sources said. These radars provide fast, automatic, and accurate location of enemy weapons like mortars, shells, and rockets in its 50-km range. Moreover, it can also concurrently handle multiple projectiles fired from different weapons at different locations. Further, Indian indigenous systems are far more reasonably priced as compared to their rivals. To boost defence exports, the Ministry of Defence is also reaching out to South-East Asia, Latin America, and Middle-Eastern countries.

AIRBUS, MBDA TO JOINTLY DEVELOP DEMONSTRATORS FOR REMOTE CARRIERS

New Delhi. Leading French aircraft manufacturer Airbus and European missile manufacturing major MBDA are coming together to develop demonstrators for Remote Carriers. This joint venture involves MBDA focusing on the development of small and medium class platforms together and under the lead of Airbus. The Airbus will address the whole Remote Carrier scope and in particular teaming intelligence, whilst focusing on medium to large platforms.

MBDA's portfolio of capabilities brings complementary expertise into the Airbus led Remote Carrier domain and contribute significantly to the future capabilities of Air Power. As the European champion in missiles, with industrial presence in France, Germany and Spain, MBDA brings in a unique expertise in launching, flying and autonomy of small and large missiles.

Airbus, as a major European player is building on its full scale expertise in small to large systems and in Man-Unmanned Teaming. Among its demonstrators, Airbus has operated since 2006 the Barracuda, a flying test bed for developing technologies and procedures to be used by mature next-generation UAVs to test fast reconnaissance, surveillance, targeting and battle damage assessment capabilities. Designed to act as force multipliers the Remote Carriers are unmanned aerial vehicles (UAV), which aim at reducing the risks for manned aircraft by taking over specific air operations' roles within high risk environments, providing new air warfare capabilities and teaming in combination with and coordinated by other manned air assets. The Remote Carriers will complement and augment manned fighter aircraft capabilities performing in close cooperation yet with a high degree of automation to improve the mission performance in high intensity conflicts, and increase the combat mass to better compensate limited numbers of sophisticated manned fighter aircraft. The Remote Carriers will drastically increase operational capabilities at a very fast pace.

HAL IN TALKS WITH DASSAULT TO MANUFACTURE RAFALE FIGHTER JETS

NEW DELHI. Leading Defence Public Sector Undertaking (DPSU) Hindustan Aeronautics Limited (HAL) is reportedly in talks with French aircraft manufacturer Dassault in a move to revive old relations for the manufacture of Rafale fighter aircraft.

The two sides have held several rounds of talks for possible cooperation in producing Rafale fighter jets in India for additional anticipated orders under a 'staggered procurement' plan.

The talks have taken place between the companies on possible work share for additional orders of the cutting edge combat jet, though there is no going back to earlier discussions that broke down in 2012 over differences in localisation and pricing.

The two aviation companies are old partners, having worked most recently on the $2.1 billion deal to upgrade the Indian Air Force's Mirage 2000 fleet. If additional orders are placed for Rafale — Chief of Defence Staff (CDS) Gen Bipin Rawat hinted recently that 36 more fighter jets could be ordered within four years — a work share model could be worked out to manufacture parts for the fighter jet at HAL facilities.

Currently, French manufacturers are executing the order for 36 jets and investing 50 per cent of the €7.8 billion contract price in the Indian aerospace and defence sectors as part of the offsets clause, with a factory in partnership with Reliance Defence at Nagpur also geared to produce the Falcon executive jets.

According to indications, talks have taken place on how HAL facilities and expertise could be used for the next round of localisation when more jets are ordered. The current batch of Rafale on order are following the 'staggered payments' model, with India paying for 11 fighter jets every year till deliveries end. If the contract is extended, the staggered procurement could stretch over the next few years to make up for fighter shortages.

The two airbases that are being created for the Rafale on order are capable of absorbing additional jets without any change, which would also bring down the cost of the deal. If the Rafale jet deal is extended with the 'staggered order approach' it could lead to a rethink on earlier plans of acquiring 110 fighter jets under the Strategic Partnership (SP) model that requires an Indian company to tie up with a foreign collaborator to produce the aircraft domestically.

ERRATA

This is to inform the readers and viewers of Raksha Anirveda that the incorrect image for news 'Defence Secretary-led Empowered Apex Committee Reviews Progress of IAC Project' in its quarterly edition (Jan-Mar, 2020) published on page 138. The other two news, one on page 139 (GRSE Lays Keel of Second Frigate Prestigious Project 17A) and another on page 143 (Fourth and Last Anti-submarine Warfare Stealth Corvette by GRSE to be Delivered Soon) also carried incorrect images. The three news with correct images are being reproduced below. The error is deeply regretted.

Editor, Raksha Anirveda

FOURTH AND LAST ANTI-SUBMARINE WARFARE STEALTH CORVETTE BY GRSE TO BE DELIVERED SOON

New Delhi. In a boost to Indian Navy's firepower, Defence PSU Garden Reach Shipbuilders and Engineers (GRSE) Ltd is set to deliver anti-submarine warfare (ASW) stealth corvette INS Kavaratti to it soon. 'Kavaratti' is the last of the four Anti-Submarine Warfare (ASW) stealth corvettes built by the GRSE for the Indian Navy under Project P28, GRSE Chairman-cum-Managing Director Rear Admiral VK Saxena said. "All trials of the ship have been successfully completed, and we plan to deliver it by the end of this month," Rear Admiral Saxena said. 'Kavaratti' will be the 104th ship to be constructed and delivered by the GRSE, he said. With a displacement of 3,300 tonnes, the ship has a carbon composite superstructure, which has been flawlessly integrated with the steel hull through technology developed by the GRSE. "The carbon composite superstructure provides advantage of a lower weight of the warship, thus increasing its stability, manoeuvrability and faster acceleration," GRSE chief said. The new technology will mean that the warship, which has 90 per cent indigenous components, will also require lower maintenance, he said. The ship is equipped to fight in nuclear, chemical and biological warfare conditions and its weapons and sensors suite is predominantly indigenous, sources said. The first of the four ASW stealth corvettes under Project P28 – 'Kamorta', was delivered to the Navy in July 2014, 'Kadmatt' was delivered in November, 2015 and 'Kiltan' was delivered in October 2017, a GRSE official said.

GRSE LAYS KEEL OF SECOND ADVANCED STEALTH FRIGATE OF PRESTIGIOUS PROJECT 17A

Kolkata: Garden Reach Shipbuilders and Engineers Limited (GRSE) touched a key milestone in its Project 17A with the laying of the keel of its second of three Advanced Stealth Frigates on January 24. The keel was laid at GRSE's Main Works Unit by D Santra, Structural Fitter (Sk-II) of Shipbuilding Shop in the august presence of Vice Admiral G Ashok Kumar, AVSM, VSM, Vice Chief of Naval Staff. The occasion was graced by Rear Admiral VK Saxena, IN (Retd), Chairman & Managing Director, GRSE; SS Dogra, Director (Finance), Cmde Sanjeev Nayyar, IN (Retd), Director (Shipbuilding) and Cmde PR Hari, Director (Personnel) and other senior officers of the Indian Navy led by Rear Admiral G K Harish, VSM, Director General (Naval Design) and GRSE.

The prestigious contract of Rs 19,294 crore for construction of three highly Advanced Stealth Frigates under Project 17A is the largest ever order won by the company. This contract was signed between the Ministry of Defence and GRSE on February 20, 2015. The first ship is expected to be delivered in 2023 and the next two ships in 2024 and 2025 respectively. Today's Keel Laying marked another project milestone being achieved ahead of schedule by GRSE. P17A Frigates are state-of-the-art Guided Missile Frigates. Each of these ships are 149 m long, with displacement of approximately 6670 T and a speed of 28 knots. The shipyard has been recently awarded with the ICC PSE Excellence Award (2017-18) for "Operational Performance Excellence" and 16th National Award for "Excellence in Cost Management" in the category of Medium Public Sector Manufacturing Companies.

The company is showcasing its shipbuilding capabilities at DefExpo 2020 at Lucknow.

DEFENCE SECRETARY-LED EMPOWERED APEX COMMITTEE REVIEWS PROGRESS OF IAC PROJECT

New Delhi. The Empowered Apex Committee (EAC) headed by Defence Secretary Ajay Kumar on January 20 reviewed the progress of Indigenous Aircraft Carrier (IAC-P71) project at Cochin Shipyard.

The review critically examined the current status of the project as the IAC is in a very advanced stage of construction, and is scheduled to commence Basin Trials in early 2020 followed by the Sea Trials by mid 2020.

This is the 13th EAC Review Meeting of the Project and the first to be held after the signing of the Phase-III of the IAC Contract on October 31 between Ministry of Defence and Cochin Shipyard Limited.

The Defence Secretary was accompanied by Vice Admiral Ashok Kumar, Vice Chief of Naval Staff; Vice Admiral GS Pabby, Chief of Material; Vice Admiral SR Sarma, Controller Warship Production & Acquisition from IHQ MoD (Navy) and other senior officers from IHQ MoD (Navy), Warship Overseeing Team and Carrier Acceptance and Trials Team.

DRDO-IISC DEVELOPED NEW EXPLOSIVE DETECTION DEVICE UNVEILED

Pune. A new explosive detection device RalDer-X was unveiled at the National Workshop on Explosive Detection NWED-2020) in Pune on March 1. RalDer-X has the capability to detect explosives from a stand-off distance. The data library can be built in the system to expand its capability to detect a number of explosives in pure form as well as with the contaminants. Bulk explosive in concealed condition can also be detected by the device. RalDer-X has been co-developed by High Energy Materials Research Laboratory (HEMRL) Pune and Indian Institute of Science (IISc), Bangalore. The NWED-2020 was inaugurated by Secretary, Department of Defence Research and Development and Chairman, Defence Research and Development Organisation (DRDO) Dr G Satheesh Reddy. The two-day workshop has been organised by HEMRL Pune on its diamond jubilee celebration. HEMRL Pune is a premier laboratory of DRDO. It provides a platform to scientists, technocrats and users to share knowledge, experience and updated information on the technological advancements made in the recent past. The workshop will help in the further development of explosive detection devices and keep abreast on the recent development and advancements in the field of explosive detection. In his address, the DRDO Chairman emphasised that detection of explosives is a compelling need of the hour. He said, security agencies are continuously monitoring vulnerable targets with the help of intelligence agencies to thwart the attempts of anti-social elements. Dr Reddy appreciated the joint pursuit of academia and DRDO in developing portable devices, which can now be safely and effectively used by security agencies. He also released a souvenir comprising of abstracts from eminent speakers of DRDO laboratories, IITs, Advanced Centre of Research in High Energy Materials, University of Hyderabad, other universities and delegates.

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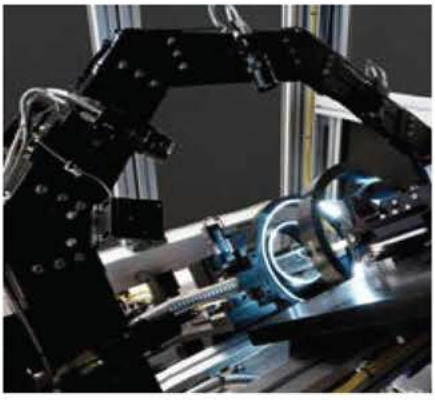

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